Recognizing and Treating Malaria in U.S. Residents

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Hello, I'm Dr. David Townes, a medical epidemiologist with the Centers for Disease Control and Prevention's Division of Parasitic Diseases and Malaria, in the Center for Global Health.

Every year there are approximately 250 million cases of malaria worldwide, resulting in approximately 880,000deaths. Over 90 percent occur in sub-Saharan Africa, with the majority occurring in children less than five years of age. Malaria is endemic in over 100 countries with approximately half the world's population at risk.

Malaria is caused by an infection with a protozoan. This includes *Plasmodium falciparum*, responsible for most of the severe disease and death from malaria, *Plasmodium vivax, Plasmodium malariae, Plasmodium ovale*, and *Plasmodium knowlesi*, a malaria species of old world monkeys also known to cause disease in humans. The vector is the female anopheles mosquito. There are 400 different species, 30 of which are important to malaria transmission. They are night biting with some resting indoors and some outdoors.

Every year in the United States, there are approximately 1,500 cases of malaria reported. In 2008, there were 1,298 cases of malaria, 537 of which were hospitalized, and two died. Forty four percent of these cases were acquired in Africa, followed by 13 percent from Asia. In 39 percent of cases however, the geographic region of acquisition was not reported.

When performing a pre-travel malaria risk assessment for a traveler, it is important that this be an individual risk assessment. Geography or destination country is not enough, as all travel is not created equally. It is important to consider not only destinations but specific itinerary, type of travel, activities, and accommodations. Additionally, it may be important to consider the season or time of year of travel, as well as individual risk factors, such as pregnancy, that may affect advice about travel and use of chemoprophylaxis. Upon completion of a risk assessment one might recommend no specific interventions, mosquito avoidance only, or mosquito avoidance plus chemoprophylaxis.

For the majority of travelers, mosquito avoidance is best accomplished through a combination of the use of insect repellants, protective clothing, and insecticide treated bed nets. Many of the common recommended mosquito repellants contain DEET in concentrations between 20 percent and 50 percent. There is no advantage to products with DEET concentrations greater than 50 percent. In fact, products with 20 percent DEET concentration are just as efficacious as those with 50 percent DEET concentration, except the lower concentration products require more frequent application. One alternative to DEET are products containing picaridin with at least a 20 percent concentration, as they have similar efficacy to DEET. Two other recommended products include those containing oil of lemon eucalyptus and those containing IR3535. In addition, it is also important to wear clothing treated with permethrin. Consumers may purchase permethrin spray to apply to clothing or purchase pre-treated clothing available through several manufacturers.

If there is any chance of encountering mosquitoes during the night while sleeping, it is essential to sleep under an insecticide treated bed net. In addition to the mosquito avoidance measures just discussed, it may be recommended that some travelers take malaria chemoprophylaxis. There are several choices and the correct choice will depend on destination, endemic species of malaria, drug resistance patterns, and individual patient characteristics and preference. Common choices for malaria prophylaxis include chloroquine, doxycycline, mefloquine, atovaquone-progunil or malarone, and primaquine.

After returning from a trip, if an individual presents with fever and has been in a malaria endemic area, malaria must be considered in the differential diagnosis and tested for. Testing should include microscopy with a thick and thin blood smear. If initially negative, these should be repeated every 12 to 24 hours for 36 to 72 hours until positive or three have been negative. There are other diagnostic modalities including PCR and malaria rapid diagnostic tests, or RDTs, that may be helpful in certain situations, but the mainstay of diagnosis remains microscopy.

Patients with malaria may have non-specific signs and symptoms. Patients with uncomplicated malaria, the milder form of the disease, may present with fever, headache, chills, body ache, vomiting, diarrhea, and/or cough. They may be anemic and thrombocytopenic. In addition to these signs and symptoms, patients with severe malaria may present with severe anemia, hypoglycemia, DIC, acidosis, renal failure, ARDS, hemolysis, shock, cerebral malaria, and hyperparasitemia.

Once the diagnosis of malaria has been made, there are several choices for treatment. Generally, patients with uncomplicated malaria are treated with oral therapy. Specific treatment choice will depend on the destination, the species of malaria and parasitemia, if known, the resistance patterns, and the clinical status of the patient. One choice, isquinine, in conjunction with a second drug, either doxycycline, tetracycline, or clindamycin. Atrovaquone – proguanil, or malarone, may also be used. Other choices include mefloquine, chloroquine, or primaquine. In addition, the FDA approved a new anti-malarial in 2009. This new anti-malarial, Coartem, is a combination of artemether and lumafantrine. Artemether is a member of the class of drugs called artemisinins which were originally derived from the sweet wormwood shrub. Artemisinins are potent anti-malarials and, in combination with other drugs, is the W-H-O first line recommended treatment for uncomplicated malaria. Similar to uncomplicated malaria, the specific treatment choice for severe malaria will also depend on the destination, the species of malaria, and the parasitemia, if known, the resistance patterns, and the clinical status of the patient. Patients with severe malaria should be treated with intravenous therapy. First line therapy is quinidine plus a second drug, either doxycycline, tetracycline, or clindamycin. An alternative drug, artesunate, also from the class of drugs called artemisinins, is available in the United States through the CDC via an Investigational New Drug Protocol. It is a three day intravenous course followed by a course of either malarone, doxycycline, clindamycin, or mefloquine.

There are several malaria resources on the CDC website, including the CDC Health Information for International Travel 2010, commonly referred to as the yellow book. It is available in hard copy and on-line and has excellent up-to -date information for pre-travel consultation for malaria, including specific malaria species, risk to the traveler, and resistance patterns, all

segmented by country. On the CDC website you will also find the guidelines for treatment of malaria in the United States. This table contains a wealth of geographic region and species specific information about the treatment of malaria. It also lists the telephone number for the CDC malaria hotline which is available 24 hours a day for clinicians with questions about management of patients with malaria or suspected malaria. Thank you.

[Announcer] For the most accurate health information, visit www.cdc.gov or call 1-800-CDC-INFO, 24/7.