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C.M.G. Buttery, M.D., M.P.H., Commissioner
Grayson B. Miller, Jr., M.D., Epidemiologist
Editor: Carl W. Armstrong, M.D.

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Tickborne Diseases to Look for in Virginia

Unfortunately, tick season is upon us in Virginia. Medical personnel should be alert to the possibility of infectious diseases transmitted by ticks, especially Rocky Mountain spotted fever (RMSF), Lyme disease, erlichiosis and tularemia.

Rocky Mountain Spotted Fever (RMSF)

Virginia, along with North and South Carolina, Maryland, Georgia, Tennessee and Oklahoma, report two thirds of the RMSF cases in the nation.[1] The majority of Virginia cases are seen in the summer months. From 1974 through 1982 an average of 112 cases and 3 deaths were reported each year. Since 1982 only 38 cases and one death per year have been reported. The etiologic agent is *Rickettsia rickettsii. Dermacentor variabilis,* the dog tick, is the most common vector in this part of the country. Four to six hours of attachment are required for the rickettsiae to become reactivated to infect man.

RMSF is characterized by sudden onset with moderate to high fever, malaise, myalgia, headache, chills and conjunctival injection. A maculopapular rash appears on the extremities around the third day and spreads to the palms and soles and then much of the rest of the body. Petechiae are common. Absence or delayed appearance of the typical rash contributes to diagnostic delays and increased fatalities.[2]

Veterinarians should consider RMSF in dogs with acute onset of fever, CNS depression, neurologic signs, tachypnea, scleral blood vessel injection, lymphadenopathy, or splenomegaly. Canine cases have been reported by Virginia veterinarians.

Erlichiosis

Infection with an *Ehrlichia canis*—like agent has recently been added to the list of causes of undifferentiated febrile illness after exposure to ticks. The first well documented case of human ehrlichial infection occurred in April, 1986 when a 51-year-old man presented to a Detroit hospital with acute onset of fever, malaise, myalgia, and headache.[3] Two and one-half weeks earlier he had been bitten by a tick while planting trees in rural Arkansas. This patient developed pancytopenia and had laboratory evidence of abnormal liver function and renal failure, but he did not develop an exanthem or petechial rash. Infection with *E. canis* was suspected after a morphologically similar organism was observed in white blood cell inclusions. A fourfold fall in titer between convalescent and late convalescent phase serum samples was detected to several ehrlichia (the highest titer and the greatest fall were seen for *E. canis*) but to no other organisms transmitted by ticks.

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Since this report, 45 additional patients with undifferentiated febrile illness have been presumptively diagnosed using serologic techniques as having infection caused by *E. canis*. Typically, they presented with fever and leukopenia but only 20% have had a rash. Four of these patients were Virginia residents and two of these had tick exposure in 1986 near Hopewell. Active surveillance for cases of ehrlichial infection was instituted between April and September, 1987 in the Hopewell area, but only one additional case was detected in 1987.

We recommend that ehrlichiosis be considered as a possible cause of undifferentiated febrile illness in Virginia residents with tick exposure.

Lyme Disease

Lyme disease is now considered the most common tickborne disease in the United States. The number of cases in Virginia has increased each year since it was first identified in 1981. In a cooperative study with the Medical College of Virginia that involved a physician mail survey, a computer search of discharge diagnoses at major referral hospitals and investigation of cases reported through routine surveillance, eight cases were identified in 1986 and 20 in 1987. Constitutional complaints occurred in 61%. Organs involved were skin (ECM, 89%), heart (4%), brain (11%), and joints (29%). No deaths were reported. Most cases had onset during the early summer (May–July) and 12 counties and one city were represented. A history of tick bite was obtained in 71%.

During 1987 a field survey of wildlife and ticks for evidence of Lyme disease was carried out in cooperation with Old Dominion University and the North Carolina School of Veterinary Medicine. Only two *Ixodes dammini* ticks (the most common Lyme disease vector) were identified from the over 3000 ticks that were collected in Virginia. Both *I. dammini* specimens were found on Parramore Island on the Virginia eastern shore. One of these contained over 4000 *Borrelia burgdorferi* spirochetes, the causative organism of Lyme disease. Three of the eight tick species examined (*I. cookei, Amblyoma americanum* and *Dermacentor variabilis*) contained lesser numbers of *B. burgdorferi*. Serum specimens from white footed mice, white tailed deer and raccoons were obtained. One of 40 white footed mice had antibodies to *B. burgdorferi*. Results from the other species are pending.

Clinical Lyme disease has been reported in dogs, horses and cows with chronic polyarthritis as the most common presentation.

False negative and false positive serologic results are not uncommon in Lyme disease testing. Since variability in test results has been noted to occur, practitioners should rely more on clinical and epidemiological findings to make the diagnosis of Lyme disease.

Tularemia

An average of four to five cases of tularemia are reported each year in Virginia. The majority of cases are reported during the summer and most of those cases are tick-associated. The etiologic agent, *Francisella tularensis*, can also be transmitted by inoculation of skin or mucous membranes with blood or

How Should Ticks Be Removed?

- Use tweezers or forceps. If fingers must be used, use a tissue, paper towel or gloves for protection. Do not handle ticks with bare hands.
- Pull the tick upward using a steady motion to avoid breaking off the mouthparts in the skin. It helps to hold the tick as close to the skin surface as possible and avoid twisting or jerking the tick.
- Try not to crush the tick as its fluids may be infectious.
- Dispose of the tick by flushing it down the toilet.
- After the tick has been removed, wash hands with soap and water.
- Apply antiseptic to the bite site.

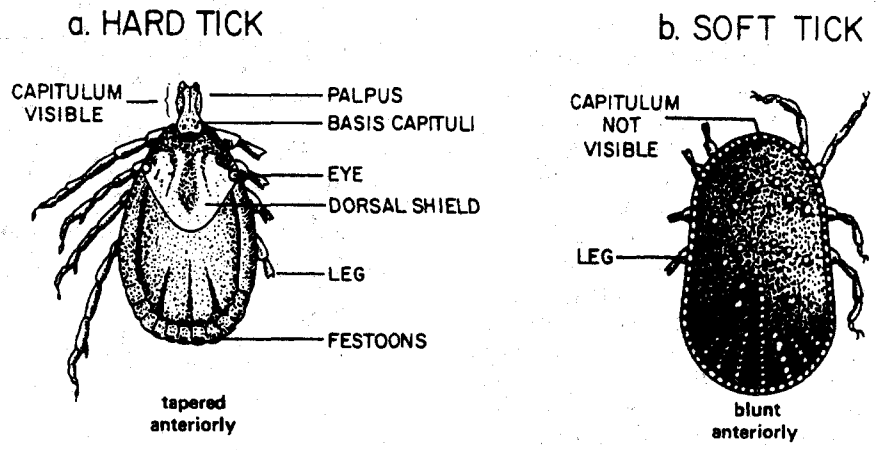

Figure. Generalized Dorsal Views of Female Hard and Soft Tick. There are two main groups of ticks: the hard ticks (Family Ixodidae) and the soft ticks (Family Argasidae). The hard tick is distinguished by a dorsal shield or scutum immediately behind the capitulum (false head). The dorsal shield is small in the female, but in the male it covers the entire dorsal surface. The soft tick has no dorsal shield. Hard ticks also are tapered anteriorly while most soft ticks are blunt. In the United States hard ticks are much more abundant than soft ticks, cause greater annoyance, and are far more important in the transmission of disease to man and animals.

References

1. Needham GR. Evaluation of five popular methods for tick removal. Pediatrics 1985;75:997–1002.
2. Centers for Disease Control. Ticks of public health importance and their control. Atlanta, GA. 1978. HEW Pub. No. (CDC) 78-8142.

tissue from infected animals. Wood ticks (*Dermacentor andersonii*), dog ticks (*D. variabilis*), and Lone Star ticks (*Amblyomma americanum*) transmit tularemia by bite.

Clinical signs are related to the route of introduction and the virulence of the strain. The disease most often presents as an indolent ulcer, accompanied by swelling of the regional lymph nodes (ulcero-glandular type). Diagnosis is made by recovery of the infectious agent or by a rise in serum antibodies between acute and convalescent samples. Tularemia does not appear to be a clinical problem for domestic animals.

Serologic Testing Available

Paired human sera for the diagnosis of RMSF, ehrlichia infection, Lyme disease and tularemia may be sent to the Division of Consolidated Laboratory Services, Attention: Serology Laboratory, 1 North 14th Street, Richmond, Virginia 23219.

Animal sera for the diagnosis of RMSF, erlichiosis and Lyme disease may be sent to the attention of Dr. Jay F. Levine, Department of Epidemiology and Public Health, School of Veterinary Medicine, North Carolina State University, 4700 Hillsborough Street, Raleigh, North Carolina, 27606. The charges are $10.00 for the acute sample and $5.00 for the convalescent.

Reported by: Suzanne R. Jenkins, V.M.D., M.P.H., Jacob E. Jones, M.D., Tracey S. Heimberger, M.D., Daniel E. Sonenshine, Ph.D., and Jay F. Levine, D.V.M., M.P.H.

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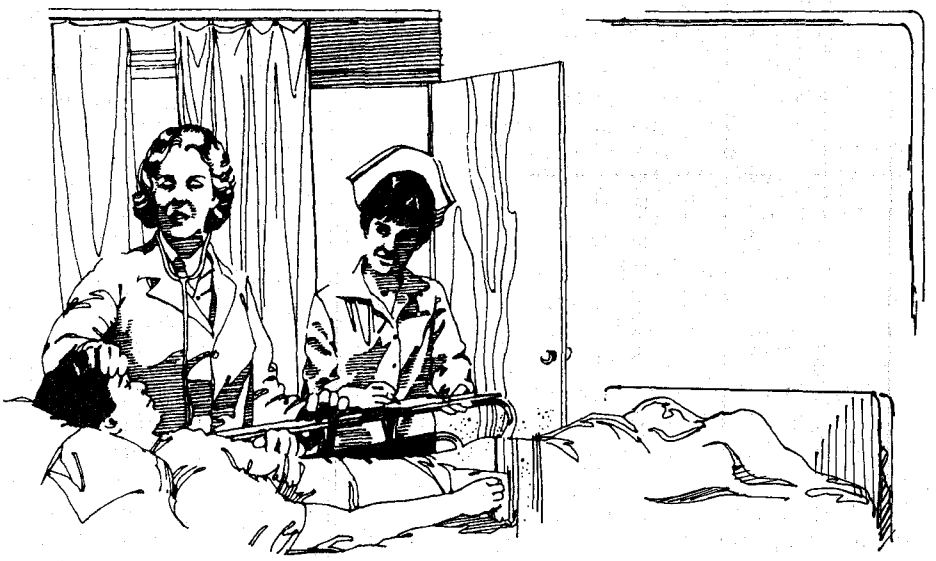
1. Centers for Disease Control. Rocky Mountain spotted fever—United States, 1985. MMWR 1986;35:247–9.
2. Woodward TE. Rocky Mountain spotted fever: epidemiological and early clinical signs are keys to treatment and reduced mortality. J Infect Dis 1984;150:465–8.
3. Maeda K, Markowitz N, Hawley RC, Ristic M, Cox D, McDade J. Human infection with *Ehrlichia canis*, a leukocyte rickettsia. N Engl J Med 1987;316:853–6.

Recommendations for the Prevention of Malaria in Travelers



Malaria continues to be an important health risk to Americans who travel to malaria-endemic areas of the world. The continued extension of chloroquine-resistant *Plasmodium falciparum* (CRPF) in Africa, Asia, South America, and Oceania has reduced the number of effective drugs for malaria prophylaxis. In addition, some alternative drugs to chloroquine have been found to be associated with serious adverse reactions, and thus their usefulness is limited. Guidelines for prophylaxis must take into account the risk of exposure to malaria, the effectiveness and safety of antimalarial drugs, and the use of personal protective measures. Recommendations for the prevention of malaria should be revised periodically because of geographic changes in the occurrence of drug-resistant *P. falciparum* malaria, new information on the efficacy or toxicity of drugs used for prophylaxis, and/or the availability of new drugs.

Malaria in humans is caused by one of four protozoan species of the genus *Plasmodium: P. falciparum, P. vivax, P. ovale,* and *P. malariae*. All are transmitted by the bite of an infected female *Anopheles* mosquito. Occasionally malaria is transmitted by blood transfusion or congenitally from mother to fetus. The disease is characterized by fever and influenza-like symptoms, which may occur at intervals and which include chills, headache, myalgia, and malaise. Malaria may be associated with anemia and jaundice, and *P. falciparum* infections may cause kidney failure, coma, and death. Deaths due to malaria are preventable.

Risk of Acquiring Malaria

Malaria transmission occurs in large areas of Central and South America, sub-Saharan Africa, the Indian Subcontinent, Southeast Asia,* the Middle East, and Oceania. The estimated risk of acquiring malaria varies markedly from area to area. This variability is a function of the intensity of transmission in both urban and rural areas within the various regions as well as a function of the itineraries of most travelers. For example, during the period 1983–1986, 634 cases of *P. falciparum* among American civilians were reported to CDC. Of these, 507 (80%) were acquired in sub-Saharan Africa; 44 (7%), in Southeast Asia; and 63 (10%), in the Caribbean and South America. Of the 28 fatal infections, 21 were acquired in sub-Sa-

**Thailand, Indonesia, Malaysia, People's Republic of China, the Philippines, Burma, Kampuchea, Vietnam, and Laos.*

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haran Africa. Thus, most cases of imported malaria among American travelers were acquired in sub-Saharan Africa, despite the fact that only an estimated 90,000 Americans travel to sub-Saharan Africa each year, whereas an estimated 900,000 Americans visit Southeast Asia and South America each year. This disparity in the risk of acquiring malaria stems from the fact that travelers to Africa are at risk in most rural and many urban areas. Moreover, travelers tend to spend considerable amounts of time, including evening and nighttime hours, in rural areas where malaria risk is highest. In contrast, most travelers to Southeast Asia and South America spend most of their time in urban or resort areas where risk of exposure, if any, is limited, and they travel to rural areas only during daytime hours, when risk is limited.

Drug Resistance

Resistance of *P. falciparum* to chloroquine has been reported from all countries with *P. falciparum* malaria except the Dominican Republic, Haiti, Central America, the Middle East, and the following countries in West Africa: Chad, Equatorial Guinea, Guinea, Guinea-Bissau, Liberia, Senegal, and Sierra Leone. In addition, resistance to both chloroquine and pyrimethamine/sulfadoxine (Fansidar®) is widespread in Thailand, Burma, and Kampuchea.

General Advice for Travelers to Malaria-Endemic Areas

All travelers to malaria-endemic areas are advised to use an appropriate drug regimen and personal protection measures to prevent malaria. However, travelers must be informed that, regardless of methods employed, malaria can still be contracted. Symptoms can develop as early as 8 days after initial exposure in a malaria-endemic area and as late as several months after departure from a malarious area. Travelers should understand that malaria can be treated effectively early in the course of the disease but that delaying appropriate therapy can have serious or even fatal consequences. Individuals who have the symptoms of malaria should seek prompt medical evaluation, including thick and thin malaria smears, as soon as possible.

Personal Protection Measures

Because of the nocturnal feeding habits of *Anopheles* mosquitoes, malaria transmission occurs primarily between dusk and dawn. Travelers must be advised of the importance of measures to reduce contact with mosquitoes during those hours. Such measures include remaining in well-screened areas, using mosquito nets, and wearing clothes that cover most of the body. Additionally, travelers should be advised to purchase insect repellent for use on exposed skin before travel. The most effective repellents contain N,N diethylmetatoluamide (DEET), an ingredient in many commercially available insect repellents. The actual concentration of DEET varies among repellents (ranging up to 95%); the higher the concentration, the longer-lasting the repellent effect. Travelers should also be advised to purchase a pyrethrum-containing flying-insect spray to use in living and sleeping areas during evening and nighttime hours.

Chemoprophylaxis

Malaria chemoprophylaxis is the use of drugs to prevent the development of the disease. Preferably, malaria chemoprophylaxis should begin 1–2 weeks prior to travel to malarious areas. In addition to assuring adequate blood levels of the drug, this regimen allows any potential side effects to be evaluated and treated by the traveler's own physician. The exception is doxycycline; because of its short half-life, its use should begin 1–2 days before entering a malarious area. Chemoprophylaxis should continue during travel in malarious areas and for 4 weeks after departure from these areas.

In choosing an appropriate chemoprophylactic regimen prior to travel, several factors should be considered. The travel itinerary should be reviewed in detail and compared with the information on areas of risk within a given country to determine whether the traveler will actually be at risk of acquiring malaria. The risk of acquiring CRPF malaria is another consideration. In addition, any previous allergic or other reaction to the antimalarial drug of choice and the accessibility of medical care during travel must be determined.

Chemoprophylactic Regimens

For travel to areas of risk where CRPF has *not* been reported or where only low-level or focal chloroquine resistance has been reported, once-weekly use of chloroquine *alone* is recommended. Chloroquine is usually well tolerated. The few individuals who experience uncomfortable side effects may tolerate the drug better by taking it with meals or in divided, twice-weekly doses. As an alternative, the related compound hydroxychloroquine may be better tolerated. (See Table 1 for recommended dosages for chloroquine and other chemoprophylactic regimens.)

For travel to areas of risk where CRPF *is* endemic, once-weekly use of chloroquine *alone* is recommended. In addition, travelers to these areas (except those with histories of sulfonamide intolerance) should be given a treatment dose of Fansidar® to be carried during travel and should be advised to take Fansidar® promptly in the event of a febrile illness during their travel *when professional medical care is not readily available*. It must be emphasized to these travelers that such presumptive self-treatment of a possible malarial infection is *only a temporary measure and that prompt medical evaluation is imperative*. They should be advised to continue their weekly chloroquine prophylaxis after presumptive treatment with Fansidar®. (See Table 1 for recommended dosage.)

Alternative Chemoprophylactic Regimens

Doxycycline *alone*, taken daily, is an alternative regimen for short-term travel to areas with risk of CRPF. It is particularly appropriate for those individuals with a history of sulfonamide intolerance or for those, such as short-term travelers to forested areas of Thailand, Burma, and Kampuchea, who may be at risk in areas of chloroquine and Fansidar® resistance. Travelers who use doxycycline should be cautioned about the possible side effects (see Adverse Reactions). Doxycycline prophylaxis can begin 1–2 days prior to travel to malarious areas. It should be continued daily during travel in malarious areas and for 4 weeks after departure from these areas.

Fansidar® taken once weekly in combination with chloroquine may be considered in exceptional circumstances involving prolonged exposure in areas with intense transmission of CRPF and where medical care is not available. *If weekly use of Fansidar® is prescribed, the traveler should be cautioned about the possible side effects as described in the*

section on adverse reactions.

Proguanil (Paludrine®) is, like pyrimethamine, a dihydrofolate reductase (DHFR) inhibitor. Resistance of *P. falciparum* to DHFR inhibitors is present in some endemic regions, but its distribution is not well delineated. Proguanil is not available commercially in the United States. Limited data suggest that it may be effective in Kenya, but not in Thailand and Papua New Guinea. No current data are available on the efficacy of proguanil in other areas of CRPF, especially West Africa. Travelers using proguanil should take a *daily* 200-mg dose (adult) in combination with a *weekly* regimen of chloroquine.

Mefloquine (Lariam®), a new antimalarial similar in structure to quinine, is highly effective against both chloroquine- and Fansidar®-resistant *P. falciparum* infections. Approval for use in the United States is pending; currently the drug is available in France and Switzerland. Mefloquine may be considered for use by travelers to areas where there is risk of CRPF infection and by travelers to areas where *P. falciparum* is resistant to both chloroquine and Fansidar®. Currently available information suggests the adult prophylactic dose is 250 mg weekly. Mefloquine prophylaxis should begin 1 week before entry into the malarious area and should continue weekly while the traveler is there. Adverse reactions are infrequent at prophylactic dosage but may become more common with the higher doses used in treatment. Minor side effects observed with prophylactic doses, such as gastrointestinal disturbance and dizziness, tend to be transient and self-limited. Because mefloquine has occasionally been associated with asymptomatic sinus bradycardia and a prolonged QT interval, it should not be used by those receiving beta-blockers, calcium channel antagonists, or other drugs that may prolong or alter cardiac conduction.

Primaquine: Prevention of Relapses of *P. vivax* and *P. ovale*

Unlike *P. falciparum* and *P. malariae*, *P. vivax* and *P. ovale* have forms that can persist in the liver and cause relapses for as long as 4 years after routine chemoprophylaxis is discontinued. Travelers to malarious areas should be alerted to this risk; if they develop malaria symptoms after they return home, they should report their travel history and the possibility of malaria to a physician as soon as possible. Primaquine prevents relapses by acting against the liver stages of *P. vivax* and *P. ovale;* however, its use is not indicated for all travelers. Primaquine is administered after the traveler leaves an endemic area and usually in conjunction with chloroquine during the last 2 weeks of the 4-week period of prophylaxis after exposure in an endemic area has ended.

Since most malarious areas of the world (except Haiti) have at least one species of relapsing malaria, travelers to these areas have some risk of acquiring either *P. vivax* or *P. ovale*. However, this risk is extremely difficult to quantify. Prophylaxis with primaquine is generally indicated for persons who have had prolonged exposure in malaria-endemic areas, e.g., missionaries and Peace Corps volunteers. While the actual risk to the traveler with less intense exposure is difficult to define, with the exception of individuals deficient in glucose-6-phosphate dehydrogenase (G6PD) (see Adverse Reactions), most individuals can tolerate the standard regimen of primaquine.

Adverse Reactions and Contraindications to Antimalarials

The frequent or serious side effects of recommended antimalarials are discussed below. However, physicians should review the prescribing information in standard pharmaceutical reference texts and in the manufacturers' package inserts.

Chloroquine and hydroxychloroquine rarely have serious adverse reactions when taken at prophylactic doses for malaria. Occasionally, minor side effects such as gastrointestinal disturbance, headache, dizziness, blurred vision, and pruritus occur, but generally these do not require discontinuing the drug. While high doses of chloroquine, such as those used to treat rheumatoid arthritis, have been associated with retinopathy, this serious side effect has not been associated with routine weekly malaria prophylaxis. However, periodic ophthalmologic examinations for persons using chloroquine for extended periods (more than 6 years of cumulative weekly prophylaxis) are recommended. Chloroquine and related compounds may exacerbate psoriasis and may interfere with the antibody response to human diploid cell rabies vaccine.

Amodiaquine, a 4-aminoquinoline similar to chloroquine in structure and activity, has been used as an alternative prophylactic drug in areas where CRPF is endemic. It is not commercially available in the United States. Amodiaquine-associated agranulocytosis has been reported among travelers from the United Kingdom and Switzerland, countries where the drug has been commercially available. Therefore, amodiaquine is *not* recommended for malaria prophylaxis (*1*).

Fansidar® can cause severe adverse cutaneous reactions. Between 1982 and 1985, 24 cases of erythema multiforme, Stevens-Johnson syndrome, and toxic epidermal necrolysis were documented among American travelers using Fansidar®. Seven of these reactions were fatal. Available data indicate that the incidence of fatal cutaneous reactions associated with the use of Fansidar® among American travelers ranges from 1/11,000 to 1/25,000 users. These severe cutaneous reactions were associated with Fansidar®

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when used as once-weekly prophylaxis. Fansidar® has also been associated with serum-sickness-type reactions, urticaria, exfoliative dermatitis, and hepatitis. IF ONCE-WEEKLY USE OF FANSIDAR® IS PRESCRIBED, THE TRAVELER SHOULD BE ADVISED TO DISCONTINUE IT IMMEDIATELY IF HE/SHE DEVELOPS A POSSIBLE ILL EFFECT, ESPECIALLY ANY SKIN OR MUCOUS MEMBRANE SIGNS OR SYMPTOMS, SUCH AS ITCHING, REDNESS, RASH, MOUTH OR GENITAL LESIONS, OR SORE THROAT. Use of Fansidar® is contraindicated for persons with histories of sulfonamide intolerance and for infants under 2 months of age.

Doxycycline is a tetracycline and may cause side effects associated with this group of drugs. Travelers to tropical climates who use doxycycline should be made aware of the possibility of photosensitivity, usually manifested as an exaggerated sunburn reaction. The risk of such a reaction can be minimized by avoiding prolonged, direct exposure to the sun. In addition, doxycycline use may be associated with an increased frequency of monilial vaginitis. Doxycycline is contraindicated in pregnancy (see Prophylaxis During Pregnancy, this page) and for children under 8 years of age.

Primaquine may cause severe hemolysis in G6PD-deficient individuals. Before using primaquine, G6PD deficiency should be ruled out by appropriate laboratory testing.

Prophylaxis During Pregnancy

Malaria infection in pregnant women may be more severe than in nonpregnant women. In addition, the risk of adverse pregnancy outcomes, including prematurity, abortion, and stillbirth, may be increased. For these reasons, and because chloroquine has not been found to have any harmful effects on the fetus when used in the recommended doses for malaria prophylaxis, pregnancy is not a contraindication to malaria prophylaxis with chloroquine or hydroxychloroquine. However, because no chemoprophylactic regimen is completely effective in areas with CRPF, women who are pregnant or likely to become so should avoid travel to such areas.

The safety of Fansidar® during pregnancy has not been completely established. Experimental data demonstrating the teratogenic effect of pyrimethamine in laboratory animals has resulted in restrictions in the licensing of compounds containing pyrimethamine. However, pyrimethamine, alone and in combination with sulfonamides, has been used for nearly 30 years to treat pregnant women with toxoplasmosis (another protozoal parasitic infection). While caution must be exercised when extrapolating from accumulated case reports of women treated for this infection, it is difficult to implicate pyrimethamine as a cause of fetal abnormalities. Thus, while the teratogenic effect in animals cannot be ignored, published data do not substantiate the inference that pyrimethamine is a human teratogen.

Sulfadoxine is a sulfonamide antimicrobial that, when administered during the last trimester of pregnancy, theoretically could compete with bilirubin for plasma proteins and exacerbate neonatal jaundice. It is unclear, however, whether this specific sulfa congener poses any risk to the newborn.

Doxycycline, a tetracycline, is generally contraindicated for malaria prophylaxis during pregnancy. Adverse effects of tetracyclines on the fetus include discoloration and severe dysplasia of the teeth and inhibition of bone growth. In pregnancy, therefore, tetracyclines would be indicated only if required to treat life-threatening infections due to multidrug-resistant *P. falciparum*.

Primaquine should not be used during pregnancy because the drug may be passed transplacentally to a G6PD-deficient fetus and cause life-threatening hemolytic anemia in utero. Whenever radical cure or terminal prophylaxis with primaquine is indicated, chloroquine should be given once a week until delivery, at which time the decision to give primaquine may be made.

Prophylaxis While Breastfeeding

Very small amounts of antimalarial drugs are secreted in the breast milk of lactating women. The amount of drug transferred is not thought to be harmful to the nursing infant; however, more information is needed. Because the quantity of antimalarials transferred in breast milk is insufficient to provide adequate protection against malaria, infants who require chemoprophylaxis should receive the recommended dosages of antimalarials (Table 1).

Chemoprophylaxis for Children

Children of any age can contract malaria. Consequently, the indica-

tions for prophylaxis are identical to those described for adults. Doxycycline is contraindicated for children less than 8 years of age, and Fansidar® is contraindicated for infants less than 2 months of age.

Chloroquine phosphate, which is manufactured in the United States in tablet form only, tastes quite bitter. Pediatric doses should be calculated carefully according to body weight. Pharmacists can pulverize tablets and prepare gelatin capsules with calculated pediatric doses. Mixing the powder in food or drink may facilitate the weekly administration of chloroquine to children. Alternatively, chloroquine in suspension is widely available overseas.

OVERDOSE OF ANTIMALARIAL DRUGS CAN BE FATAL. THE MEDICATION SHOULD BE STORED IN CHILDPROOF CONTAINERS OUT OF THE REACH OF CHILDREN.

Health Information for International Travel 1988 will soon be published by the Center for Prevention Services, CDC. This document includes the above recommendations for the prevention and presumptive treatment of malaria in travelers. In addition, it includes the chemoprophylactic regimen recommended for each country and the risk of malaria in each country. It will be a useful reference to health professionals, travel agencies, international businesses, and other agencies that advise international travelers concerning malaria and other health risks they may encounter when visiting foreign countries. This publication will be available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, telephone (202)783-3238, as DHHS publication no. (CDC)88-8280.

Reported by: Malaria Br, Div of Parasitic Diseases, Center for Infectious Diseases; Div of Quarantine, Center for Prevention Svcs, CDC.

Reference

1. Centers for Disease Control, Agranulocytosis associated with the use of amodiaquine for malaria prophylaxis. MMWR 1986;35:165-6.

Reprinted from MMWR 1988;37:277-284.

Table 1. Drugs used in the prophylaxis and presumptive treatment of malaria

Drug	Prophylaxis		Presumptive Treatment for Travelers to Areas of Chloroquine Resistance
	Adult Dose	Pediatric Dose	
Chloroquine phosphate (Aralen®*)	300 mg base (500 mg salt) orally, once/week	5 mg/kg base (8.3 mg/kg salt) orally, once/week, up to maximum adult dose of 300 mg base	Chloroquine is not recommended for the presumptive treatment of malaria acquired in areas of known chloroquine resistance.
Hydroxychloroquine sulfate (Plaquenil®*)	310 mg base (400 mg salt) orally, once/week	5 mg/kg base (6.5 mg/kg salt) orally, once/week, up to maximum adult dose of 310 mg base	Hydroxychloroquine is not recommended for the presumptive treatment of malaria acquired in areas of known chloroquine resistance.
Doxycycline	100 mg orally, once/day	>8 years of age: 2 mg/kg of body weight orally, once/day up to adult dose of 100 mg/day	Tetracyclines are not recommended for the presumptive treatment of malaria.
Proguanil (Paludrine®*)	200 mg orally, once/day, in combination with weekly chloroquine	<2 yrs: 50 mg/day 2–6 yrs: 100 mg/day 7–10 yrs: 150 mg/day >10 yrs: 200 mg/day	Proguanil is not recommended for the presumptive treatment of malaria.
Pyrimethamine-sulfadoxine (Fansidar®*)	1 tablet (25 mg pyrimethamine and 500 mg sulfadoxine) orally, once/week	2–11 mos: ⅛ tab/wk 1–3 yrs: ¼ tab/wk 4–8 yrs: ½ tab/wk 9–14 yrs: ¾ tab/wk >14 yrs: 1 tab/wk	**Adult Dose**: 3 tablets (75 mg pyrimethamine and 1,500 mg sulfadoxine), orally, as a single dose **Pediatric Dose**: 2–11 mos: ¼ tab 1–3 yrs: ½ tab 4–8 yrs: 1 tab 9–14 yrs: 2 tabs >14 yrs: 3 tabs as a single dose
Primaquine	15 mg base (26.3 mg salt) orally, once/day for 14 days, or 45 mg base (79 mg salt) orally, once/week for 8 weeks	0.3 mg/kg base (0.5 mg/kg salt) orally, once/day for 14 days, or 0.9 mg/kg base (1.5 mg/kg salt) orally, once/week for 8 weeks	Premaquine is only recommended for use after leaving an endemic area to prevent relapses of *Plasmodium vivax* and *P. ovale*.

*Use of trade names is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services or the Public Health Service.

Cases of selected notifiable diseases, Virginia, for the period May 1, through May 31, 1988.

Disease	State					Regions				
	This Month	Last Month	Total to Date 1987	Total to Date 1988	Mean 5 Year To Date	This Month N.W.	N.	S.W.	C.	E.
Measles	49	26	0	116	15	2	47	0	0	0
Mumps	52	21	51	80	24	1	2	1	45	3
Pertussis	2	2	34	11	19	0	0	0	0	2
Rubella	0	0	1	0	1	0	0	0	0	0
Meningitis—Aseptic	11	7	60	41	59	0	5	4	1	1
*Bacterial	14	19	84	72	111	4	2	1	1	6
Hepatitis A (Infectious)	32	45	134	161	74	3	3	0	7	19
B (Serum)	24	32	188	113	204	2	4	4	8	6
Non-A, Non-B	8	1	18	31	34	1	0	2	0	5
Salmonellosis	73	82	518	399	431	11	15	13	15	19
Shigellosis	27	18	56	145	55	5	0	5	9	8
Campylobacter Infections	32	24	187	131	175	5	8	1	8	10
Tuberculosis	38	41	159	184	156	2	7	4	8	17
Syphilis (Primary & Secondary)	33	34	108	172	169	0	5	2	15	11
Gonorrhea	1093	1067	6226	5334	7257	—	—	—	—	—
Rocky Mountain Spotted Fever	3	0	0	3	4	0	0	0	3	0
Rabies in Animals	29	60	162	177	156	9	1	5	11	3
Meningococcal Infections	5	6	39	30	39	0	0	2	0	3
Influenza	23	72	1210	2392	1590	0	0	0	0	23
Toxic Shock Syndrome	0	0	0	0	3	0	0	0	0	0
Reye Syndrome	0	0	0	0	2	0	0	0	0	0
Legionellosis	1	3	3	6	7	1	0	0	0	0
Kawasaki's Disease	1	4	10	8	15	1	0	0	0	0
Acquired Immunodeficiency Syndrome	25	30	92	153	—	0	6	3	10	6

Counties Reporting Animal Rabies: Amelia 3 raccoons; Bath 1 raccoon; Botetourt 1 cow, 1 raccoon; Charles City 1 raccoon; Chesterfield 3 raccoons; Fairfax 1 raccoon; Fauquier 1 raccoon; Fluvanna 1 raccoon; Hanover 1 raccoon; Henrico 1 raccoon; Highland 1 raccoon; Lancaster 1 cat, 1 raccoon; Louisa 1 raccoon; New Kent 2 raccoons; Northumberland 1 skunk; Orange 1 raccoon; Rockbridge 1 fox; Russell 2 skunks; Scott 1 skunk; Shenandoah 1 raccoon; Spotsylvania 1 raccoon.

Occupational Illnesses: Asbestosis 33; Carpal Tunnel Syndrome 6; Dermatitis 2; Loss of Hearing 12; Mesothelioma 1; Pneumoconioses 70; Silicosis 1.

*other than meningococcal

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