Vaccines in Travel Health: From Risk Assessment to Priorities

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Immunizations prior to travel contribute to reducing the risk of specific diseases for the traveler as well as the risk of international spread of diseases. Environmental and host factors determine the risk of acquiring a disease while traveling. Most relevant in the first group of factors are the location to be visited,[1,2] duration of travel, and reason for travel. Among host factors, the health of the traveler and his or her expected behavior abroad need to be considered. Consequently, an epidemiologic, host-related, and legal requirement–based assessment of the planned trip should be conducted when considering which immunizations are appropriate for a traveler.

Current Epidemiologic Threat of Vaccine-Preventable Infections

As suggested by several expert groups around the world, travel vaccines can be grouped as those that are required, routine, and recommended (Table 1). No recent morbidity and mortality data exist for many vaccine-preventable diseases in travelers, and incidence rates identified decades ago may have decreased. This may be the result of improved hygienic conditions at travel destinations (contradictory to observations in developing countries with respect to traveler's diarrhea),[3] or of immunization efforts.[4] It is unlikely that the current risk of vaccine-preventable diseases in travelers can be assessed now because it would be unethical to leave cohorts unprotected for the purpose of epidemiologic assessment.

Required Vaccines

Vaccination against yellow fever, a disease that occurs only in tropical Africa and northern South America (Figure 1), is the main required vaccine. This requirement is based on the international health regulations (IHR).[5] Although only a few hundred cases of yellow fever are reported to the World Health Organization (WHO) annually, serious underreporting of this disease is occurring. It is estimated that there are actually > 200,000 cases each year.[6] Based on recent epidemiology, it appears that yellow fever may be a reemerging disease with increasing recognition of vectors/animal reservoirs. Although yellow fever has never been reported in Asia, the vectors, *Aedes* and *Haemagogus* mosquitoes, have been observed there. This is why vaccination against yellow fever may not only be required when entering an endemic country, but may also be required when entering Asia after visiting endemic areas elsewhere. In travelers yellow fever is rare, but several cases in unvaccinated travelers have been reported in the past 10 years.[7] On the other hand, in areas where not a single case has been diagnosed for over 50 years, such as in the Kenya coastal region, the risk of possible adverse events by vaccination may outweigh a benefit of hypothetical reemergence in that specific region.

Cholera and plague are the two other diseases addressed in the current IHR that are under revision.[5] Because vaccination against cholera is required only for those traveling to Palau or Sudan after transiting an infected area,[8] the risk of cholera is discussed in the "Recommended Vaccines" section, below. Only two international travelers have been diagnosed with plague since 1966. In most industrialized countries, no plague vaccine is marketed; therefore immunization against this

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J Travel Med 2005; 12:26–35.

Table 1 Comparison of Various Expert Recommendations for Immunizations in Nonimmune Travelers Planning to Visit a Developing Country

	Expert Group/Country				
Vaccine	*WHO/World*	*CATMAT/Canada*	*CDC/US*	*CDSC/UK*	*NHMRC/Australia*
Required vaccines					
Yellow fever	**	**	**	**	**
Routine vaccines					
Diphtheria/tetanus	***	***	***	***	***
Polio	**	**	**	**	**
Measles	***	***	***	***	***
Hepatitis B	*	*	*	*	*
Recommended vaccines					
Hepatitis A	***	***	***	***	***/*
Rabies	*	*	*	*	*
Typhoid fever	*	*	*	*	*
Meningococcal	*	*	*	***	*
Japanese encephalitis	*	*	*	*	*
Tuberculosis	*	—/*	—	*	*
Cholera	c	—	—	—	—
Influenza	*	*	*	*	NA

c = consider in all travelers to endemic countries; CATMAT = Committee to Advise on Tropical Medicine and Travel; CDC = Centers for Disease Control and Prevention; CDSC = Communicable Disease Surevey Center; NA = not available; NHMRC = National Health and Medical Research Council; UK = United Kingdom; US = United States; WHO = World Health Organization.
*** = all travelers; ** = all travelers when visiting an endemic country; * = risk groups only; — = none;

disease is neither required nor recommended by any expert group.[9]

Although not specifically mentioned in the IHR, immunization against meningococcal disease with quadrivalent vaccine is a requirement for pilgrims and workers in the kingdom of Saudi Arabia.

Routine Vaccines

Routine childhood immunizations recommended in national vaccination programs usually include those against diphtheria, tetanus, poliomyelitis, measles, and hepatitis B.

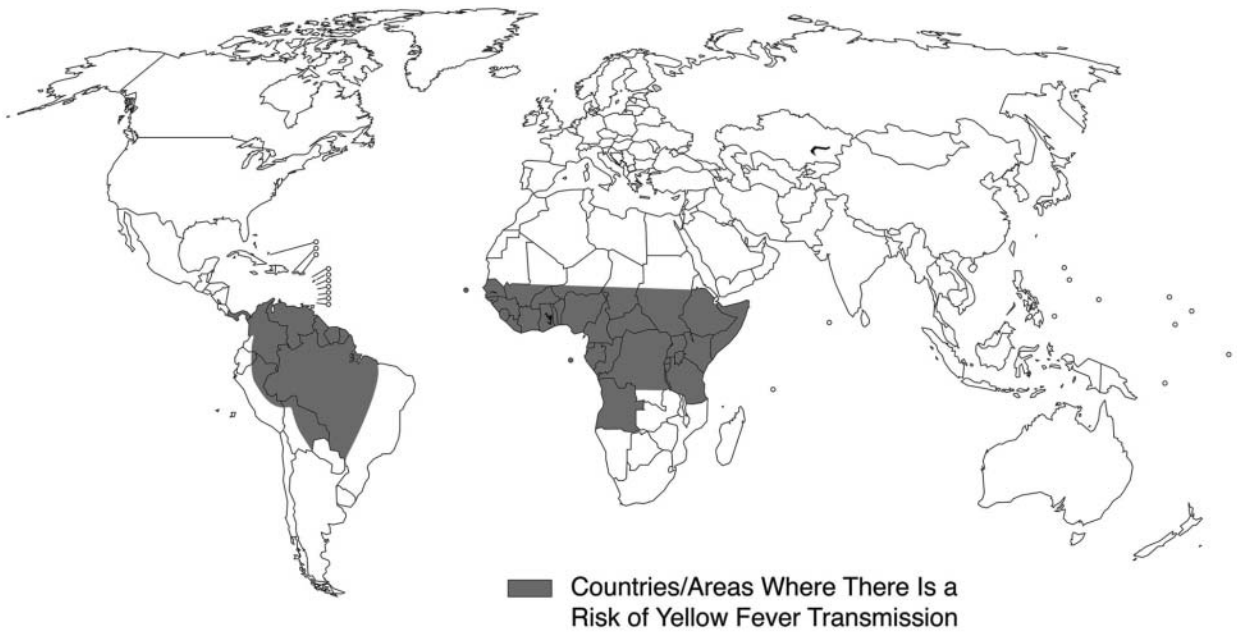

Figure 1 Areas endemic for yellow fever.

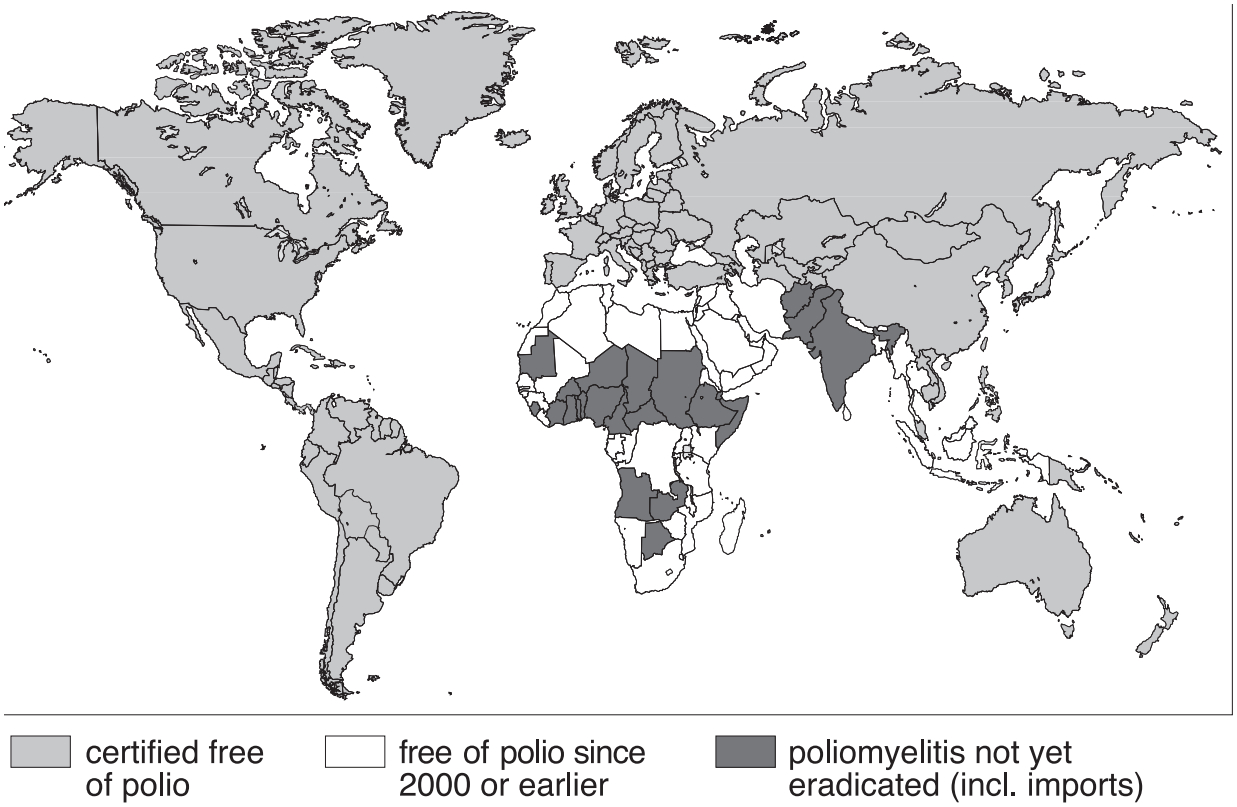

Figure 2 Global poliomyelitis incidence in 2004.

Although no cases of tetanus have been reported recently in travelers, such reports may be hidden in national surveillance data. As was demonstrated by a large epidemic in the former Soviet Union from 1990 to 1997, diphtheria outbreaks may occur under specific circumstances. Several travelers became ill, and some died.[10] Far less serious forms of cutaneous diphtheria are occasionally imported from developing countries; these infections cannot be prevented by immunization.[11]

Poliomyelitis has been eradicated from many parts in the world, but there are still important foci, mainly in South Asia and tropical Africa (Figure 2).[2] Rarely, the virus may be imported by asymptomatic persons, and the obstruction to immunize children in northern Nigeria has in 2004 resulted in a resurgence of the disease in Africa.[12,13] In travelers residing in industrialized countries, poliomyelitis has not been observed since the early 1990s; but even if travel-related risk has decreased, routine childhood polio immunization still remains a must to ensure immunity. In most industrialized countries oral polio vaccine has been withdrawn from the market because of the risk of vaccine-associated paralytic poliomyelitis, and inactivated polio vaccine is being used.

Hepatitis B is primarily a concern for expatriates living close to the local population and for travelers who fail to take appropriate precautions. The monthly incidence is 25 per 100,000 for symptomatic infections and up to 420 per 100,000 for both symptomatic and asymptomatic infections.[14] Minute quantities of the virus are often sufficient for transmission, and the exact mode of transmission remains unknown in many individuals. Behavioral surveys have demonstrated that 10 to 15% of travelers voluntarily or involuntarily (eg, after an accident requiring an invasive medical procedure or after tattooing) expose themselves to blood and bodily fluids while traveling abroad.[15,16] Casual sex and nosocomial transmission have been identified as important risk factors.[17,18] Because routine administration of hepatitis B vaccine to infants and/or adolescents was not initiated until the 1990s in most industrialized countries, many adults remain unvaccinated.

As a result of suboptimal compliance with measles vaccination (< 80% had at least one dose in some regions of European countries), European, African, and Asian travelers often are responsible for outbreaks in the Americas, where the measles vaccine uptake is far better.[19] There are no epidemiologic data known to us on measles among travelers in developing countries, but it is known that at least malnourished children there tend to have a more serious clinical course. To our knowledge, hardly any relevant data exist for travelers on pertussis, *Haemophilus influenzae* type b, mumps, or rubella, diseases for which vaccines are also routinely administered during

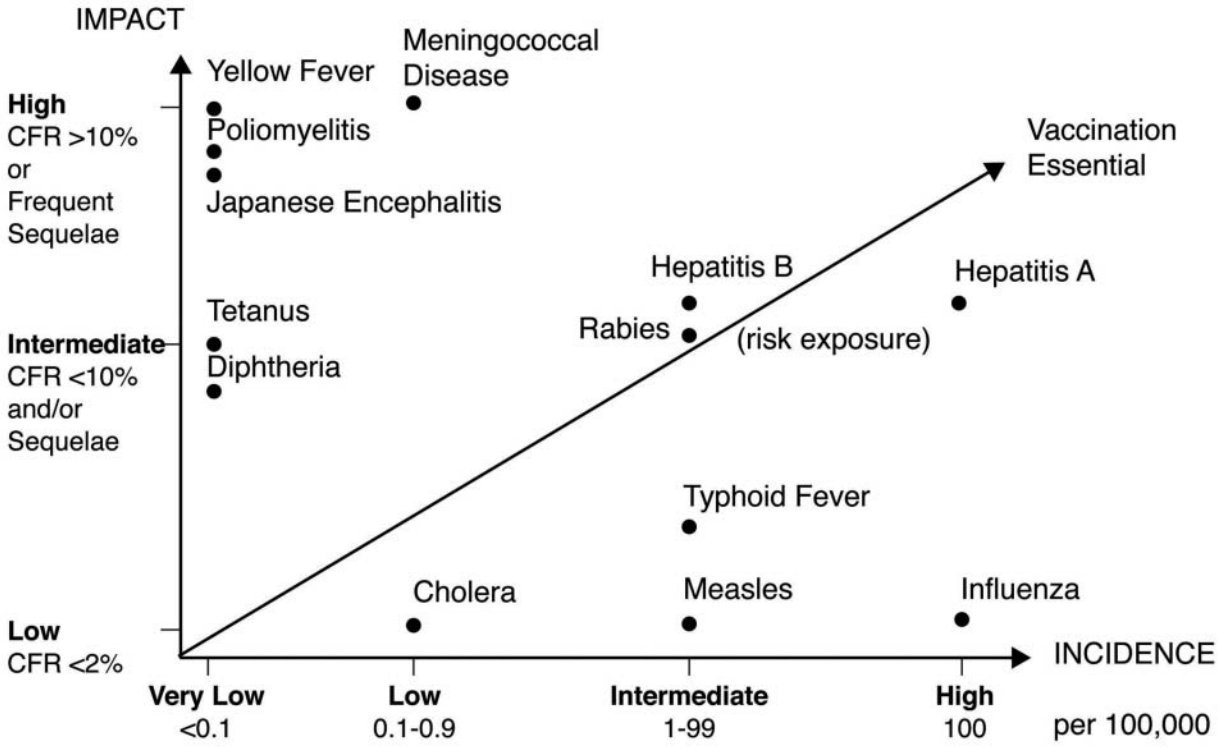

Figure 3 Impact and incidence of vaccine-preventable diseases in travelers to developing countries. CFR = case-fatality rate.

childhood in industrialized countries. Since patients with acute illness would obviously be contagious and justly would be denied to check-in for a flight, this could have consequences for an entire family.

Recommended Vaccines

For recommended immunizations, it is useful to consider incidence rates and impact (Figure 3), as well as specific risk factors (summarized in Table 2).

Influenza. Various outbreaks of influenza on cruise ships or after airline flights have been described.[20–22] The GeoSentinel Surveillance Network collected data on the frequency of respiratory tract infections encountered during travel from September 1997 through August 2001.[23] Respiratory tract infections were the second most common cause of illness among 1,719 persons, and 96 patients (5.6%) were diagnosed with influenza. This condition is likely to be underdiagnosed as not every case would get laboratory confirmation. Influenza was significantly associated with traveling to countries in the northern hemisphere between December and February (odds ratio [OR] 2.34, 95% CI 1.48–3.69), visiting friends and relatives (OR 6.11, 95% CI 1.85–20.11), and traveling for more than 30 days (OR 1.70, 95% CI 1.04–2.78). According to a follow-up survey recently presented, the monthly incidence rate of influenza in travelers exceeds 1%.[24] In early 2003 traveling febrile patients with influenza had an additional problem when thermal scanning at airports resulted in evaluation, occasionally with hospitalization, if it was suspected that the person had severe acute respiratory syndrome (SARS).[25]

Hepatitis A. Hepatitis A, with the exception of influenza, is the most frequent vaccine-preventable infection in nonimmune individuals traveling to developing countries. The average incidence rate has been 3 per 1,000 travelers per month; in high-risk backpackers or foreign-aid volunteers, the rate may be as high as 20 per 1,000 travelers per month.[26] A recent study documented a tenfold lower incidence rate, but a substantial proportion of the population included had a destination in the Caribbean.[27] Even luxury tourists staying at superior tourist accommodations and practicing usual food-consumption behaviors may be at risk for hepatitis A infection.[1,28] Risk areas for hepatitis A and hepatitis B are shown in Figure 4.

In the past, hepatitis A affected mainly children and took an asymptomatic or oligosymptomatic course in industrialized countries; the infection increasingly occurs

Table 2 Proposed Risk Criteria for Determining the Use of Recommended Travel Vaccines*

Vaccine	*Duration of Trip*†	*Environmental Factor*	*Host Factor*
Influenza	—	Many long flights, cruises	> 50/65 yr, preexisting disease, small children (?)
Typhoid	> few weeks	South Asia, north and west Africa, substandard eating places, or off-tourist itinerary	Gastric anacidity
	> 1 mo	All to developing countries	
Rabies	> 1 mo	High endemicity	High exposure: eg, cyclists, work with animals; children
	> 3 mo	High endemicity	Any exposure
Meningococcal disease	> 1 d	Epidemics, meningitis belt	Asplenic
	> 1 wk	Dry season, meningitis belt	
Japanese encephalitis	> 2–4 wk	Rural areas (rice fields), during season	—
Tuberculosis	> 1 mo‡	Close contact with local population	Infants and children
Cholera	—	Work in refugee camp	Gastric anacidity

*This table refers to recommended vaccines. Vaccination against hepatitis A is recommended by most expert groups for all visits to developing countries.

†Assuming comparatively good hygienic conditions at destination.

‡Only for infants.

in adult and elderly patients and has a case-fatality rate of 1.8% among persons aged 50 years or older.[29,30] Incapacitation lasts 2 to 3 months even among airline pilots, who are usually highly motivated professionals.[31] Increasingly, even small children with asymptomatic hepatitis A infection (eg, after a stay visiting friends or relatives in the country of the family's origin) create problems because they shed the virus. This results in outbreaks among teachers and staff in schools and nursing homes and among parents of other children who may also become infected.

Typhoid fever. Typhoid fever has an incidence rate of 30 per 100,000 travelers per month to South Asia.[32–34] Elsewhere, the rate of diagnosed typhoid fever is clearly lower; for example, tourists visiting Kenya rarely import typhoid fever. A large proportion of infections are imported by individuals visiting friends and relatives in their country of origin. The case-fatality rate is only 0.3% among travelers.

Rabies. The risk of acquiring rabies is particularly high in Asia, where 90% of all human rabies deaths are reported.[35] South Asia has the highest risk. There may also be underreporting in many parts of the world. Hazards to travelers also arise from a low availability of rabies immune globulin and safe vaccine, not necessarily evident from rabies epidemiologic data. Rabies-free areas include Australia, New Zealand, the Pacific Islands, Scandinavia, the United Kingdom, Ireland, Iceland, Italy, France, and Switzerland; in some of these areas, rare cases of rabies transmitted by bats have been reported. In developing countries, of the 0.2 to 0.4% of the traveling population who experience an animal bite each month, many are at risk for rabies.[36,37] However, no one knows the true rate of exposure to the virus. In the period from 1977 to 2000, 26 cases of imported rabies were diagnosed in Western Europe, mainly in France and in the United Kingdom.[38,39] Rabies is a particular risk for those who work with animals, explore caves,[40] or travel by bicycle. Rabies is also a particular concern in small children, who often do not tell their guardians that they have been bitten by an animal. In unvaccinated patients developing symptoms, the case-fatality rate is near 100%.[41]

Meningococcal disease. Meningococcal disease has frequently been observed during or after the hajj and to a lesser extent during the umrah pilgrimage by Muslims to Mecca (200 cases per 100,000), but it is rare in travelers staying in countries where the infection is highly endemic (0.04 cases per 100,000).[42] In contrast, in 2004 there were no reported cases of meningococcal disease during or after the hajj. Concern is also justified in those visiting the sub-Saharan "meningitis belt" during months of high transmission with annual regional epidemics. There have been rare reports of *Neisseria meningitidis* being transmitted during air travel of at least 8 hours' duration.[43] The case-fatality rate among travelers is slightly higher than 20%.

Japanese encephalitis. A few dozen cases of Japanese encephalitis have been diagnosed among travelers and expatriates within the past 25 years. The annual rate in travelers was < 1 per 1 million, often these had been at risk by overnighting in farms.[44] Rarely, tourists staying < 4 weeks in Bali may be affected.[45] Most recently the incidence of Japanese encephalitis has decreased in most endemic countries as a result of intermittent irrigation,

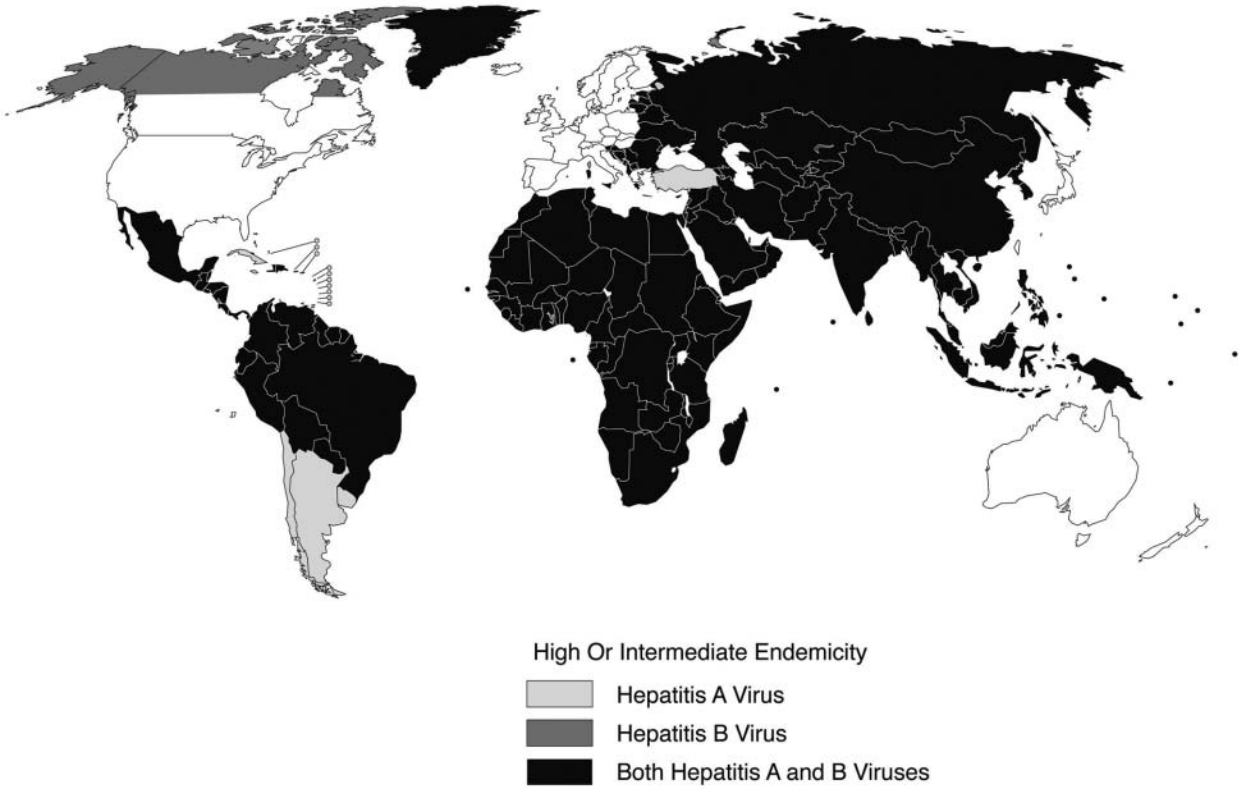

Figure 4 Geographic distribution of moderate to high levels of hepatitis A and/or B virus. Adapted from World Health Organization.[2]

as opposed to traditional continuous irrigation, of rice fields and other plantations. In addition, in most Southeast Asian countries, pigs, which are the usual host of this disease, are now usually contained to large farms, which are rarely approached by travelers (D.R. Shlim, T. Solomon, A. Oya, personal communication, October 2002).[46]

Tuberculosis. Based on results of tuberculin tests, the incidence rate of infection with *Mycobacterium tuberculosis* is 3,000 per 100,000 person-months of travel, and of these people 60 per 100,000 have active tuberculosis.[47] The prevalence of transmissible tuberculosis among air travelers is estimated to be 5 to 100 per 100,000 passengers. Transmission in flight or during prolonged train and bus rides has been reported only rarely, but documenting in-flight transmission is very hard owing to wide dispersal of passengers. Outdoor transmission is negligible, unless there is repeated exposure, as may occur among long-term, low-budget travelers or expatriates.[48]

Cholera. Cholera occurs in approximately 0.2 per 100,000 travelers, with asymptomatic and oligosymptomatic infections being more frequent, as demonstrated in Japanese travelers.[49] The case-fatality rate is < 2% among travelers.

Tick-borne encephalitis. Very few anecdotal reports have documented tick-borne encephalitis in international travelers[50]; there may be some underreporting partly associated with lack of serological assessment. Certainly infection may occur while hiking or camping in endemic areas.

Bioterrorist agents. No case of smallpox has occurred worldwide since 1978, and anthrax has been only an extremely rare risk in travelers, usually occurring in its cutaneous form after travelers purchase souvenirs made with goat skin. Vaccination against these infections is only to be considered for specific populations among the military or relief workers; in most countries these vaccines are only available in designated institutions.

Considerations for Prioritizing Immunizations

Travel health professionals must first decide what they wish to prevent with immunization: death, symptomatic illness, or infection. A rough estimate of the benefits of a variety of preventive measures to travelers is shown in Table 3. Clearly, malaria prophylaxis shows the greatest benefit in reducing mortality in travelers. Among vaccine-preventable diseases, immunization against hepatitis A and B saves the most lives. Similarly, when analyzing the impact of travel vaccines on morbidity, the greatest reductions can be expected with influenza, hepatitis A, and, to a lesser degree, hepatitis B (Table 4).

Table 3 Mortality among 1 Million Exposed* Travelers

Cause of Death	*CFR (%)*	*No Preventive Measures†*	*Type of Measure*	*With Intervention*	*Benefit*
Accident	NA	10 (–100)	Advice	7 (–80)	3 (–20)
HIV/AIDS	NA	10	Advice	< 1	~ 10
Malaria	1	300	PPM + ChePro	< 2	~ 300
Hepatitis A	0–4	20	Vaccine	0	20
Hepatitis B	2	10	Vaccine	0	10
Yellow fever	50	2‡	Vaccine	0	10
Typhoid fever	1	< 1 (India, 3)	Vaccine	0–< 1	1–3
Japanese encephalitis	30	< 1	Vaccine	0	< 1

AIDS = acquired immunodeficiency syndrome; CFR = case-fatality rate; ChePro = chemoprophylaxis; HIV = human immunodeficiency virus; NA = not available; PPM = personal protection measures against mosquito bites.

*1-month stay in developing countries; for malaria in tropical Africa.

†Rough estimates based on published data.

‡Rare infections in travelers as most are protected by vaccine that, in many countries, is a requirement for entry.

No travel health professionals should recommend that travelers receive all types of vaccines in stock. They should instead prioritize the recommended vaccines based on the severity of these diseases, their incidence among travelers to the specific countries, and the estimated degree of exposure (see Figure 3). Travel characteristics, described below, must be taken into account. It is not logical to immunize travelers against rare diseases that have a low case-fatality rate when treated effectively, but to leave them unprotected against more frequent and life-threatening infections for which no effective treatments are available. For example, hepatitis A and B have both high incidence rates and a significant impact (see Figure 4). The majority of travelers should be protected, and logically the combination hepatitis A/hepatitis B vaccine has an advantage similar to combined routine childhood vaccines.

Besides the factors mentioned in the introduction, it is not as important whether the destination is urban or rural when deciding which immunizations to provide as the hygienic standard of the site.[1,26] Regardless of the destination, high-standard tourists and businesspeople are less likely to be exposed to vaccine-preventable infections; however, nowhere is the risk nil. Classic examples of high-risk travelers include young backpackers who stay and eat at inexpensive places, and those who return to their native land to visit friends or relatives. The duration of travel has relevance because the risk of infection increases almost continuously with time, but it is difficult to determine a precise period of stay abroad as a decisive factor for or against vaccination. When considering immunization with vaccines that offer lifelong or long-lasting protection, the cumulative exposure of the traveler during that time period must be considered, rather than simply focusing only on the next trip. The reasons for travel (eg, professional activities, personal hobbies, and, if known, behavioral patterns) also need to be considered.

Host-related considerations include immune status (eg, previous immunizations, history of infection with resulting lifelong immunity), state of health with subsequent special risk (eg, an asplenic traveler), age, and specific contraindications for vaccination (eg, acute illness, young age, pregnancy, lactation, or altered immunocompetence). For example, travelers who have lived in developing countries for longer than 1 year (particularly if they were born there or came from the lower socioeconomic strata), those with a history of jaundice, or persons born before World War II often have acquired immunity against hepatitis A through exposure and thus need no additional vaccine protection.[14]

Vaccine-related considerations for prioritizing immunizations include efficacy, safety, and cost. Travelers often must pay out of pocket because many managed care plans

Table 4 Morbidity Owing to Vaccine-Preventable Infections among 100,000 Exposed* Travelers

Infection	*Without Vaccine†*	*With Vaccine*
Hepatitis A	300	< 1
Hepatitis B (symptomatic)	20–60	2–5
Influenza	500	250
Yellow fever	4‡	0
Typhoid fever	3 (–30)	1–10
Rabies	Unknown, > 1	0
Japanese encephalitis	1	0
Poliomyelitis	< 1	0
Meningococcal disease	< 1	0
Cholera	< 1	0+
Tetanus	NA	0
Measles	NA	0+

NA = not available.

*1-month stay in high-risk areas (developing countries).

†Very rough estimates based on published data.

‡Rare infections in travelers, as most are protected by vaccine that, in many countries, is a requirement for entry.

do not pay for travel immunizations.[51] As a result, financial constraints may preclude the traveler from receiving all vaccines that are indicated. On the other hand, long-term antibody persistence and anamnestic responses may soon render hepatitis A and B booster vaccinations obsolete everywhere and save costs.[52] Both financial and time constraints may make it difficult to administer multiple doses of a vaccine as required (eg, hepatitis B, rabies) to achieve appropriate protection before departure. Nevertheless, these difficulties should not result in prophylactic nihilism because protection can still be afforded on the day of departure through immunization and education. In many ways, travel medicine clinics have become de facto immunization clinics by providing an opportunity to increase adult immunization coverage.

Arguments against Vaccination

Questionable efficacy may be an argument against vaccination, and although protective efficacy has been shown to be good to excellent with most travel vaccines, there are a few exceptions. Even though measles, mumps, rubella, hepatitis B, and Japanese encephalitis vaccines do not exceed 95% protective efficacy,[53] this should not be an argument against immunization. Most agree that there is no benefit of bacille Calmette-Guérin (BCG) vaccine for the prevention of tuberculosis in adults,[54] and there are concerns about limited efficacy with all typhoid and cholera vaccines.[55,56] Recent concerns about lack of efficacy of hepatitis A and B vaccines in senior travelers originated from only a few breakthrough infections. These concerns should never be an argument against immunization; a serologic verification of response is usually not needed.[57] It must be noted that effective protection may exist despite a lack of serologic evidence.

Adverse events may be a serious argument against vaccination, and health professionals should be aware of ongoing debates in the media. Reports of adverse events are often lacking in evidence or are exaggerated. All vaccines have potential adverse effects, particularly local injection-site reactions; however, most vaccines have excellent reactogenicity profiles, and serious adverse events are infrequent. Concerns persist primarily with vaccines against yellow fever and Japanese encephalitis.[58,59] BCG vaccination against tuberculosis also is associated with a considerable rate of adverse events.

Cost may be an argument against immunization, although the results of a pilot study among travelers leaving for developing countries demonstrate that this is only rarely the case.[60] For example, many travel health professionals have seen cases of hepatitis A in backpackers who stayed for several months in developing countries.[26] Whether the reason for lack of immunization in these travelers was really cost, fear of needles, fear of adverse events, or ignorance remains to be determined. No travel-related vaccination is considered cost-beneficial when actuarial methods are applied across broad populations; the cost of vaccination is greater than the cost of avoided infection and death. Nevertheless, many travelers are willing to invest in safety just as they often invest in comfort while traveling.

An increasing concern worldwide is the shortage of travel and other vaccines, which is mainly a problem in North America. Unfortunately, this shortage forces travel health physicians and their colleagues to make difficult decisions about who among their patients should receive the doses they have in stock.

Conclusions on Vaccination Recommendations

It is one of the travel health professional's responsibilities to provide recommendations about which vaccines should be administered, but ultimately it is the traveler who will either accept or refuse that advice. Obviously, travelers must receive any required vaccines prior to traveling, unless contraindications exist. Those with medical contraindications may need a special medical certificate explaining why they did not receive that vaccine. Travelers ideally should have received the full immunization series against diphtheria, tetanus, polio, measles, and hepatitis B in childhood. If not, they should be given catch-up vaccinations because exposure to these diseases is possible in countries where coverage rates for these vaccines are not as high as coverage rates in industrialized countries. Diphtheria/tetanus boosters (never use monovalent tetanus vaccine, no longer available in many countries) are indicated every 10 years. As is illustrated in Table 1, there is worldwide unanimity with regard to this issue among travel health experts.

Most questions among clinicians arise with regard to recommended immunizations. Because of noncompliance with avoidance of potentially contaminated food and beverages, combined with the high incidence of hepatitis A and the considerable impact of this disease, it is recommended by most international and national expert groups that all travelers to developing countries receive the hepatitis A vaccine prior to departure (Table 1). Those travelers visiting friends and relatives are particularly negligent and difficult to reach predeparture. Very few believe that there is any indication remaining for immune globulin, and this agent has been withdrawn from the market in most countries. Where it is still available, there is concern because immune globulin is a blood-derived product and may not contain a sufficient quantity of anti–hepatitis A virus antibodies in view of low seroprevalence among donors. Studies in primates have demonstrated that hepatitis A immunization can be protective even when administered postexposure.[61,62] Based on these results, most travel clinics administer hepatitis A vaccine even when departure is on the same day, and only

very few cases of hepatitis A have been documented among travelers who received an adequate dose.[14,63,64]

It is universally recommended that travelers at considerable risk for developing complications of influenza, whether because of preexisting illness or age > 50 years (United States) and 65 years (most other countries), should be vaccinated prior to traveling particularly prior to cruises. The risk may be considerable also in small children. The Centers for Disease Control and Prevention in the United States and the National Health and Medical Research Council in Australia are currently considering whether influenza vaccination would be a worthwhile recommendation for all travelers because of the considerable incidence and total impact of influenza. As mentioned, influenza vaccine might be additionally indicated to reduce the risk of influenza as a febrile illness that may ultimately lead to suspicion of SARS, for example. In some northern hemisphere countries, the southern hemisphere influenza vaccine is available in the summer months for exposed travelers.

Most other immunizations are indicated only for groups at risk. Although there is consensus on that principle, the risk definition may vary slightly; the criteria summarized in Table 2 are suggested. Fundamentally, it is an arbitrary decision as to what extent one wishes to recommend or to receive protection against disease. Cost often is a problem, particularly in preexposure immunization against rabies, for which every dose exceeds $70 (US). Only the select few travelers who are at considerable risk for exposure to Japanese encephalitis in rural endemic areas need to be vaccinated against this disease (eg, agronomy students staying on farms). Because of the rarity and low impact of cholera, vaccinating travelers against this disease is usually not recommended.[1] Only the WHO (since 2002) and Austrian experts recommend immunization against cholera or at least its consideration for travelers visiting endemic areas. There are also differing opinions with regard to BCG. Most agree that vaccination against tuberculosis is useless in adults. Many also agree that this measure may be indicated for a select few infants at considerable risk for exposure to *M. tuberculosis,* particularly when they stay far from medical facilities. Time constraints must also be considered whenever several doses of a particular vaccine are needed to offer protection.

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