Malaria – Old and New Controls

Illnesses consistent with malaria were described from ancient China, the Roman Empire, and medieval Europe. The name malaria, first used in the 18th century, comes from a contraction of the Italian words “mal” and “aria”, or bad air that was believed to cause the fever and chills that befell those who spent time marshy districts. Today the disease remains a significant source of morbidity and mortality globally. WHO estimated there were almost 800,000 malaria deaths worldwide in 2009, mostly among African children.

Malaria parasites in the blood were first identified in 1880 and, ten years later, the first species were named as Plasmodium vivax and P. malariae. Additional species affecting humans are P. falciparum (recognized in 1897, also the year that mosquito transmission of malaria was demonstrated), P. ovale (1922), and simian P. knowlesi (first human infection reported in 1965).

United States Experience

Around 1920, there were several hundred thousand malaria cases in the United States annually (300/100,000). Malaria was endemic in this country through the mid-20th century, when a wartime agency
established mosquito control around military training bases in southern states. This agency, Malaria Control in War Areas, was the origin of today’s Centers for Disease Control and Prevention (CDC), which initially had considerable activity in mosquito control. Malaria was considered eliminated in the United States in 1951 although most states including Washington have the vector anopheline mosquitoes. If an infected person arrives in the United States and is bitten by a mosquito, malaria can be introduced locally, as has occurred in California several times.

According to the CDC case definition, malaria diagnosis must occur in the United States regardless of previous episodes of malaria. There is no requirement that the case have symptoms. A confirmed case must have positive microscopy performed by an experienced laboratory or a positive nucleic acid test (PCR tests must fulfill CLIA requirements, including validation studies). A suspected case has detection of Plasmodium species by rapid diagnostic antigen testing without confirmation by microscopy or nucleic acid testing. Blood smears from questionable cases can be referred to Washington State Public Health Laboratories for confirmation.

Currently, cases in the United States are usually new arrivals or travelers; about half of cases are first- and second-generation immigrants who have visited relative and friends in malaria-endemic countries. Rare transfusion-associated and locally transmitted malaria cases also occur.

In recent years 25-40 malaria cases were reported annually in Washington State residents, totaling 216 cases for 2005-2011 year to date. There were 146 males (68%). Mean age was 32.4 years with 26 cases under 18 years of age. Species of malaria was available for 165 cases: 87 (53%) P. falciparum, 62 (38%) P. vivax, 7 (4%) P. ovale, 6 (4%) P. malariae, and 3 (2%) mixed P. ovale and P. vivax. There were 99 hospitalizations and two deaths, both due to the more severe falciparum malaria.
Travel information was available for 174 of the Washington cases, and included 114 (66%) associated with Africa, 45 (26%) with Asia, 29 (17%) with India, and 15 (8%) with exposures in either Afghanistan or Iraq. These exposures reflect the known distribution of malaria, which is highest in sub-Saharan Africa and parts of Asia and Oceania.

Treatment and Prevention

For thousands of years, botanicals from cinchona trees (quinine) and from Artemisia have been recognized to have antimalarial properties. Current choice of treatment for a patient depends on the likelihood of resistance to certain drugs based on infecting species; geographic origin of the infection; severity of illness; and other risk factors such as pregnancy, age, or presence of G6PD deficiency. CDC provides a consultation line for clinicians (770-488-7788 9:00 am to 5:00 pm ET and 770-488-7100 after hours). Note that there is currently a primaquine shortage due to manufacturing issues (see: http://www.cdc.gov/malaria/primaquine.html).

Before an international trip, travelers should determine if there is risk of malaria during their itinerary, considering the season, types of accommodation, and style of travel. Malaria prevention may involve avoiding mosquito bites with repellents, suitable clothing, and insecticide-impregnated bed nets as well as taking appropriate chemoprophylaxis. Women who are pregnant should receive particular counseling to avoid malaria infection.

Travelers visiting friends and relatives (VFR) in high risk areas should take the same precautions to prevent malaria as other travelers. Compared to business travelers or tourists, such VFR travelers may be at increased risk due to several factors including: extended duration of travel, staying in private residences with less protection than hotels, and lesser use of insect repellents and chemoprophylaxis. These factors may reflect misperceptions of risk since immigrants who have lived in the United States for years or persons were born in this country to immigrants will lack the immunity to malaria of family or friends still living in an endemic country.
The Future

A malaria vaccine currently under development was recently reported to demonstrate a 55% reduction in frequency of malaria episodes during the 12 months of follow-up in children 5-17 months of age at first immunization, and a 35% reduction in severe malaria (see: http://www.who.int/vaccine_research/Malaria/en/index.html). The vaccine was provided in conjunction with other interventions to reduce exposure to malaria such as bed nets, indoor residual insecticide spraying, and treatment of pregnant women. There will be ongoing studies of safety and effectiveness for the vaccine including the need for a booster dose.

Areas of risk for malaria are constantly changing. Greece recently reported 20 cases of P. vivax acquired since the end of September in the southern region of the country, primarily the Laconia district. In October, 2011, Centers for Disease Control and Prevention (CDC) recommended persons traveling to that area should take antimalaria prophylaxis: http://www.cdc.gov/malaria/malariagreece.htm. This situation is a reminder that a traveler returning home with active malaria can introduce malaria into areas where there are competent mosquito vectors, which is the presumed cause of the outbreak in Greece.

Although malaria has been eliminated from the United States, the disease remains a global challenge as well as a risk for travelers to many areas. Existing and future interventions may eventually reduce that substantial disease burden.

Resources

National case definition for malaria:
http://www.cdc.gov/osels/ph_surveillance/nndss/casedef/malaria_current.htm

CDC Travelers’ Health resources with information about destinations and conditions, and links to the 2012 Yellow Book: http://wwwnc.cdc.gov/travel/

Distribution of mosquitoes in Washington: