Special Infectious Disease Risks of Expatriates and Long-Term Travelers in Tropical Countries. Part II: Infections Other Than Malaria

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A wide range of viral, bacterial, and protozoal diseases pose risk to long-term tropical travelers. Risk varies geographically and with lifestyle. For some infections, risk increases with duration of stay, coming to resemble that of the local population. Risk management strategies include vaccination, chemoprophylaxis, avoidance measures, and screening, where appropriate. Vaccination against hepatitis A and B, typhoid, and rabies is recommended for all long-term travelers to (sub-)tropical areas. Lowering of the vaccination threshold for Japanese encephalitis is suggested. Meningococcal disease is rare in travelers, but vaccination is safe and acceptable. The efficacy of Bacillus Calmette–Guérin (BCG) is uncertain; immunological testing avoids BCG's confounding of tuberculin testing. Diarrhea is common, and self-treatment may be recommended. Sexually transmitted infections including human immunodeficiency virus (HIV) are serious risks; education, screening, and HIV postexposure prophylaxis following involuntary exposure are recommended. Many infections are chronic or asymptomatic, and appropriate screening is recommended on return or after prolonged exposure.

In addition to malaria, a wide range of infectious diseases threaten the long-term traveler and expatriate in the tropics. From the risk mitigation viewpoint, it is convenient to consider these as either "vaccine preventable" or "non–vaccine preventable."

Vaccine-Preventable Diseases

The standard practice of bringing all routine vaccinations up to date is as applicable to the long-term traveler as it is to the short-term traveler, if not more so. Influenza is a perennial rather than a seasonal disease in the tropics, and this vaccination should not be overlooked. The indications and use of yellow fever vaccine and vaccination waiver certificates are mandated by law and are well established.[1]

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Hepatitis A

Individuals who grow up in developed countries have lower exposure rates than children raised in countries where the virus circulates intensely, where usually there has been exposure and the development of immunity before the age of 10 years. If seronegative prior to departure, they are at increased risk of infection in developing countries. Steffen quotes a case rate for infection in nonimmune travelers to developing countries as between 0.1 and 1 case per 1,000 per month,[2] but this may be higher in long-term travelers having closer contact with local populations,[3] for whom risk would be cumulative. A common source–combined hepatitis A and E outbreak in Djibouti illustrates the differential risks run by expatriates: locals contracted hepatitis E, while expatriates contracted hepatitis A.[4] Locals possessed immunity to hepatitis A from childhood exposure, while water hygiene spared expatriates from hepatitis E.

Children may vector hepatitis A into households and infect seronegative adults.[5] Hepatitis A may cause fulminant hepatitis and death in children in both developed and developing countries.[6,7] Furthermore, it appears that vaccination of children may interrupt the spread of hepatitis A,[8] which argues for the vaccination of departing children and adults.

All seronegative travelers should be vaccinated, and especially the long-term traveler and potential expatriate.

Rabies

Expatriates appear to be at a greater risk than short-term travelers of suffering potential rabies exposures: the incidence among expatriates in Nepal (5.7/1,000/year) is three times that of tourists.[9] Hatz and colleagues cite a bite incidence of 18.2 bites/1,000/year in German and Swiss expatriates.[10] Peace Corps volunteers working in rabies-endemic countries received postexposure prophylaxis (PEP) at the rate of 43.6/1,000/year.[11]

Accessing correctly administered PEP may be problematic in developing countries. Proper wound care, human rabies immune globulin, and tissue culture–derived rabies vaccines may not be readily available. Hatz and colleagues surveyed animal bite management in Swiss and German expatriates,[10] finding that only 24% to 30% of PEP treatments complied with World Health Organization (WHO) recommendations. PEP was often neglected, with preexposure prophylaxis imparting a sense of complacency among some expatriates. Vaccinators should ensure that expatriates understand preexposure prophylaxis' role and the need for PEP following potential exposures. Hatz and colleagues also found that only 41% of dogs owned by expatriate bite victims had been immunized against rabies.

Rabies preexposure prophylaxis cost remains a concern. A Canadian decision tree model concluded that preexposure immunization was justifiable for children who would be at risk for at least 1 year,[12] although the caveat was added that the decision should always be individualized. Concerns are that young children may not report potential exposures and that bites to children are more likely to involve the head and neck; it is also possible that young children may exhibit riskier behavior, being more likely to be attracted to animals. Additionally, the Canadian model incorrectly assumed the ready availability of competent care and PEP in developing countries. It seems prudent to offer preexposure prophylaxis to all departing long-term travelers and their pets if bound for rabies-endemic areas.[3]

Meningococcal Disease

A very rare disease in the average traveler, meningococcal infection is likely to be more common in those having close contact with the local population.[13–15] Urban outbreaks in developing countries are known,[15] but these appear to spare expatriates. The quadrivalent conjugate A,C,Y,W135 vaccine is currently the most appropriate for travelers considered being at high risk, as it gives better immunological memory and a longer period of protection than the equivalent polysaccharide vaccine.[16] A possible association of the conjugate vaccine with the Guillain–Barré syndrome is uncertain,[17] and current recommendations on its use remain unchanged.[16,18] The conjugate vaccine currently enjoys only limited international availability, however, and the quadrivalent polysaccharide remaining may have to be used in its stead.

Japanese Encephalitis

The attack rate is estimated at 1/5,000/month for travelers to rural areas,[19,20] but for long-term travelers and expatriates in affected areas, the risk may, dependent on circumstances, be higher. While personal protection measures will considerably reduce mosquito bite incidence, they will not prevent all bites. The central question for long-term travelers remains whether to be vaccinated.[20]

Current recommendations are to offer vaccination to travelers likely to be in affected rural areas for at least 4 weeks or to travelers whose activities place them at unusual risk, although the latter stipulation remains undefined. The problem with these recommendations is that transmission is not entirely rural, and cases have been recorded in short-stay tourists.[21,22] Transmission occurs both within and on the edges of some Asian cities, eg, Bangkok.[23,24] Small-scale farming within cities, although declining,[20] may facilitate urban transmission. Disturbingly, aseptic meningitis attributable to Japanese encephalitis is reported from Hiroshima, and vaccination of the human population does not prevent enzootic circulation of the virus;[25] epidemiological silence may prevail with locals being immune and unvaccinated foreigners susceptible. Locals probably also enjoy cross-immunity from other flavivirus infections. National vaccination programs and cross-immunity may distort risk calculations based on local incidence data, understating the risk to expatriates. An aggravating factor for expatriates is that disease severity may be worse in adults.

Concerns have been expressed about the safety of the mouse brain–derived vaccine,[26] but a reexamination of the vaccine's safety history found that

both serious and mild adverse events occurred at rates considered acceptable for other vaccines.[19] While age, location, occupation, recreational activities, and similar factors will affect the decision to vaccinate, difficulties in determining true risk and the illness' grave nature argue for lowering the vaccination threshold for long-term travel. The advent of cell culture–derived vaccines with improved safety profiles may facilitate this.[27]

The serious nature of the disease may also raise legal liability concerns for employers of expatriates.

Typhoid

WHO rates typhoid incidence in most developing countries as "high" or "medium," and a review of travelers' typhoid concluded that vaccination should be offered to all bound for risk destinations.[28] Efficacy is less than for most other travel vaccines, and travelers should be aware infection remains possible, although the emergence of multiresistant *Salmonella typhi*, especially in South Asia,[29,30] increases the utility of the vaccine. South Asia followed by the Middle East and Central Africa pose particular risks to travelers.[31] Contemporaneous intake of oral typhoid vaccine and antimalarials with antibacterial activity should be avoided.

Hepatitis B

Hepatitis B virus (HBV) infection is the only vaccine-preventable sexually transmitted infection (STI). The increasing prevalence of HBV in developing countries and the consequent risk to expatriate workers of sexually acquired infection[5,32] mean vaccination should be offered to all long-term expatriate workers.

Prevalence rates for HBV infection in sub-Saharan Africa and parts of Asia exceed 10% in many places, significantly higher than that in developed countries. This implies substantial iatrogenic threat to expatriates, and health-care workers (HCWs) in particular, in sub-Saharan Africa. One study reports a strong association between the presence of HBV markers and being a HCW.[33] HBV infection risk should be weighed and matched with the personal profiles of expatriates and HCWs under consideration for posting.

Additionally, evidence exists that expatriates in close contact with local people (particularly children) in highly endemic settings are at increased risk of horizontal HBV acquisition.[34] Nonsexual HBV transmission rate increases with time, being associated with household contact with the local pediatric population. Expatriates should be advised to avoid body fluid contact at all times, this being the main risk factor for nonsexual HBV transmission. Clearly, all expatriates (HCWs and others) should be vaccinated against HBV.

Rotavirus

Although there are no data on rotavirus vaccination in long-term travelers, contact with local playmates may increase the risk of rotavirus infection in younger long-term travelers and the new vaccines may be considered for the younger long-term travelers.

Non–Vaccine-Preventable Diseases

Human Immunodeficiency Virus and Other STIs

Expatriate workers' STI acquisition risks have been well documented since the mid-eighties[35]; furthermore, a rise in STI incidence [including human immunodeficiency virus (HIV)] has been described among travelers and expatriates; this may reflect an increase in risk behavior in this group, triggered possibly by excessive alcohol or illicit drugs. Part of the explanation lies in the rising prevalence of STI and HIV worldwide; consistent condom use by expatriates is considered to be very low (ie, around 20%),[36] while 5% to 50% of short-term travelers engage in casual sex while abroad.[37] Additionally, abstinence and faithfulness are mostly not relevant to the many single long-term travelers. Knowledge of STI and HIV epidemiology in foreign countries (particularly impoverished African countries) by HCWs may be suboptimal[38] and even poorer among lay travelers.

There is hence a need on embarkation for comprehensible health education that emphasizes STI and HIV epidemiology at travelers' destinations. Sociocultural differences between departure and destination countries' sexual behavior and practices should be included and discussed.

From a purely medical point of view, it is advisable to have an HIV test done (including extensive precounseling) before departure: this raises awareness of the risks abroad while revealing the expatriate's own HIV status, which might have legal implications in the event of seroconversion while abroad.

After returning from a long stay abroad, HIV testing should be repeated 3 and 6 months after arriving home and the following STIs screened for in travelers with a history of risk or exposure: gonorrhea, chlamydia, syphilis, hepatitis B and—in case of contact with blood products or a history of blood transfusion—hepatitis C.

Running parallel with the explosive increase in HIV prevalence is the risk of occupational exposure

by HCWs. PEP through highly active antiretroviral treatment should be included in counseling predeparture; risk avoidance and general precautions should also be covered. Currently, few health organizations have a formal policy on PEP, despite one study finding 5.1% of HCWs employed in highly endemic regions would have required PEP.[39] Source patient pretesting, eg, presurgery, can reduce likely the need for PEP but in no way justifies ignorance or unavailability of PEP. This usually comprises two nucleoside analogues and a protease inhibitor. Nonnucleoside analogues are generally avoided to discourage the development of resistant mutations. Furthermore, repatriation arrangements should be in place for victims to deal with the many and potentially lethal side effects that may emerge, the management of which may be beyond local medical facilities. Whether one should supply PEP to people who indulge in risky sexual behavior is subject to lively debate.

A special situation mandating PEP may be sexual assault, which is not uncommon in parts of urban Africa. How far should employers go in providing readily accessible standby PEP for sexually assaulted employees? One study looked into this issue: assessing the likely occurrence of sexual assault in a particular area should provide the necessary insight on whether PEP should be immediately available at all times.[40]

Hepatitis C

With an estimated prevalence of 170 million cases worldwide, hepatitis C virus (HCV) is a common problem for which no vaccine is available. Reported prevalence in Africa varies between 6 and 15%.[41] Wansbrough-Jones and colleagues examined the risk of transfusion-acquired HCV[42]: if intravenous drug use is not taken into account, blood transfusion is by far the main cause of expatriate HCV acquisition. Screening the blood supply for HCV, nearly always impossible in poor rural settings in Africa, could reduce transfusion-transmitted HCV. Screening predeparture may be useful for legal reasons or in cases where specific risk factors are present.[43] The incidence in long-term travelers is unknown, but there are occasional reports of travel-related cases.[44–47]

Hepatitis E

Ample evidence links hepatitis E, transmitted via the fecal–oral route, to travel.[48–55] Although the incidence in long-term travelers is unknown, Ooi and colleagues detected an asymptomatic 2% seroconversion rate in American travelers to diverse destinations.[56] Kitazawa and colleagues report an increasing travel-related incidence in Japan.[53] Potasman and colleagues did not report an increased incidence of infection in backpackers to tropical countries, explaining this as evidence that hepatitis E transmission occurred principally during outbreaks;[57] if that is the case, the length of residence might increase risk. Living standards and conditions will also play a role in determining risk, as evidenced by the differential hepatitis E incidence in colocated local and expatriate populations.[4,58,59]

Transmission has been shown in diverse tropical locations worldwide, but intensity seems highest in Asia. A vaccine is under development,[60] but currently, food and water hygiene remains the mainstay of prevention. Long-term female travelers who may fall pregnant while abroad may need to be informed of the fulminant nature of hepatitis E if contracted in pregnancy.[61–63]

Schistosomiasis

Despite schistosomiasis' low profile, infestation may cause serious disease. Neurological complications occur in travelers with single exposures and light infections,[64,65] while presentation may be years later.[66]

Expatriate infection rates vary with location and behavior. Bierman and colleagues cite 18% seroprevalence in asymptomatic Dutch expatriates; Cetron and colleagues found 32% seropositivity in foreigners resident in Malawi for longer than 1 month. Cetron and colleagues and Trachtenberg and colleagues both found that the likelihood of seropositivity increased with length of stay.[67–69]

Worm burden is generally lower in expatriates than locals, likely a reflection of differing exposure patterns. Vreeburg measured egg shedding by locals and expatriates in Surinam. Analysis of this report reveals significantly less egg shedding by expatriates than locals involved in freshwater activities (chi-square, $p < 0.0001$). Locals not engaged in freshwater activities did not have a significantly lower level than expatriates (chi-square, $p = 0.23$).[70] Scanty expatriate egg shedding may hamper diagnosis.

Departing long-term travelers should be counseled on schistosomiasis avoidance and informed that contact with any infected water may lead to infestation. Advice should be given on treatment of water intended for bathing or drinking and on the need for postexposure screening, although care should be taken to make sure that the availability of screening does not create a false sense of security. Travelers should be aware that symptoms may be nonspecific or absent. Provisional results suggest

that both topical DEET and dimethicone may be protective;[71] apart from brisk toweling after exposure, there is little other prophylaxis available, although artemisinins remain under investigation.[72]

Schistosomiasis management in endemic countries can be suboptimal, and repeated empiric treatment with praziquantel is not uncommon. As praziquantel is inactive against younger worms, premature treatment may permit juveniles to mature, giving a false sense of security. Additionally, acute schistosomiasis may be misdiagnosed as malaria.

Immunologically naive expatriates may be at a greater risk of acute schistosomiasis (Katayama syndrome). The syndrome is commonest in infection with *Schistosoma japonicum*; incidences of 5% in *Schistosoma mansoni*[73] and 1.5% in *Schistosoma haematobium* infections are reported.[64,73] Treatment is generally directed at symptom suppression with corticosteroids. Recrudescence is possible (A. van Gompel, unpublished data).

Schistosomiasis diagnosis remains problematic. Viable ova in stool, urine, rectal snips, or other biopsy specimens clinch the diagnosis, but the search for ova is often unrewarding. In the series of Whitty and colleagues only 34% of travelers had ova in their urine, and only 10% in their stool.[73] In the absence of ova, diagnosis relies on a history of exposure and seropositivity. While peripheral blood eosinophilia may suggest the diagnosis, it has diverse etiology and does not inevitably accompany nonacute schistosomiasis. Numerous expatriate studies report finding eosinophilia in only 50% of confirmed cases.[67,73,74] First infections are now often diagnosed serologically, but seropositivity may only manifest in 12 weeks[64] or later after infection. Diagnosis of reinfection is bedeviled by persistent seropositivity: Whitty and colleagues even report titer increases in some cured patients.[73]

Schistosomiasis' silent but often serious nature and its problematic management may challenge clinicians, while its threat may be underestimated outside specialist centers.

Tuberculosis

Developing world tuberculosis infection rates, amplified by HIV, exceed those in the developed world. Prevalence reaches 35% in sub-Saharan Africa. Contact with locals and length of stay increase infection risk.[75] Cumulative time of just 3 months in high-endemicity countries increases the likelihood of a positive skin test, with an incidence of 3.4% per annum (95% confidence interval: 2.6–6.6) found for Dutch long-term travelers who were not HCWs.[75,76] Essentially, the incidence of infection in expatriates comes to resemble that of the local population (0.5%–2.5% per annum).[77]

Immunization of departing long-term travelers with Bacillus Calmette–Guérin (BCG) remains a vexed issue. Apart from the vaccine's uncertain efficacy, especially in adults, immunization confounds tuberculin sensitivity testing (TST).[78] The counterargument is that long-term travelers as a group are noncompliant with postexposure testing. Only 61% of Dutch long-term travelers attended posttravel screening,[79] and even within this "compliant" group, 33% required telephonic encouragement. While the recent availability of immunological testing for *Mycobacterium tuberculosis* infection may circumvent BCG's confounding of TST, the vaccine's problematic efficacy remains.

In the absence of an international consensus on best practice, the travel health advisor will need to weigh the benefits and disadvantages of immunization and postexposure testing and make an informed decision on the most appropriate recommendation to offer his/her traveler.

Gastrointestinal Disease

Shlim and colleagues, based on Nepalese data, felt that expatriates remained at a high risk of diarrhea for their first 2 years of residence in developing countries.[80] Infection patterns appear to vary with location: expatriates resident in Thailand >1 year were less likely to have bacterial pathogens, especially *Campylobacter*, isolated on culture.[81] Speelman and colleagues in Bangladesh also reported that *Campylobacter* isolation declined with residence.[82] Overall, the likelihood of suffering with diarrhea declines with increasing residence.[83]

A range of bacterial and protozoal pathogens were identified by Shlim and colleagues in symptomatic expatriates, along with a high carriage rate (32%) in asymptomatic expatriates.[80] Younger age, dining in restaurants, and recent arrival in country have been identified as risk factors for diarrhea.[84,85] Enterotoxigenic *Escherichia coli*, *Shigella*, and *Campylobacter* provided common bacterial causes of diarrhea: the annual attack rate for *Cyclospora* was 32% and for *Giardia* 16%.[80] Brickfield and colleagues demonstrated a *Giardia* attack rate of 3.2/100/month in US Embassy personnel stationed in Ethiopia,[86] while Haberberger and colleagues found enteroadhesive *E coli* to be the commonest organism in US Embassy personnel in Cairo.[87] Fryauff and colleagues found *Cyclospora* to be the most

common protozoal pathogen in adult expatriates in West Java.[88] Clearly, infection patterns vary geographically.

A very recent review of 52 published studies examined the incidence, etiology, and impact of diarrhea in travelers away from home for >2 weeks. This review included studies undertaken in military personnel.[89] This study confirmed that etiology varied by region, with Southeast Asia having a relatively lower prevalence of enterotoxigenic *E coli* (ETEC) (13% of cases) and a relatively higher prevalence of *Campylobacter* (24%) and *Salmonella* (11%). Overall, pathogens were identified in 55% of cases: ETEC was the commonest pathogen in Latin America and the Caribbean (28%) and the Middle East (29%). ETEC (17%) and *Shigella* (9%) were the commonest pathogens isolated in sub-Saharan Africa. No significant adverse events were associated with the antibiotic treatment of diarrhea in 1,045 clinical visits. The impact of diarrhea was reported as being sufficiently severe to warrant confinement to sick quarters with a median probability of 27% (range 3%–56%). The authors make the point that their study did not examine the full impact of infection with organisms such as rotavirus and norovirus, which may present with vomiting but no diarrhea.

Given the frequency of diarrhea and its often suboptimal management in developing countries, self-treatment may be considered. Expatriates should be educated on the importance and techniques of oral rehydration and that antibiotics should be reserved for severe attacks and that antimotility agents should be avoided in the presence of fever or signs or invasive disease.[90] Education on proper medicine storage techniques should also be given. Fluoroquinolones are popular choices for empiric treatment, with azithromycin as an alternative where contraindications or resistance preclude fluoroquinolone use.[85] The newer rifaximin appears inactive for the treatment of *Campylobacter*,[91] while the effect against *Shigella* is uncertain.[92,93] Travelers should be cautioned on tendencies to overdiagnose amebiasis and overprescribe metronidazole in developing countries.[94] Protozoal etiology is suggested by prolonged diarrhea. Tropical sprue is seen in long-term travelers and expatriates[95,96] and may need to be considered when investigating culture-negative chronic diarrhea, as may noninfectious causes.

A case has been made for screening kitchen staff from poorer backgrounds,[97] although this may be impractical. Such staff may require education on hygiene practices. Poor domestic hygiene poses risk of *Ascaris lumbricoides* and *Trichuris trichuria* transmission.

Long-term expatriates may be at increased risk of *Helicobacter pylori* infection,[98,99] and appropriate screening may be indicated for symptomatic expatriates.[100]

Strongyloidiasis

Strongyloides infestations may persist over 50 years[101] and cause hyperinfection, making detection and treatment important. A study of returned expatriates with confirmed strongyloidiasis revealed many to be asymptomatic. Symptoms when present did not assist diagnosis, except for a history of intermittent serpiginous urticaria.[102] Screening of returned expatriates may be considered, and serology is the preferred modality. Serology may, however, have lower sensitivity in recent infestations and travelers than in immigrants. Eosinophilia is not always present.[103]

Hookworm and *Strongyloides* infestation may be prevented by the avoidance of bare skin contacting soil. Walking barefoot outdoors should be discouraged.

Cysticercosis

Cysticercosis in travelers is gaining increasing recognition. Data with respect to long-term travelers are sparse, but 8.2% seropositivity has been reported in Peace Corps volunteers in Madagascar.[104] Expatriates may acquire cysticercosis from *Taenia solium* ova shed by domestic workers but remain asymptomatic for lengthy periods.[105] Screening of food handlers abroad may be considered, as may supervision of kitchen hygiene standards. Although Leutscher[104] calls for routine screening of returned long-term travelers, test sensitivity and uncertain correlation of seropositivity with disease remain problems.[106] Screening provoked anxiety needs balancing against early detection benefits.

Leishmaniasis

Amplification by HIV, conflict, and urban migration are likely to increase visceral leishmaniasis prevalence in some areas,[107] with cutaneous leishmaniasis following suit.[108] Distribution varies with species and continent, but even in South and Central America, where predominantly rural distribution prevail, urban leishmaniasis occurs. Importantly, infection may follow brief exposures.[109] Prevention relies on personal protection measures. Leishmaniasis should be included in the differential diagnosis of ulcerated skin lesions in travelers with positive exposure

histories. The interval between infection and symptom development may be protracted.

Filariasis

Lymphatic filariasis is occasionally seen in travelers,[110] in whom it may be paucisymptomatic. Lymphatic filariasis may be diagnosed coincidentally or following investigation of eosinophilia.[111]

Onchocerciasis and loiasis are occasionally seen in returned expatriates; one study reported onchocerciasis following exposures ranging from 2 weeks to 39 years.[112] Ophthalmia and microfilaremia are infrequent findings in expatriates with onchocerciasis[113] and loiasis.[114]

Dengue

German expatriates with mean residence of 9.8 years in endemic countries showed 4.3% seropositivity. Duration of residence correlated with seropositivity.[115] Of Israelis in endemic countries for a mean of 5.3 months, 7.7% seroconverted, of whom 43% were asymptomatic higher seroconversion rates have been reported in aid workers posted to developing countries.[116] Long-term expatriates may suffer infection with more than one serotype,[117] and thus be at risk of dengue hemorrhagic fever and shock syndrome: the mortality incidence from such second dengue infections is roughly estimated to be of the order 1/100,000 or less travelers exposed, dependent on location and climate, approximating the incidence of traveler mortality from motor vehicle accidents.[116,117]

American Trypanosomiasis

The average expatriate remains at low risk unless spending time in rural areas, although urban risk has increased.[118] Expatriates should be aware that infection routes include ingestion and transfusion.[119]

African Trypanosomiasis

This remains rare in nonindigenous populations, although the incidence in travelers is expected to increase.[120] A review recently conducted by the authors confirmed at least 58 cases of imported human African trypanosomiasis since 1990, but underreporting appears to occur. Most cases of human African trypanosomiasis in long-term travelers appear attributable to the more indolent West African form of the disease caused by *Trypanosoma brucei gambiense* (S. Toovey and A. van Gompel, personal communication). Personal protection measures remain the mainstay of prevention. Although cases are reported from Kinshasa,[121] the risk appears to be in rural areas: Robays and colleagues found that apparently urban trypanosomiasis in Kinshasa actually correlated with extraurban activities.[122]

Other Infections

The incidence of brucellosis may be increasing in travelers.[123] Rickettsial diseases of the spotted fever and typhus groups may be a risk for travelers in rural and periurban environments, and education on vector avoidance is recommended. Skin exposure to contaminated surface water carries risk of leptospirosis, and exposures may be covered with doxycycline prophylaxis.[124] Consumers of raw or undercooked fish may be at risk of gnathostomiasis, sparganosis, capillariasis, and liver flukes.

Conclusions

Expatriates and long-term travelers are at a risk of a wide range of infections, many of which may be chronic or asymptomatic. Risk profile will vary geographically and with lifestyle. Risk management strategies include vaccination and chemoprophylaxis where possible, education on avoidance, and screening where appropriate.[125,126]

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