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FOREWORD

In this month's bulletin we highlight travel medicine. This coincides with the implementation of the International Health Regulations (IHR) in June of this year. Included articles cover common health problems of the traveller including tick bite fever and sexually transmitted infections and emphasise the role of preventative medicine and the use of vaccination. Health problems of displaced persons and the implications of the IHR for the traveller are discussed. With the increase in global travel, travel health is of increasing importance to clinicians and public health practitioners alike.

Cheryl Cohen
Editor

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TICK BITE FEVER AS A RISK TO TRAVELLERS IN SOUTHERN AFRICA

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The rickettsiae comprise a diverse group of vector-borne zoonotic bacterial pathogens, whose clinical diseases can be usefully classified into 3 groups: typhus (louse- or flea-borne); spotted fevers, which include South African tick bite fevers (TBF); and scrub typhus. There are at least two spotted fever diseases of southern Africa: boutonneuse fever-like TBF (caused by *R. conorii*) and African TBF (caused by *R. africae*).[1] The former is usually transmitted by dog ticks in a peri-urban or peri-domestic situations. In contrast, ATBF is typically transmitted by particular cattle and game ticks (*Amblyomma hebraeum* in southern Africa) (Figure 1) in rural settings. Surveys have shown up to 70% seroprevalence in sub-Saharan areas where *Amblyomma* ticks and cattle farming coincide.[2] Despite this, there are very few clinical case reports of tick bite fever in indigenous populations,[3] presumably because of mild or inapparent disease. In Zimbabwe, annual case incidence rates of ATBF have been estimated as 60 to 80 per 10 000 patients.[4] TBF is commonly recognised in non-African patients in South Africa but the incidence is not known. Tourists and travellers were the subjects of recent case series publications.[5] The incidence rates of infection have been estimated to be 4 to 5% in visitors from Europe, which are higher than those for other febrile illnesses such as malaria and typhoid fever. There is a large population at risk e.g. game reserve visitors, hunters, soldiers, and farmers.[5]

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Figure 1: *Amblyomma hebreum*, adult male
(Photo: P Jupp, A Kemp)

Clinical features

TBF is common in South Africa, although recognised cases are probably far outnumbered by subclinical ones. Larval and nymph stage ticks typically transmit the diseases; larvae ('pepper ticks') are often unnoticed because they are so small. *R. conorii* infections (boutonneuse fever-type TBF) begin, after an incubation period of 5 to around 7 days, with a consistent prodrome of malaise, fever, headache, nightmares, and myalgia. The eschar is the primary lesion and marks the site of attachment of the infected tick; it consists of a central necrotic area surrounded by inflamed skin (Figure 2). The eschar is not always obvious; it may be under scalp hair, behind the ear, in the anogenital area, or other cryptic body sites. About 3 days after onset of symptoms, the generalised coarse maculopapular rash appears (Figure 2); distribution typically includes the palms and soles.

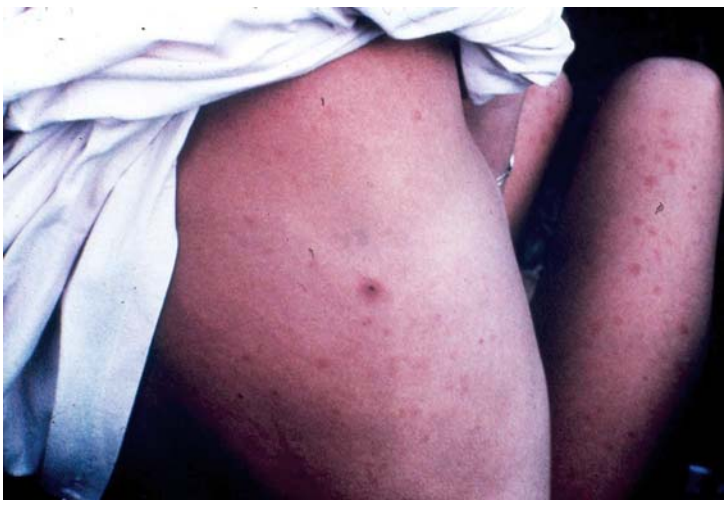

Figure 2: Eschar and coarse maculopapular rash of tick bite fever (Photo: B. Miller)

Clinical presentation varies from very mild to severe and even fatal disease, the latter particularly, but not exclusively, in elderly or debilitated people.[6] Complications include encephalitis, confusion, or coma; pneumonia; pulmonary embolism following deep vein thrombosis; bleeding; gangrene; hepatorenal failure; and myocarditis. Especially when diagnosis and treatment is delayed, TBF cases can present with multi-organ involvement, and mimic meningococcal septicaemia, other fulminant Gram-negative septicaemia, or viral hemorrhagic fever like Crimean-Congo HF. African TBF (*R. africae*) tends to be a milder disease without life-threatening complications.[2] The ATBF prodrome is similar to that of *R. conorii* infection; characteristic, but not consistent, distinguishing features are multiple eschars, tender regional lymphadenopathy, rashless illness, or only scattered and/or vesicular rash elements.[5]

Diagnostic issues

The triad of fever, eschar and rash occurs in 50-75% of cases of TBF, but there are less typical presentations. The eschar may resemble an infected insect bite or other skin trauma. The rash may suggest rubella, measles, secondary syphilis, disseminated gonococcal disease, enterovirus or arbovirus infections, leptospirosis, typhoid, immune complex vasculitis, or drug reactions. Meningococcal rashes can look similar, but the onset and progression of illness is much faster than TBF. Malaria is an important differential diagnosis of the non-specific prodrome in travellers. Early serological tests are often negative and repeat testing is required; treatment should not be delayed solely because of negative serology. Early treatment may abort seroconversion. Specific micro-immunofluorescence is the serological method of choice. The Weil-Felix agglutination test is now regarded as obsolete. In most patients the white blood cell count remains within the normal range. In severe cases neutropenia and thrombocytopenia occur.

Treatment and prevention

Many infections are mild, but TBF can be very severe and therapeutic delay should be avoided. Doxycycline is the treatment of choice. For adults, doxycycline 100 mg bd for 5-7 days is recommended although shorter courses may be adequate.[7] Doxycycline is highly effective and if there is no clinical response within 48 hours, the possibility of another diagnosis should be considered. A fluoro-quinolone such as ciprofloxacin, or chloramphenicol, may be the only available options in critically ill patients unable to tolerate oral medication, as parenteral tetracycline is unavailable in South Africa. Erythromycin has poor efficacy[8] and there is little clinical data to recommend the new macrolides such as clarithromycin and azithromycin, although they may have a place in supplementing initial doxycycline treatment. As TBF can be life-threatening in patients of any age group, initial treatment with the most effective agent, doxycycline, is recommended for all patients. In children less than 8 years of age and pregnant women, an initial 2 days of doxycycline should be followed by 3-5 days of a macrolide. Ticks are repelled by DEET-

containing products, but these have limited duration of activity and need to be re-applied periodically. Careful examination for attached ticks should be done after walking in tick-infested vegetation, remembering that larval ticks are extremely small. Post-exposure antibiotic prophylaxis is not useful, merely prolonging the incubation period.

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THE HEALTH PROBLEMS OF DISPLACED PERSONS

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Introduction

"Most refugees are ordinary people living extraordinary lives: driven from their homes by fear, conflict and persecution, they have had to give up jobs, possessions, dreams, even families in their struggle to survive. They remain some of the most vulnerable people in our societies. They need assistance and protection. And they need understanding." Kofi A. Annan, United Nations Secretary-General, 1997 – 2006.

Displaced persons are defined as persons who are forced to move away from their home or home region. Forced migration has resulted from religious and political persecution, natural disaster as well as war throughout human history. The relatively recent increased focus on this dilemma is the result of greater ease of travel, allowing displaced persons to flee to nations far removed from their homes, the creation of an international legal structure of human rights, and the realisations that the destabilising effects of forced migration, especially in parts of Africa, the Middle East, south and central Asia, ripple out well beyond the immediate region.

Globally there are approximately 10.6 million refugees and an estimated 25.8 million internally displaced persons (IDPs) (0.17% and 0.4% of the world's population respectively). The majority of refugees and IDPs are in Asia and Africa, which between them host a total of 9.2 million refugees and 18.1 million IDPs. In 2006, the total number of refugees and asylum seekers in South Africa was estimated at 160 000, the majority living in urban centres. This does not include economic migrants seeking refuge in South Africa following the continued collapse of the Zimbabwean economy.

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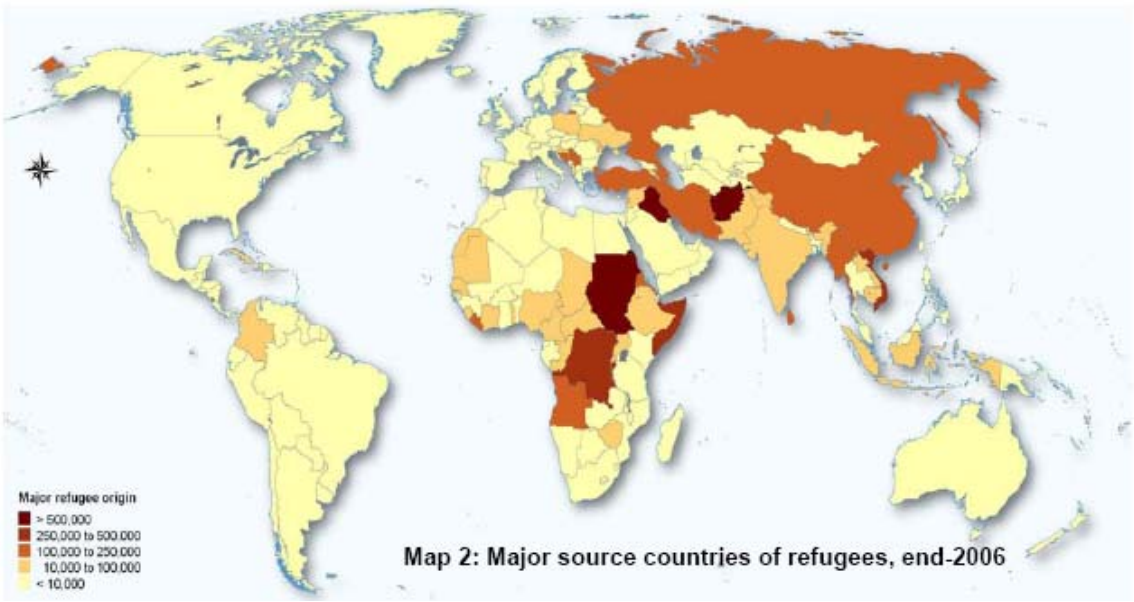

Map 2: Major source countries of refugees, end-2006

Source: UNHCR: 2006 Global Trends: Refugees, Asylum-seekers, Returnees, Internally Displaced and Stateless Persons

Refugees include persons recognised under the 1951 Convention relating to the Status of Refugees, its 1967 Protocol (South Africa (SA) ratified these in 1996) and the 1969 OAU Convention Governing the Specific Aspects of Refugee Problems in Africa (SA ratified 1995); those recognised in accordance with the UNHCR Statute; persons allowed to stay for humanitarian reasons; and persons granted temporary protection.

Internally displaced persons (IDPs) are often displaced for the same reasons as refugees. However, because IDPs have not crossed an international border, their legal situation as well as the international response to their plight differs significantly from that of refugees.

Health problems faced by displaced persons

Human dignity and basic human rights are of utmost importance and difficult to maintain especially when displaced persons are seen as intruders and are not sufficiently covered by law and policy in the receiving country.

In war or persecution, personal safety is a main concern. In natural disasters, fear and lawlessness are often threats to displaced peoples' safety from other people besides trauma directly resulting from the forces of nature.

Malnutrition, diarrhoeal diseases, measles, acute respiratory infections and malaria consistently account for 60-95% of all reported deaths among refugees and displaced populations.

Critical public health interventions

Overcrowding, inadequate hygiene and sanitation and the resulting poor water supplies increase the incidence of diarrhoea, malaria, respiratory infections, measles and other communicable diseases. Appropriate site location and layout and spacing and type of shelter can mitigate the conditions that lead to the spread of disease.

Adequate sources of potable water and sanitation must be equally accessible for all residents. Appropriate numbers of suitable located waste disposal facilities, water distribution points, availability of soap and bathing/washing facilities and health education are needed. Adequate quantities of relative clean water are preferable to small amounts of high quality water.

The control of disease vectors, including mosquitoes, flies, rats and fleas, is a critical measure.

Prompt provision of the environmental health measures, community outreach and effective case management of ill patients with provision of essential drugs and public health surveillance trigger early appropriate control measures. Proper management of diarrhoeal diseases with relatively simple, low technology measures can reduce case fatality to less than 1% even in cholera epidemics.

Measles immunisation along with Vitamin A supplementation are recommended for all children ages 6 months and older. Immunisation programmes should eventually include all antigens recommended by WHO's expanded programme on immunisation.

The threat posed by HIV infections and sexually transmitted infections is exacerbated by civil conflict and disasters and is related to education, health, poverty, human rights, legal issues, forced migration, security, military forces and violence against women.

The myth associated with disasters that cadavers represent a serious threat of epidemics often leads to inappropriate mass burial or cremation of victims. As well as being scientifically unfounded, this practice leads to serious breaches of the principle of human dignity, depriving families of their right to know something about their missing relatives.

Undernutrition increases the case mortality from measles, diarrhoea, and other infectious diseases. Deficiencies of vitamins A and C have been associated with increased childhood mortality in non-refugee populations. The highest nutritional priority in refugee camps is the timely provision of general food rations that include sufficient protein, fat, and micronutrients.

Maternal deaths have been shown to account for a substantial burden of mortality among refugee women. Programmes to improve health may include health education and outreach; antenatal, delivery, and postnatal care; nutritional supplementation; encouragement of breast feeding; family planning and preventing spread of sexually transmitted diseases; and immunisation and weight monitoring for infants.

Medical care in emergency situations should be based on simple, standardised protocols. Conveniently accessible PHC clinics should be established at the start of the emergency. Essential medicines and supplies should be available.

Emergency health information systems must be established to monitor the health of affected populations. Crude mortality is the most critical indicator of improving or deteriorating health status. It not only indicates the current state but also provides a baseline against which the effectiveness of relief programmes can be measured.

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THE INTERNATIONAL HEALTH REGULATIONS AND THE TRAVELLER

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Background

The International Health Regulations (2005) [IHR (2005)] were adopted by the World Health Assembly in May 2005 and came into force in June 2007, replacing the previous regulations of 1969.[1] The revised regulations provide a global framework and schedule for member states and the World Health Organization (WHO) to 'prevent, detect, assess and provide a coordinated response to events that may constitute a *public health emergency of international concern*.[2] 'State Parties have two years to assess their national structures and resources and develop national action plans; and three years to meet the core capacity requirements'.[2] This will ensure 'the appropriate application of routine, preventive measures and the use by all countries of internationally approved documents' and facilitate notification of events and implementation of any temporary recommendations.[3]

The global spread of infectious diseases and the need to revise the regulations were highlighted by SARS and, more recently, the threat of avian influenza assuming a pandemic human form. The new regulations are far wider in scope, with emphasis moving from border control to containment at source; from preset measures to adapted response; and from listed diseases (*yellow fever, cholera, plague*) to all public health threats.[2] They are primarily concerned with preventing the spread of diseases rather than protection of the individual. Although they impact on travellers' obligations and rights, however, cognisance is taken of both the personal rights of travellers and the need to implement methods 'that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade'.[1,3]

The two aspects of the regulations that are most likely to affect individual travellers are the vaccination requirements and the disinsectation measures implemented in affected or susceptible countries. These measures are designed to protect populations at susceptible destinations from importation of infected travellers or vectors and to protect individual travellers going to high risk destinations. The greatest challenge facing authorities is the movement of people across land borders at which the IHR (2005) may be very difficult to enforce.

Documentation and mandatory vaccines

The best known requirement of the International Health Regulations is almost certainly the yellow fever certificate. With the IHR (2005), an 'international certificate of vaccination or prophylaxis' has been introduced to cover all vaccinations and prophylaxis that may be required for diseases specified by the WHO in accordance with the regulations.[1] The designated vaccine currently regulated is against yellow fever, while recommendations and specific country requirements regarding meningococcal disease and poliomyelitis depend on the destination and timing of travel such as pilgrimage to Mecca (Hajj).

Yellow fever, a mosquito-spread viral infection, affects 42 countries in Africa, Central and South America. Many of these countries require yellow fever vaccination for travellers from all countries, a measure to protect visitors from acquiring the disease, while nearly all require vaccination for travellers from other countries with risk of the disease. Currently over 80 other countries, including South Africa, require yellow fever vaccination for travellers coming from countries with risk of yellow fever transmission to protect their populations from imported cases to areas where there are *Aedes* mosquitoes which could become infected.[3]

The yellow fever vaccine is very effective and is recommended for all travellers to countries or areas within countries at risk, with the exception of those for whom it is contraindicated. For each traveller, an assessment of the risk of the destination and the risk of adverse effects from the vaccine is required before vaccination. In South Africa, the national Department of Health designates official yellow fever vaccination centres which are staffed by licensed health practitioners who have been trained in travel medicine, including pre-travel risk assessments and the requirements for vaccination. To meet entry/exit requirements of all countries, immunised travellers must carry the yellow fever vaccination certificate which becomes valid 10 days after vaccination and remains valid for 10 years.[1] If vaccination is contraindicated, the traveller must carry a written medical waiver issued by an official immunisation centre. Those without proof of vaccination may be refused entry into a territory requiring the certificate or quarantined for not more than 6 days after last possible exposure.[1] The practice of vaccinating such travellers at some airports has no scientific basis and is not condoned by the IHR (2005).

Travellers' rights

Under the IHR (2005), no health documents other than those specified or included in recommendations can be required of the traveller, but the regulations do not apply to people seeking residence. If a traveller becomes ill on an aircraft, the receiving country can only refuse to accept the person when the point of entry is not equipped for applying health measures - previously, those with diseases in the regulations could be refused entry. In the process of disinfection, disinsecting and deratting, emphasis is placed on there being no deleterious effect to people or property, but individuals cannot refuse any such process required by the IHR (2005). Although travellers can be compelled to undergo examination, vaccination or prophylaxis, these must be justified and be the least invasive and intrusive necessary. Travellers may also be required to submit to

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additional measures including isolation, quarantine and placement under surveillance for a number of specified diseases (e.g. *smallpox, poliomyelitis, human influenza (new subtype), SARS);* 'any unusual event of with potential international public health impact'; or diseases of national or regional concern such as dengue and meningococcal disease.[1]

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SEXUALLY TRANSMITTED INFECTIONS IN TRAVELLERS

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Many new sexually transmitted infections, including HIV, are contracted each day. This may be due to people taking chances and failing to use condoms as a protective measure.

The risk of acquisition or transmission of STIs during travelling is increased for a number of reasons. The change of environment, away from the confines of routine daily lives, into new and often exotic venues, can make people lose their usual self-control and become uninhibited. Travel, particularly when one goes alone on business trips, can also leave people feeling bored and lonely – they sometimes find relief in the company of strangers and feel guilty later. Taking risks with new sexual partners is more likely in an environment removed from the normal social controls of daily lives, including the restraining effect of peer-pressure and limited free time due to social/family commitments.

STIs are not evenly distributed throughout the world, and travel to some places with high STI and HIV prevalence will raise the risk of acquiring such infections. In addition, antimicrobial resistance profiles for STIs like gonorrhoea vary across the world. For example it is over 90% likely that gonorrhoea acquired in Hong Kong will not respond to ciprofloxacin, whereas this may work very well in treating gonorrhoea acquired in Bolivia.

Important contributory factors to putting oneself at risk of STIs and HIV include;

- Forgetting or choosing not to practice 'safe sex', by the non-use of condoms
- The excitement of trying out new things in a new environment when no-one is watching
- Poor judgment and disinhibition associated with excessive alcohol intake
- Use of recreational drugs, including 'poppers'
- Having sex with high risk partners, such as street-based commercial sex workers
- Use of the internet to find 'one night stands' in big cities

Useful tips for the pre-travel consultation:

- First of all, DISCUSS STIs and 'safe sex'! Many STI patients complain that their doctors never discuss sexual issues with them, except when they have an STI
- Advise the person to always keep a supply of condoms during his/her travel if they think that they are likely to be sexually active with a new partner whilst away
- Go one stage further … give the traveller some condoms if you suspect they may be at risk! They are freely available from the Department of Health.
- Discuss the dangers associated with excessive alcohol intake and recreational drugs in terms of disinhibition
- Emphasise the danger of STIs, including HIV, in sexual activities with 'unknown' people
- Advise the person about typical STI-related symptoms, which may include penile/vaginal discharge, genital ulceration/sores or unusual body rashes. If present, they should consult a medical practitioner as soon as possible and avoid further sexual encounters until treated adequately.
- Discuss the option of post-exposure prophylaxis with antiretroviral drugs for HIV-related high-risk sexual exposures, and if thought prudent, prescribe these for the person concerned.
- If the person has been away and at risk of acquiring an STI from a non-regular sexual partner through unprotected sexual intercourse, advise on the importance of an STI 'check up' on return before putting their regular partner at risk.
- Ensure higher risk travellers, for example some men who have sex with men (MSM), are fully vaccinated for hepatitis B +/- hepatitis A before travelling as some MSMs' sexual behaviour and preferences place them at greater risk of both these STIs.

Useful tips for the traveller with an acute STI

- Consider the possibility of antimicrobial resistance if gonorrhoea is suspected in cases of urethritis, vaginal discharge or their complications - treat accordingly (I.M. ceftriaxone 250 mg as a single dose is a good choice)
- Discuss and encourage an HIV test at the time of presentation and advise a repeat test three months after the sexual exposure/onset of STI symptom
- Advise on the importance of a 3-month follow-up serological test for syphilis if the traveller is coming back from an area where syphilis is still common (many parts of Africa, South America, Asia, Eastern Europe)
- Ensure that all sexual partners over the past 3 months are contact traced, wherever possible – this includes the regular partner or spouse if sexual intercourse has resumed after arrival home

VACCINES FOR TRAVELLERS

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A traveller is 'someone who moves from one place to another' and includes the leisure and business traveller who generally travels for a short period, the expatriate resident in another country for a length of time, as well as displaced persons. This article will focus on the first group of travellers.

Immunizations are amongst the most cost-effective medical and public health interventions available. Appropriate vaccines prior to travel can reduce the risk of vaccine–preventable diseases for the individual traveller and may also reduce the risk of international transmission of diseases. Recently polio has been reintroduced by returning travellers into countries from which it had been eliminated.

Several factors should be considered when planning immunizations for the traveller; those vaccines required as a condition of entry; the specific diseases prevalent in the countries and regions of travel, including any specific outbreaks of disease; mode and purpose of travel, and individual traveller characteristics.[1,2] Special groups such as the paediatric traveller, the elderly, the traveller with co-morbid disease, the immunocompromised and the pregnant traveller pose specific challenges in terms of efficacy and safety related to vaccines. Vaccine cost and time available before travel are important considerations.

Yellow fever is the only immunization required as a condition of entry in terms of the International Health Regulations (IHR). There may however be some additional country specific requirements. Countries 15^{o} north and south of the equator in Africa and South America are considered yellow fever risk areas (see map), and all persons entering or returning from these countries require to be vaccinated timeously before travel.[3] Although a very rare illness amongst travellers, the mortality is high.

As of 15 June 2007, the "Model International Certificate of Vaccination or Prophylaxis" contained in Annex 6 of the International Health Regulations (2005) replaces the "International Certificate of Vaccination or Revaccination against Yellow Fever" contained in Appendix 2 of the IHR (1969).[3] A single dose of the live virus vaccine is highly effective in producing a long-lasting immune response 10 days after vaccination, but IHR require re-vaccination every 10 years at designated yellow fever centres. Adverse events are uncommon. Neurotropic and viscerotropic disease have been reported rarely, particularly in the elderly but more recently in other age groups. The vaccine is contraindicated in persons with true egg allergy and in children less than 6 months of age, and pregnant woman because of the risk of encephalopathy to the foetus. In the event of an epidemic, however, pregnant women and all children and infants resident in the area should receive the vaccine. In HIV-infected persons with advanced immuno-suppression, the vaccine has been shown to be less effective and because of the risk of adverse events, the vaccine is not recommended for patients with symptomatic HIV, or those with CD4 counts <200 cells/mm^3.[4,5]

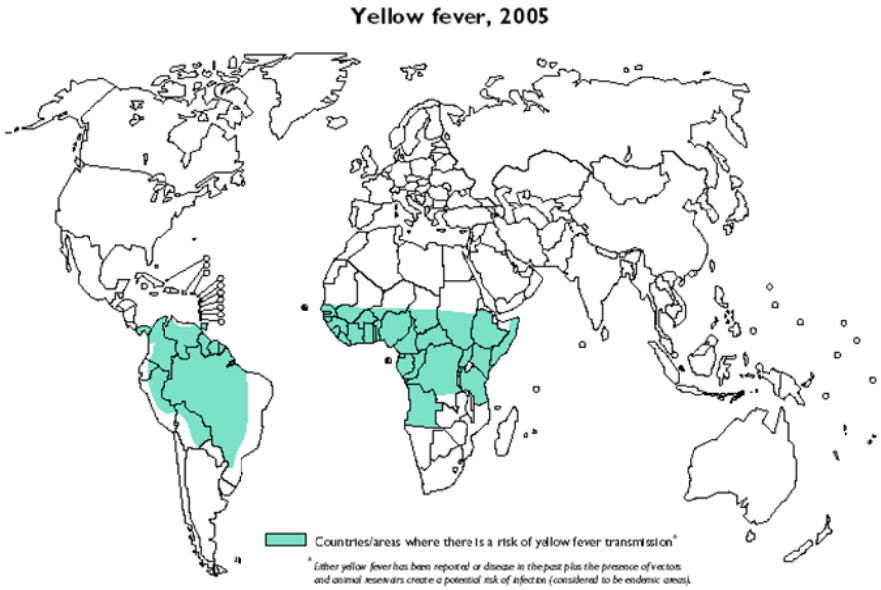
Hepatitis A is the most common vaccine preventable disease in travellers, with an incidence of 20 cases per 1000 travellers per month. Since the disease may result in significant morbidity and even mortality in adults, non-immune travellers particularly to rural areas should receive the vaccine.[6] Pre-testing for immunity is cost-effective depending on the population group. Following one dose of vaccine, > 80% are protected by day 15, but a booster after 6 months is required to ensure long-lasting immunity. Although the vaccine elicits an immune response 2-4 weeks after administration the practice of giving "last-minute" travelers immunoglobulin for early protection is no longer considered necessary.

Following outbreaks of meningococcal disease sero-group W135 in travellers returning from the Hajj, pre-travel vaccine using quadrivalent vaccine is now a requirement of entry to Saudi Arabia.[7] Meningococcal vaccine should also be considered for travel to the meningitis belt, particularly in the setting of an outbreak. Whilst serogroup A remains most common, serogroup W135 is emerging and the appropriate vaccine must be used.

Rabies remains a problem on the Indian sub-continent, and parts of south-east Asia, and rural Africa. Pre-travel rabies vaccination obviates the need for the usually scarce rabies immunoglobulin post-exposure and should be considered for certain travellers. The mode of travel, occupational risks, local rabies epidemiology and access to safe and effective post-exposure treatment should be taken into consideration.[8,9]

Comprehensive studies on the efficacy and use of the new cholera vaccines in travellers are lacking and indications for their use are unclear.[10] The new inactivated vaccine provides 80-85% protection in local communities for 6 months, and 62% after 3 years. Since vaccines are not a substitute for caution on the part of the traveller, and are only one component of disease prevention, it is more prudent for travellers to take appropriate food and water precautions.

The risk of typhoid varies according to geographical area visited and style of travel. The live oral vaccine Ty21a has an efficacy of 62-79% in endemic areas, but there are no good studies in travellers and it is not available in South Africa. The polysaccharide vaccine Typhim Vi® showed an efficacy of 75% during the months of active surveillance in Nepal, while the South African study showed 55% efficacy



Source: World Health Organization. International Travel and Health 2007, Chapter 5: Infectious diseases of potential risk for the traveler, p92.

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3 years post immunization.[11,12] Both vaccines are well tolerated and provide significantly more protection than the killed whole cell vaccine, which is no longer available.

The use of polio vaccine for travellers will depend on travel destination, perceived risk, any current outbreaks and requirements of the specific country. The Saudi Arabian Ministry of Hajj has announced that proof of vaccination against polio will be required of all pilgrims under the age of 15 coming from countries where polio is currently an issue. Recently this was amended and now, irrespective of previous immunization history, all such individuals arriving in Saudi Arabia will receive oral polio vaccine at border points. In addition to this, all travellers from Afghanistan, India, Nigeria and Pakistan, regardless of age and previous immunization history, will also receive an additional dose of OPV upon arrival in Saudi Arabia.

Seasonal influenza is a common disease in travellers, but access to the northern hemisphere vaccine may be difficult. Most of the widely used antigens can be given safely and effectively at the same time without increased rates of adverse reactions or impaired antibody responses. In general, inactivated vaccines can be administered simultaneously, but at different sites. Immune globulin should not be given for at least two weeks after measles, mumps and rubella vaccination, but no interference has been shown with the response to oral polio or yellow fever vaccines. Vaccines commonly associated with adverse reactions should preferably be administered three weeks apart.

There are a number of new vaccines in development. Since malaria poses a major risk for many travellers, an effective vaccine for malaria would be of great benefit. Currently travellers have to depend on personal protection and appropriate chemoprophylaxis.

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RECOMMENDED VACCINES FOR PREVENTION OF TRAVEL-RELATED INFECTIONS

Vaccine	Trade name (vaccine type)	Adult schedule	Booster or revaccination	Children	Pregnancy	HIV	Comments
Cholera	Dukoral® (Inactivated bacterial)	2 doses oral (150ml): 1 week apart	Booster after 2 years	Use from 2 years of age 2-6 years give 3 doses > 6 years adult dose	Use	No data	Avoid food and drink for 2 hours before and 1 hour after dose. If > 6 weeks between doses, start schedule again. Children should have a booster after 6 months. Protection 1 week after last dose.
Hepatitis A	Avaxim® Havrix® (Inactivated viral)	1 dose IMI (160u/0.5ml) 1 dose IMI (1440u/1ml)	Booster after 6 months	Use from 1 year of age Paediatric formulations available	Data unavailable	Use	Protection 2-4 weeks after 1st dose.
Hepatitis B	Heberbiovac® (Recombinant viral)	3 doses IMI (1ml): 0, 1 and 2 months	None	Use. Paediatric formulation available	Use	Use	
	Engerix B® (Recombinant viral)	3 doses IMI (1ml): 0, 1 and 6 months	None	Use. Paediatric formulation available	Use	Use	Accelerated schedule: 0,1 and 2 months or 0, 7 and 21 days, but then a booster is required 12 months after initial dose.
Hepatitis A and B	Twinrix® (Inactivated and recombinant viral)	3 doses IMI (1ml): 0, 1 and 6 months	None	Use from 1 year of age. 1-15 years old give 2 doses: 0, 6-12 months	Use with caution	Use	
Influenza	Vaxigrip® Influvac® (Inactivated viral)	One dose SC or IMI (0.5ml): annually before influenza season	Revaccinate annually	Use from 6 months of age (paediatric product available)	Use	Use, unless CD_4 count < 200 cells/mm^3	Children 3 –8 years should have booster after 1 month, the first time they recieve the vaccine. Contraindicated in persons with severe egg allergy. Southern hemisphere vaccine may not protect against Northern hemisphere strains. Protection 2-4 weeks after dose.
Neisseria meningitidis serogroups A,C,W_{135},Y	Mencevax® Menomune® (Polysaccharide)	1 dose SC (0,5ml)	Revaccinate every 3-5 years	Not very effective in children < 2 years old	Use	Use	Protection 2-3 weeks after dose.
Neisseria meningitidis serogroups A&C	Imovax Meningo A&C® (Polysaccharide)	1 dose SC or IMI (0,5ml)	Revaccinate every 3-5 years	Not very effective in children < 2 years old	Use	Use	
Poliomyelitis	Merieux® Polioral® (Live attenuated viral)	Oral (2 drops): single dose as a booster after primary schedule in childhood		Use	Can be used*	Can be used*	* preferably use inactivated vaccine
	TdPolio® (Inactivated viral in combination with tetanus and adult diphtheria toxoid)	IMI (0.5ml): single dose as a booster after primary schedule in childhood		Use from 6 years of age	Use	Use	In combination with tetanus and adult diphtheria. If tetanus booster within the last 5 years, side effects may be exaggerated.
Rabies	Verorab® Rabipor® (Inactivated viral)	3 doses IMI in deltoid (never gluteus)(0.5ml): 0, 7, 21 or 28 days	Booster every 5 years	Safe	Use	Efficacy limited but safe	Post exposure, give boosters on day 0 and 3, but no rabies immunoglobulin in vaccinated individuals. Do serological tests to determine need for boosters.
Typhoid	Typhim Vi® Typherix® (Polysaccharide)	1 dose deep SC or IMI (25 mcg/0.5ml)	Revaccinate every 3 years if still at risk	Use from 2 years of age	Use	Use	Protection 2-3 weeks after dose.
Yellow Fever	Stamaril® (Live attenuated viral)	1 dose IMI or SC (0,5 ml)	Booster after 10 years	Use from 6 months of age	No, unless risk is very high	Use unless CD_4 count < 200 cells/mm^3 or symptomatic	Must be administered 10 days before travel. Contraindicated in persons with severe egg allergy. Protection 10 days after dose.

Provisional listing: number of laboratory-confirmed cases in South Africa of diseases under surveillance reported to the NICD, corresponding periods 1 January - 30 June 2006/2007

	Disease/ Organism	Case Definition	Subgroup	Cumulative to 30 June year	EC	FS	GA	KZ	LP	MP	NC	NW	WC	South Africa
VIRAL DISEASES	Acute Flaccid Paralysis	Cases < 15 years of age from whom specimens have been received as part of the Polio Eradication Programme		2006	19	12	33	24	35	20	6	7	14	170
				2007	22	14	36	30	16	14	6	13	14	165
	Measles	Measles IgM positive cases from suspected measles cases, all ages		2006	2	0	9	0	1	2	2	3	0	19
				2007	2	0	4	0	0	3	0	1	1	11
	Rubella	Rubella IgM positive cases from suspected measles cases , all ages		2006	63	8	92	27	19	36	22	16	42	325
				2007	60	4	22	37	24	10	9	16	32	214
	VHF	Laboratory-confirmed cases of CCHF (unless otherwise stated), all ages		2006	0	2	2	0	0	0	2	0	0	6
				2007	0	0	0	0	0	0	0	0	0	0
	Rabies	Laboratory-confirmed human cases, all ages		2006	1	0	0	2	15	0	0	1	0	19
				2007	3	0	0	3	1	0	0	0	0	7
BACTERIAL AND FUNGAL DISEASES	*Haemophilus influenzae*	Invasive disease, all ages	All serotypes	2006	11	12	82	30	0	1	6	2	26	170
				2007	5	11	77	19	1	7	0	1	28	149
		Invasive disease, < 5 years	Serotype b	2006	2	3	14	5	0	1	1	0	6	32
				2007	0	2	9	5	0	2	0	1	8	27
			Serotypes a,c,d,e,f	2006	1	1	10	2	0	0	1	0	2	17
				2007	1	0	4	2	0	0	0	0	2	9
			Non-typeable (unencapsulated)	2006	1	2	19	2	0	0	0	0	2	26
				2007	0	1	15	2	0	0	0	0	1	19
			No isolate available for serotyping	2006	3	3	13	7	0	0	1	1	3	31
				2007	1	6	16	2	1	1	0	0	8	35
	Neisseria meningitidis	Invasive disease, all ages		2006	21	13	138	7	3	9	6	8	25	230
				2007	4	12	46	9	1	4	2	8	24	110
	Streptococcus pneumoniae	Invasive disease, all ages	Total cases	2006	155	98	951	200	40	85	12	52	229	1822
				2007	72	121	837	183	38	87	18	69	238	1663
			Penicillin non-susceptible isolates	2006	31	24	295	68	8	22	4	14	63	529
				2007	27	41	302	77	8	33	6	23	85	602
			No isolate available for susceptibility testing	2006	61	7	132	19	8	17	0	8	12	264
				2007	13	16	150	35	11	10	3	8	30	276
		Invasive disease, < 5 years		2006	47	33	305	72	12	20	3	16	72	580
				2007	21	36	221	69	11	25	4	16	94	497
	Salmonella spp. (not typhi)	Invasive disease, all ages		2006	26	15	358	68	2	20	0	12	48	549
				2007	18	24	187	39	7	8	1	11	35	330
		Confirmed cases, isolate from a non-sterile site, all ages		2006	54	17	110	105	14	25	10	43	96	474
				2007	76	16	137	65	21	60	8	10	37	430
	Salmonella typhi	Confirmed cases, isolate from any specimen, all ages		2006	21	1	8	10	6	6	0	0	11	63
				2007	6	0	9	5	1	5	0	2	5	33
	Shigella dysenteriae 1	Confirmed cases, isolate from any specimen		2006	0	0	0	1	0	0	0	0	1	2
				2007	0	0	1	0	0	0	0	0	0	1
	Shigella spp. (Non Sd1)	Confirmed cases, isolate from any specimen, all ages	All serotypes	2006	71	29	108	121	10	22	17	11	257	646
				2007	23	21	89	36	6	11	8	2	64	260
	Vibrio cholerae O1	Confirmed cases, isolate from any specimen, all ages	All serotypes	2006	0	0	0	0	0	0	0	0	0	0
				2007	0	0	0	0	0	0	0	0	0	0
	Cryptococcus (*Cryptococcus spp.*)	Invasive disease, all ages	Total cases (incl. *C neoformans*)	2006	757	137	946	779	103	250	39	164	214	3389
				2007	210	225	889	576	125	201	29	227	186	2668
			C. gattii	2006	3	2	16	4	10	14	3	8	4	64
				2007	0	0	22	9	15	16	0	7	2	71

Abbreviations: VHF - Viral Haemorrhagic Fever; CCHF - Crimean-Congo Haemorrhagic Fever

Provinces of South Africa - EC: Eastern Cape, FS: Free State, GA: Gauteng, KZ: KwaZulu-Natal, LP: Limpopo, MP: Mpumalanga, NC: Northern Cape, NW: North West, WC: Western Cape

0 = no cases reported