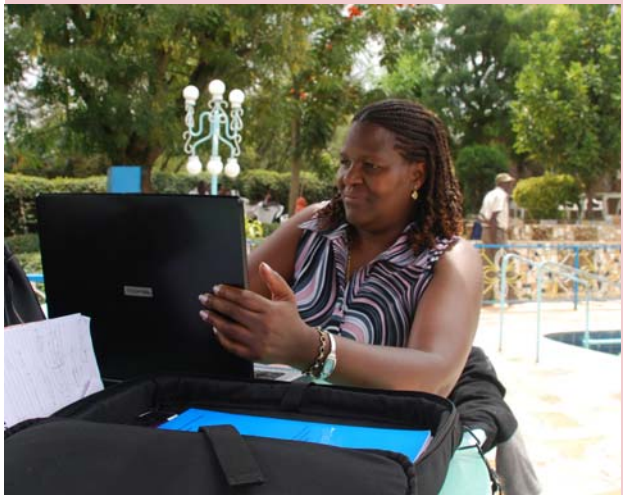
CENTERS FOR DISEASE CONTROL

Malaria: Current trends in diagnosis and treatment.

PATHOPHYSIOLOGY

Malaria is a disease caused by parasites of the Plasmodium genus and is transmitted to humans by the female Anopheles mosquito. *Plasmodium Vivax*, *Plasmodium Ovale* and *Plasmodium Malariae* cause a benign form of malaria while *Plasmodium Falciparum* gives rise to a malignant form of malaria that may lead to death if left untreated. Nonspecific clinical symptoms associated with rupture of the erythrocytes following invasion by the parasites include chills, fever, headache and general malaise. In the case of *Plasmodium Falciparum* further complications include vascular collapse, severe anemia, renal and respiratory failure, and cerebral malaria presenting as seizures or confusion, progressing to stupor, coma and death.(1)

Mosquito net in hotel in the Rift Valley in Kenya. MJoTA Publisher was in the malaria-endemic region 36 hours, slept under this net, and was diagnosed with malaria 7 days later. Note the rip in the net. Below, Kenyatta University Director of Research Charity Gichuki BVM, PhD working on documents on a Sunday afternoon in the Rift Valley, Kenya. Photos, MJoTA Publisher.



EPIDEMIOLOGY

Malaria continues to dominate despite rigorous combative measures worldwide to control the disease - an estimated 300 to 500 million humans are infected resulting in more than a million deaths are reported annually to the World Health Organization.(2)

Malaria is endemic to the tropics and subtropics, and areas of sub-Saharan Africa. In the United States malaria was eradicated in the 1950s, yet 1,337 humans infected, which included 8 deaths, were reported in 2002.(3) This has been mainly attributed to the importation of malaria from malaria-endemic countries by the residents of the United States.

DIAGNOSIS

Clinical diagnosis is inconclusive due to the nonspecific signs and symptoms of mild and severe malaria. Definitive diagnosis is made by microscopic examination of both thick and thin peripheral blood smears identifying the presence of the parasite and the degree of parasitemia enabling species-specific treatment. Antigen detection using Rapid Diagnostic Tests (RDTs) was approved by the United States Food and Drug Administration (FDA) on 13 June 2007 under the stipulation that the tests be per-

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formed by hospitals and laboratories only, with follow-up confirmation by microscopy.(4) Serology by indirect immunofluorescence (IFA) or enzyme-linked immunosorbent assay (ELISA) detects previous antibodies and is therefore not a reliable marker for diagnosis. Molecular diagnosis using the polymerase chain reaction (PCR) to detect the nucleic acids of the parasite is most accurate but is expensive and requires a specialized laboratory.

TREATMENT

Uncomplicated malaria: Oral chloroquine is the drug of choice for *Plasmodium Malariae*, *Plasmodium Ovale*, non chloroquine-resistant *Plasmodium Vivax* and uncomplicated non chloroquine-resistant *Plasmodium Falciparum*. Chloroquine-resistant *Plasmodium Vivax* infection is treated with quinine plus doxycline or tetracycline, or mefloquine. The treatment for uncomplicated chloroquine-resistant *Plasmodium Falciparum* includes quinine plus doxycline or tetracycline, or atovaquone-proguanil, or mefloquine.

Severe malaria: Intravenous artesunate for the treatment of severe malaria in the United States has not been approved for marketing in by the Food and Drug Administration. It can however be used under the provision of the Investigational New Drug application (IND) of the Centers for Disease Control which went into effect on 21 June 2007 following FDA approval. Thus it is available to patients enrolled in FDA-approved clinical trials of the Centers for Disease Control Drug Service at the Centers for Disease Control Quarantine Stations.

REFERENCES

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5. CDC. Artesunate available to treat severe malaria in US. http://www.cdc.gov/malaria/features/artesunate_now_available.htm.

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Garden in malaria-endemic Lagos, Nigeria

Malaria Surveillance --- United States, 2006

The majority of malaria infections in the United States are in travellers from malaria-endemic areas. In the United States, infection can occur through exposure to infected blood products, congenital transmission, or local mosquito-borne transmission. Malaria surveillance is conducted to identify episodes of local transmission and to guide prevention recommendations for travelers.

Description of System: Malaria cases confirmed by blood film or polymerase chain reaction are mandated to be reported to local and state health departments by healthcare providers or laboratory staff members. Case investigations are conducted by local and state health departments, and reports are transmitted to CDC through the National Malaria Surveillance System, National Notifiable Diseases Surveillance System, and direct CDC consultations. Data from these reporting systems were the basis of this report.

Results: CDC received 1,564 reports of malaria symptoms in humans living in the United States in 2006, 6 of which were fatal. This was an increase of 2.4% from 1,528 reports for 2005. *P falciparum*, *P vivax*, *P malariae*, and *P ovale* were identified in 39.2%, 17.6%, 2.9%, and 3.0% of cases, respectively. Ten patients (0.6%) were infected by 2 or more species. The infecting species was unreported or undetermined in 36.6%. Compared with 2005, the biggest increases in malaria were in travelers from Asia (16.0%). Based on estimated volume of travel, the highest estimated relative rates of malaria were in travelers from West Africa. Of 602 United States civilians who acquired malaria abroad and for whom chemoprophylaxis information was known, 405 (67.3%) reported that they had not followed a chemoprophylactic drug regimen recommended by CDC for the area to which they had traveled. Seventeen reports were of pregnant women, of whom only one reported taking chemoprophylaxis. Six deaths were reported; 5 had been infected with P. falciparum and one with *P malariae*.

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