Preventing Infectious Diseases in Long-Term Travelers to Rural Africa

Seymour Waner, David N. Durrheim, Peter A. Leggat, and Mary H. Ross

The traveler to, or expatriate residing in, rural areas of developing countries for prolonged periods is at greater risk of illness than the short-term traveler.[1] This is a result of increased and more intense exposure to pathogens and their vectors or reservoirs, poorly developed infrastructure for water supply and sewerage disposal, limited environmental hygiene, extreme climates, potentially greater risk-taking behavior, and limited availability of medical facilities. Risk may be reduced by appropriate counseling, and vaccination and prophylactic medication based on the best available epidemiological data. This paper aims to provide travelers and practitioners with guidelines for reducing the risk of acquiring important infectious diseases associated with long-term travel or placement in rural Africa, a topic that is generally neglected.[2] The diseases discussed were chosen on the basis of their frequency or potential severity and include yellow fever, malaria, tick-borne infections, food and waterborne disease, schitosomiasis, rabies, and tuberculosis.

Yellow Fever

This is the only vaccination required by law for travelers residing or traveling through endemic regions of West and Central Africa. The risk of exposure is greater for expatriates residing in endemic rural areas bordering forests where the disease is enzootic than for short-term business or vacation travelers who do not venture out of "concrete capital cities." High-risk groups include missionaries, military and agriculture personnel, and ecotourists. Vaccination with the attenuated live viral vaccine (17D) confers protective immunity for at least 10 years.[3,4]

Generally, individuals with absolute contraindications must be advised not to enter a yellow fever endemic area. Although pregnant women in their first trimester should be advised to delay their trip, vaccination could be considered for those who insist on residing in a rural endemic area.[5] Vaccination during the first trimester is believed to pose only a small theoretical risk to the mother and fetus that may be outweighed by the risk of infection.[6]

Vaccination may even be considered in individuals with egg allergy as administration of other egg-cultured vaccines has been safely administered in people with established egg allergies.[7,8] However, vaccination in such cases should be conducted in a health-care setting where resuscitation facilities are immediately available.

The decision to immunize immunocompromised travelers should be based on an evaluation of the severity of immunosuppression and weighed against the risk of exposure to the virus. As immunization may be less effective than in immunocompetent persons, measurement of neutralizing antibody response should be considered following vaccination.[9]

Ideally, children less than 9 months of age should not be vaccinated with yellow fever vaccine as they are at increased risk of developing vaccine-induced encephalitis. Although vaccination is contraindicated in infants less than 4 months of age, it should be considered in older children when the risk of infection outweighs the risk of vaccination.[6]

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In addition, all long-term travelers should be carefully briefed on the epidemiology of yellow fever so that they can practice sensible mosquito avoidance and personal protection measures. A date for their yellow fever booster after 10 years should be provided.

Malaria

Nonimmune persons traveling to *Plasmodium falciparium* endemic areas are at high risk for developing life-threatening illness if they become infected. Studies from Africa and other malaria-endemic areas indicate that malaria risk is associated with both the duration and intensity of exposure.[10,11] Holoendemic malaria is present in many tropical African countries and particularly at low altitudes. The importance of compliance with personal protection against anopheline vector mosquitoes should form a major part of the pretravel consultation and be supported with user-friendly reference material.[12,13] Measures include building dwellings far from mosquito breeding sites, mechanical barriers (shoes, socks, and long trousers, window and door screens, bed nets), and chemical barriers (permethrin treatment of clothing, curtains, and bed nets, space repellents, residual indoor spraying, and application of effective insect repellents). These measures would also protect the traveler against other arthropod-borne illnesses including dengue and filariasis.

Where possible, individuals and corporations should consult an entomologist who is acquainted with the breeding and biting behavior of the local vector mosquitoes for advice on protective measures, including appropriate environmental modification. These experts may also be able to advise on mechanical or chemical treatment, including larviciding of breeding sites.

Application of residual insecticides to walls should preferably be done by trained local people using effective insecticides with low mammalian toxicity. Individuals who undertake spraying themselves should be carefully instructed on safety precautions and correct application methods.

Advice on chemoprophylaxis for long-term travelers is fraught with controversy, personal opinion, and nonscience. The reality is that many travelers are loath to take prolonged preventive medication because of perceptions regarding exposure, potential for adverse events, fear of long term side effects, and ability and willingness to comply.

Preventive medication is generally recommended initially but the recommended duration of sustained use is controversial. Unfortunately, research necessary to guide this decision has not yet been conducted and there are no accurate markers of acquired immunity to malaria currently available.

The chemoprophylactic agents of choice for people living in high risk areas are mefloquine or doxycycline, as these have been shown to be most effective.[14,15] The combination of atovaquone and proguanil has recently been licensed by the United States Food and Drug Administration and it is also available in many European countries.[16] Use of long-term mefloquine chemoprophylaxis appears safe, although the occurrence of serious neuropsychiatric adverse events may occur after a delay.[4] The risk of serious adverse events with prolonged doxycycline use is unknown. The US Armed Forces, Peace Corps, and Diplomatic Corps (Wolf M, June 2000, personal communication), and other military personnel have, however, utilized both doxycycline and mefloquine for high-risk individuals for prolonged periods of time.[17,18] Alternatives to long-term chemoprophylaxis should be discussed. These would include the selective use of chemoprophylaxis during high-risk periods and provision of counseling on the use of standby medication. Travelers should consult credible local medical authorities who will acquaint them with high-risk periods when preventive medication should be taken and serve as a source of medical care should the traveler become ill.

Standby therapy should be provided for use when no reliable medical services are readily available. Individuals should also be advised to travel to the nearest medical facility without delay. Medication used in standby therapy includes sulphadoxine/pyrimethamine, artemesinin derivatives, mefloquine or quinine, and the combination of atovaquone and proguanil. Quinine should not be used as a standby treatment, if mefloquine has been taken as chemoprophylaxis since serious cardiac adverse events may occur. Quinine can, however, be utilized for treatment where adequate monitoring facilities are available.

Children under 5 years of age are at increased risk for developing severe malaria if they become infected and should preferably not enter a malaria endemic area.[19] Children weighing more than 5 kilograms who must travel to or reside in a malaria area should utilize mefloquine chemoprophylaxis, as doxycycline use is contraindicated because of adverse effects on skeletal and dental development.

Pregnant women are also at increased risk of severe complications and should preferably not enter a malaria area. Those living in a malaria endemic area should use the combination of chloroquine and proguanil, which is safe in pregnancy.[5] Mefloquine may be considered during the first trimester of pregnancy only if the benefit justifies the potential risk to the fetus, although this risk appears to be small.[20]

Although accurate when used in a professional laboratory environment or in the field by trained health

personnel,[21,22] rapid malaria diagnostic kits used by travelers have been found to be unsatisfactory. Travelers have difficulty in performing and interpreting these tests.[23] Valuable time may be lost if the test is misinterpreted, and a positive test provides no indication of the severity of disease. It is critical that all long-term travelers into malaria endemic regions of Africa be counseled that an acute febrile illness must be regarded as malaria, and urgent care sought. The traveler should be informed that a single negative test does not exclude malaria and that multiple tests may be required so that they will demand this where necessary.

Malaria is one of very few infectious diseases that may be life-threatening if not immediately treated and serves in its own right as an excellent reason for comprehensive travel insurance, including emergency evacuation. Travel health insurance has been discussed elsewhere.[24]

Ticks

Ticks are important vectors of viral, spirochetal, and rickettsial disease, e.g., African tick bite fever. Both long and short-term travelers should take precautions against tick bites by using repellents (skin and clothing). In addition, individuals should inspect their bodies for ticks. Important sites include the groin and scalp hairline.

If ticks are found, they should be removed by gentle traction using forceps. Then an antiseptic should be applied to the wound. Travelers should be educated about presenting symptoms and the need to consult and provide their practitioners with a travel history should they become ill.

Food and Waterborne Diseases

These diseases are an important and frequent cause of morbidity in travelers. The risk of developing travelers' diarrhea may be as high as 40% for short term travelers into high risk areas of Africa.[25] The risk in the long-term rural travelers may be compounded by the lack of sanitized water and waterborne sewerage. Strategies to prevent illness include vaccination against water and foodborne fecal-oral infections, practice of good food and water hygiene, and provision of standby therapy.

Vaccines indicated for long-term travelers from developed settings with long-term residence in rural Africa include those against hepatitis A, poliomyelitis, and typhoid. All children, except those under the age of 2 years, should be vaccinated against hepatitis A. Although improved vaccines against cholera are becoming available, the primary protection against cholera remains careful food and water hygiene. Water should ideally be filtered, boiled for an adequate period of time allowing for altitude, and then chlorinated. Alternative strategies include the addition of iodine, or use of iodine resin filters. Traveling with children has been discussed elsewhere.[26]

Milk may harbor pathogens including *Brucella* spp, enteric organisms, and *Mycobacterium bovis*. Where pasteurized milk is not available, milk should be boiled prior to use. Pasteurized powdered milk or milk concentrate may also be used. Unpasturized cheeses should be avoided.

Standby therapy with a quinolone antimicrobial should be taken if an individual develops dysentery or severe travelers' diarrhea. Quinolone antimicrobials are also indicated in children with life-threatening diarrhea. Although quinolones are not registered for use in children, when they have been used, joint symptoms were rare and appeared to be reversible.[27] Antimicrobial therapy should be combined with sufficient quantities of rehydration fluid to compensate for fluid loss.

Returning travelers should be asked about gastrointestinal symptoms and, if these are present, they deserve further investigation. A screening stool examination to exclude parasitic infections should be considered.

Schistosomiasis (Bilharziasis)

Schistosomiasis is another important health risk to the long-term rural traveler as it may cause chronic gastrointestinal (*Schistosoma mansoni*) and genitourinary (*Schistosoma haematobium*) disease. It is found in an area between latitudes 36 degrees North and 34 degrees South in Africa, where freshwater temperatures average 25 to 30°C.[28]

Apart from avoidance advice (keeping out of unprotected and untreated water bodies or using protective boots when fording streams or fishing), screening serology prior to traveling and upon return should be offered. Individuals who seroconvert should be investigated and treated. Alternatively, stool and urine examination for parasites could be performed as a routine procedure on long-term travelers returning from rural Africa.

Zoonotic Diseases

Zoonotic exposures that may present a hazard to the long-term traveler in rural Africa include bovine tuberculosis, leptospirosis, anthrax, plague, and even certain viral hemorrhagic fevers. As leptospirosis is transmitted by rodents, rodent control measures should be instituted both at home and in the work place.

Rabies is certainly the most important and deadly zoonotic adversary that may be encountered. In rural Africa, transmission is usually by the bite of infected ani-

mals. The long-term rural traveler is at risk of exposure to infected animals and pre-exposure vaccination is indicated. This is particularly important in countries where rabies immune globulin (RIG) and vaccine may not be available and health workers may not be acquainted with the correct management protocols. Pre-exposure vaccination eliminates the need for RIG and reduces the number of vaccine doses required following exposure. It may also provide some protection until the necessary booster doses of vaccine can be sourced. Potential exposure to rabies is another essential justification for adequate emergency travel insurance. Travelers should be firmly cautioned against approaching animals or keeping exotic pets.

Sexually Transmitted Infections

Travelers may be a source of sexually transmitted infections (STIs) to the host population or may acquire a STI during travel. The long-term single traveler may be at higher risk of infection.

Travelers should be counseled regarding the risk and prevention of STIs particularly as HIV and hepatitis B prevalence is high in rural subSaharan Africa. Female travelers may be at risk for rape and thus informed that prophylactic antiretroviral therapy is available. Standby antiretroviral therapy should be considered for people traveling to areas where health care facilities are sparse. Hepatitis B vaccination should be offered to all travelers, including individuals practicing safe sex, as the virus may also be transmitted though blood or poorly sterilized instruments.

Other Important Infectious Diseases

Travelers are at risk of contracting tuberculosis while traveling and at their destination, particularly if they have close contact with the local population in confined areas.[29,30] In US Peace Corps volunteers who stayed in developing countries, tuberculin conversion occurred at rates of greater than 3.5 per 100 volunteer years in two African countries and one Asian country. The rates of documented skin test conversion per 100 volunteer years were 0.5 for the African region, 0.6 for the East/Central Europe and Mediterranean region, and 0.7 for the Asia Pacific region.[31]

Bacille Calmette-Guerin (BCG) vaccination is usually restricted to young children, where its benefit against severe disease is unequivocal. Cure is possible when individuals with suggestive symptoms present early and are adequately assessed with suitable microbiological and radiological diagnostic services.[32]

Active disease should be excluded in those exposed to tuberculosis or who are symptomatic. Periodic skin testing and administration of chemoprophylaxis to patients with skin test conversion is advocated by some authors, although this justifiably remains a controversial approach.[33]

Vaccination with BCG may also result in false positive reactions to the purified protein derivative (PPD) skin tests.

Long-term travelers should be screened with PPD prior to departure and 10 to 12 weeks after return, this period being necessary to include incubating disease. They should also be educated about the symptoms of disease and encouraged to present early should they become ill.

Meningococcal Meningitis

This is a rapidly progressive and potentially fatal infection that may be encountered in Africa, particularly West Africa. Meningococcal vaccination is particularly important for travelers who will be in close contact with the local population during epidemics and for those people living in the meningococcal meningitis belt of subSaharan Africa.[6]

Medical Examination Prior to Travel

All long-term travelers should undergo an extensive medical and dental examination to exclude underlying disease, prior to their departure. Dental problems may occur at any time and dental treatment may not be readily available. Dental health and travelers is discussed elsewhere.[34]

The pretravel consultation should also be used as an opportunity for catching up on missed immunization opportunities. All travelers who have not been boostered with tetanus vaccine in the previous 10 years should, for example, be immunized.

As medical facilities in many developing countries may be suboptimal and care difficult to access, subclinical conditions should be excluded and treated prior to departure. Travelers should also be equipped with a first aid kit, as certain simple remedies may not be available in developing countries. Provision of sterile syringes and catheters should be considered for high-risk travelers, with the appropriate medical authorization.

Travelers should be followed up on their return or at suitable intervals. Laboratory tests conducted may include blood tests for liver and kidney function, glucose determination, and examination of urine and stool for parasites.

Increasing numbers of employees from developed countries are being stationed in rural Africa and are thus being exposed to infectious diseases as an occupational hazard. Occupational health personnel are therefore an important target group for information on exposures of expatriates to infectious diseases in Africa, particularly in terms of health and safety legislation.[35]

Conclusions

The long-term traveler to Africa may have a higher risk profile and require expert guidance. All potential exposures should be explored and repeated counseling sessions may be required before travelers embark on their journey, as little expert advice, drugs, or suitable equipment may be available at their destination. Where possible on-site contact and monitoring via electronic or telephone communication should be encouraged.

The advice in this paper is extrapolated from the limited number of studies conducted amongst long-term travelers. Further research into appropriate risk management is needed in terms of infectious diseases and other important aspects of their welfare, including their psychological and physical well being.

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