Travel medicine I

Preparing the traveller

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The four steps for giving travellers the foundation for healthy journeys are to assess their health, analyse their itineraries, select vaccines, and provide education about prevention and self-treatment of travel-related diseases. This process takes time. Since there is a risk of information overload, travellers should leave the clinic with some written advice for reinforcement. The order of these steps can be tailored to what best suits the travel clinic, but vaccinating early in the process allows monitoring for adverse reactions. Face-to-face discussion is vital for explaining the use and side-effects of medications. Those who provide a travel medicine service should be seeing many travellers and should seek specialist training. In 2003, the International Society of Travel Medicine introduced a certificate of knowledge examination in travel medicine. We cannot make travellers bullet-proof but it is possible to make them bullet-resistant. The pre-travel visit should minimise health risks specific to the journey, give travellers the capability to handle most minor medical problems, and allow them to identify when to seek local care during the trip or on return.

Tourists, business travellers, expatriates returning to visit friends and family, missionaries, students, and the military are all at risk of falling ill when they visit less developed and/or tropical parts of the world. Travel medicine is an emerging subspecialty that aims to keep disease and injury at bay by arming travellers with education, vaccinations, medical supplies, and resources to cope with problems on the way. Travellers may ask about immunisations, diarrhoea, and insect bites, for example, but what they expect from or ask of physicians may not always match what they need to stay healthy. Travel medicine encompasses these issues and many more, and may be provided by primary-care physicians or by doctors and nurses in specialised travel clinics who have had additional training.

Travellers face various health risks during their journeys (panel 1) and three of every four are taken ill or injured during their journeys.[1] Travellers need to be aware of these risks and of the availability of advice before departure and of care if the traveller returns home ill or falls sick shortly afterwards. Preparing the traveller for a journey to the less-developed world is not easy and takes time; education is as vital to healthy travel as are immunisations. The skill lies in the practitioner's ability to pass on information in a practical, understandable manner so that the traveller will make use of it.

More than 50 million people from developed nations visit the less-developed world every year. In 2000, there were about 699 million international travellers. After the terrorist attacks in the USA (2001) and in Bali (2002) numbers fell slightly, but they will grow again.[2,3] After the massacre of tourists near Luxor in 1997, fewer people visited Egypt, but in 1999, tourism to Luxor rose by a remarkable 40%. With so many people crossing borders, it is important to teach travellers how to avoid illness. It is equally important for physicians to be able to assess properly those who return home ill since many of the diseases that travellers encounter are uncommon and unfamiliar in Europe and North America. In general, doctors do not do a good job in preparing travellers to stay healthy during their journeys[4] and travel agents are notoriously inconsistent, or worse, in giving information about disease or the need for a medical referral.[5,6]

The risks can be broadly categorised as trauma, routine illness, or exotic illness. Injury, especially as a result of traffic accidents, is the most likely cause of morbidity and mortality in travellers[1,7,8] and trauma carries the additional risk of complications arising out of substandard local

Panel 1: **Some risks of international travel**

Of 100 000 travellers to the developing world for 1 month

- 50 000 will develop some sort of health problem during their trip
- 8000 will see a physician
- 5000 will be ill enough to have to stay in bed
- 1100 will be incapacitated in their work either abroad or returning home
- 300 will have to be admitted to hospital either during their trip or upon their return
- 50 will have to be air evacuated
- 1 will die

Adapted from Steffen R, Lobel HO. Epidemiological basis for the practice of travel medicine. *J Wilderness Med* 1994; **5:** 56–66. Steffen R, Rickenbach M, Wilhem U, et al. Health problems after travel to developing countries. *J Infect Dis* 1987; **156:** 84–91. Pechersky R, Weld L, Kozarsky P, et al. Geosentinel: disease profile of travelers. Presentation at the 7th Conference of the International Society of Travel Medicine, Innsbruck, Austria, 2001.

Search strategy

I used PubMed and the Cochrane Library (a disappointing source for travel medicine references) and my personal collection of *The Lancet, Transactions of the Royal Society of Tropical Medicine, Journal of Travel Medicine, American Journal of Tropical Medicine and Hygiene, Clinical Infectious Diseases, Journal of Infectious Diseases, New England Journal of Medicine, Undersea and Hyperbaric Medicine Journal, and Journal of Wilderness Medicine*, which dates back to 1992. I also have the abstract reviews from the annual meetings of the American Society of Tropical Medicine and Hygiene and those from the biannual meetings of the International Society of Tropical Medicine for the past 10 years.

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Panel 2: **Approach to pre-travel visit**

Stage	Content
Assessment of traveller	State of current health, medical history, underlying conditions, medications, allergies, pregnancy
Review of itinerary	Dates of travel, stopovers, season and climate, type and style of travel, environments to be visited
Vaccine	Routine/required/recommended, adverse events, vaccine administration, observation
Counselling	
Obligatory	Insect precautions; malaria chemoprophylaxis; food and water precautions; traveller's diarrhoea and self-treatment; current disease outbreaks in destination; environmental risks from water-borne disease, vector-borne disease, climate, and jet lag; trauma from motor vehicle accidents and animals; general health and routine illness; clothing and footwear; travel-specific medications, self-treatment, prophylaxis, and adverse events; routine medications; sexual activity; first aid kits; local medical care, when, why, and who; when to get assessment post-travel; insurance; crime and safety; other resources, text, internet, audiovisual
Optional based on risk and trip	Environmental risks from altitude, marine and scuba-diving associated diseases, heat/cold, motion sickness, adventure/expedition health risks; specific advice for pregnant women, children, elderly people, immunocompromised people; region-specific pathogens; parasites; zoonoses; drug use

medical care. Infectious diseases cause only 1–4% of deaths from international travel.[9]

In next week's *Lancet* I will look at the management of sick returned travellers. In this review, I will deal largely with those who are healthy before they start on a journey; pre-existing chronic conditions would require a detailed separate discussion. There are four basic actions in preparing travellers: assessment of baseline health; reviewing the intended journey; deciding upon and administering vaccines; and education for disease prevention and health maintenance (panel 2).

Health assessment

The health provider must assess the traveller's current state of health, including underlying illnesses that could be affected by the journey, medical history, medication use, drug or environmental allergies, age-specific issues, and the possibility of pregnancy. Serious illnesses that should be identified include suppressed immunity, bleeding disorders, seizures, diabetes, heart disease, and psychological or psychiatric conditions. Contraindications for vaccines and medications should be clarified.

Review of itinerary

Identify the dates of departure and return and any stopovers as well as details of plans after arrival such as type and style of travel (rural or urban, budget or luxury accommodation, solo or group travel, purpose of trip, and planned activities). For example, travellers staying in budget hotels in malaria-infested areas are generally more likely to contract malaria than those who stay in air-conditioned luxury hotels. Season, environment, local disease patterns, and current outbreaks (useful sources are given in panel 3) will help guide the rest of the consultation.

Immunisations

Considerations in choosing vaccines include destination and climate; severity of potential disease; duration of travel; activities planned; whether the trip will be urban, rural, or remote from medical care; time remaining before departure; vaccine availability, cost, and the number of doses needed; history of allergy to vaccines or their components; medications currently being taken; pregnancy; chronic illness; and underlying medical conditions such as a compromised immune system. Patients should be informed about the risks of contracting disease as well as the risks of adverse events from immunisations. Vaccines are best given simultaneously; inactivated vaccines can be administered before, with, or after different inactivated or live vaccines. Multiple parenteral live-virus vaccines can impair the immune response and so should be given simultaneously or separated by at least 4 weeks. Interruption of vaccination schedule should not force restarting a vaccine series; it is generally acceptable to continue from the last dose.[10,11] Immunisations can be classified as required, routine, and recommended (panel 4).

Required

Yellow fever is found only in the tropical Americas and Africa (figure 1). The vaccine is the only vaccine mandated by WHO's *International Health Regulations*. It should be administered at least 10 days before arrival and, though officially it lasts 10 years, immunity may be lifelong.[12] The vaccine has a good safety record, and reports of severe reactions in a few elderly recipients should not prevent it being given to those at risk.[13,14] Contraindications include age 9 months or younger, pregnancy, egg allergy, and immunosuppression.[15] Yellow fever vaccination must be properly certified. Travellers with contraindications can have an exemption documented on the certificate, which should be kept with the passport since some countries demand certificates before admitting visitors.

Cholera vaccine is no longer a WHO requirement; the disease is rare in travellers and vaccination offers only slight protection. Some individual countries, however, can require proof of cholera vaccination, though this is sometimes got round by recording that the traveller is allergic to the vaccine or by declaring the vaccine as having been given but with the initials NI (not indicated) on the certificate. Meningitis vaccination is mandatory only in Saudi Arabia, for pilgrims undertaking the Hajj pilgrimage.

Routine

Routine vaccinations are boosters for the standard immunisations of childhood (in particular tetanus and diphtheria) as well as pneumococcal vaccine for travellers older than 65 years with chronic illnesses such as diabetes or renal disease. For adult travellers to Asia and sub-Saharan Africa, poliomyelitis vaccination might also be sensible since the WHO plan for eradicating this disease has not been met (figure 1).

Recommended

These immunisations are those given on the basis of the risk of exposure during the planned itinerary and on the traveller's current immune status. They include hepatitis A, hepatitis B, rabies, typhoid fever, meningococcal meningitis, Japanese encephalitis, and tick-borne encephalitis (figure 1).[12]

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Panel 3: **Examples of web and print resources for physicians**

Source	Website or title
Governmental/academic	
WHO	International travel and health (printed version updated annually) http://www.who.int/ith
UK Department of Health	http://www.doh.gov.uk/traveladvice
PHLS Malaria Reference Laboratory	http://www.phls.co.uk
London School of Hygiene and Tropical Medicine	http://www.lshtm.ac.uk
Eurosurveillance	http://www.eurosurv.org/update/ http://www.ceses.org/eurosurv
UK Foreign and Commonwealth Office	http://www.fco.gov.uk/travel/
Centers for Disease Control (CDC)	Health information for international travel (updated biannually) http://www.cdc.gov/travel/index.htm http://www.cdc.gov/travel/yb/index.htm http://www.cdc.gov/mmwr
US Department of State	http://www.travel.state.gov
Health Canada Travel Medicine	http://www.hc-sc.gc.ca/hpb/lcdc/osh/tmp_e.html
Professional societies/organisations	
International Society of Travel Medicine	http://www.istm.org
Royal Society of Tropical Medicine and Hygiene	http://www.rstmh.org
American Society of Tropical Medicine and Hygiene	http://www.astmh.org
ProMED	http://www.promedmail.org
The Malaria Foundation	http://www.malaria.org
IAMAT	http://www.iamat.org
Divers Alert Network	http://www.diversalertnetwork.org/
Wilderness Medical Society	http://www.wms.org
Commercial	
GIDEON	http://www.cyinfo.com/
Tropimed	http://www.reisemed.ch/TROPIMED/kunoi_tropimed.htm
Travax Encompass	http://www.travax.com
MASTA	http://www.medicalonline.com.au/medical/masta/
EXODUS Traveller	http://www.exodus.ie
International SOS	http://www.internationalsos.com

Texts

International Travel and Health. Geneva: World Health Organization, 2002.
Health information for International Travel 2001–2002. Atlanta: Centers for Disease Control, 2001.
The Travel and Tropical Medicine Manual. Jong EC, McMullen R, eds. Philadelphia: Saunders, 2003.
Manson's Tropical Disease. Cook GC, ed. Philadelphia: Saunders, 2003.
Wilderness Medicine. Auerbach P, ed. St Louis: Mosby, 2002.
Travellers' Health. Dawood R. 4th edn. Oxford: Oxford University Press, 2002.
International Travel and Health. Rose S, Keystone J, Kozarsky P. 12th edn. Northampton: Travel Medicine, 2003.

PHLS=Public Health Laboratory Service. IAMAT=International Association for Medical Assistance to Travellers. GIDEON=Global Infectious Disease Epidemiology Network. MASTA=Medical Advisory Service for Travellers Abroad.

Hepatitis A is the most common vaccine-preventable illness; the risk in standard, scheduled tourist itineraries is 3 per 1000 per month, but this rate increases sevenfold in adventure travel or journeys off traditional tourist routes.[16,17] Within 2 weeks of the first dose of vaccine, up to 94% of travellers develop protective antibodies; thus, since the incubation period is 2–6 weeks, the vaccine can be given close to departure time and still offer substantial protection.[18] A combined vaccine against hepatitis A and B confers equal protection with fewer injections.[19]

Typhoid vaccine is most valuable for travellers to south Asia, west and North Africa, and South America—especially for long-term travellers, those travelling off standard tourist routes, immunocompromised travellers, those of south Indian ancestry, and patients with cholelithiasis.[20–22] The vaccine is available as a parenteral or a live oral version. It does not protect against paratyphoid fever.

Meningococcal meningitis vaccination is sensible for those visiting the meningitis belt (figure 1) of Africa and areas with active outbreaks of the disease or recent epidemics.[11,12] Although the risk of infection is generally low, the case fatality rate is 5–10% despite treatment.[23] The decision to immunise should be guided not only by the current local situation, but also by the duration and type of travel, immune status of the traveller, and season—the risk is greatest in winter or dry season. For pilgrims on the Hajj or Umra (known as the little pilgrimage and involving travel to Mecca) vaccination is compulsory and must be done no longer than 3 years and at least 10 days before arrival in Saudi Arabia.[23]

Rabies is invariably fatal. Since the risk of a bite from a potentially rabid animal is up to 2% for travellers to the developing world[17] and safe, postexposure rabies vaccination can be hard to obtain in many less-developed countries, pre-exposure protection is important, especially for children, adventure travellers, those who will be in contact with animals, and others at high risk.[24,25] Even travellers given pre-exposure vaccination should be advised that if bitten they must thoroughly clean the wound and seek additional vaccination on days 0 and 3.

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Panel 4: **Immunisations**

Vaccine	Comments
Routine	
Diphtheria/tetanus	Tetanus may be contracted by any wound; large diphtheria outbreaks occurred in CIS during the 1990s
Poliomyelitis	Not necessary for western hemisphere or Oceania/Pacific
Measles	Those born before 1957 have high probability of natural immunity. First generation vaccine not as effective as originally believed. Live virus. Egg component
Mumps	Live vaccine. Egg component
Rubella	Live vaccine. Egg component
Influenza	Season in northern hemisphere opposite that of southern hemisphere. Egg component
Pneumococcal	Duration 5 years. For those >65 years, pulmonary disease, high risk
Recommended	
Varicella	Must be frozen until just before administration
Hepatitis A	Initial dose given 2–4 weeks before departure produces protective antibodies in ⩾95% recipients. Second dose confers >10 years immunity. Different commercial brands interchangeable. Not approved in children <2 years
Hepatitis B	Series confers >20 years immunity
Hepatitis A/B	Series confers same protection as individual vaccines, but fewer doses
Typhoid	Duration 5 years. Finish before using atovaquone-proguanil for malaria chemoprophylaxis. For ⩾6 years age. Vi polycapsular vaccine. Duration 2 years. May give to age ⩾2 years. Whole cell heat and phenol inactivated vaccine. Duration 3 years, more side-effects. No longer manufactured in North America
Meningococcal meningitis	Repeat every 3 years. ACYW-135 strains do not protect against type B. Does not eliminate nor prevent carriage. Can give to >2 years age
Japanese encephalitis	Duration 3 years. Reports of urticaria and angio-oedema 2 weeks after vaccination (15 in 10 000 people). For ⩾1 year of age
Rabies	HDCV, PCEC, or RVA. 2 years protection. May give to children ⩾1 year HDCV only. Lower protective titres. Must complete 1 month before malaria chemoprophylaxis with mefloquine or chloroquine
Tick-borne encephalitis	Duration 3 years. Inactivated whole-virus vaccine
Required	
Yellow fever	Live vaccine. Not if immunocompromised (CD4+<500). Not if pregnant unless at very high risk. Caution in elderly people. Use in children >9 months (risk of encephalitis if younger). Must stamp on International Certificate of Vaccination with hand-written signature. Must give >10 days before arrival. Egg component
Meningococcal meningitis	Required by government of Saudi Arabia at least 10 days before arrival and not longer than 3 years after last dose.
Not recommended	
Cholera oral	Duration 12–18 months. Live vaccine. Not available in USA
Cholera parenteral	Short duration , efficacy slight. Repeat every 6 months as needed if at high risk. No longer endorsed by WHO

CIS=Commonwealth of Independent States. RVA=rabies human diploid cell vaccine adsorbed. HDCV=rabies human diploid cell vaccinne. PCEC=rabies purified chick embryo cell vaccine.

Japanese encephalitis vaccination should be considered for travellers to Asia who will be in rural areas for more than 3–4 weeks (less if during the peak transmission season).[11,25] Although mainly a rural disease, outbreaks have occurred in the urbanised Kathmandu valley in Nepal.[26] Hypersensitivity reactions occur in up to 0·6% of vaccine recipients, but the severity of reactions seems less than once feared and the risk should not preclude necessary vaccination.[25,27]

Tick-borne encephalitis vaccination can be given to people visiting northern, eastern, and central Europe as well as the far east of Russia. The routine series consists of three doses over 1 year but there is an accelerated schedule that provides excellent protection.[28]

Varicella vaccination might be important for travellers without a history of chickenpox.

Travellers should begin their immunisation series as early as possible before departure since many vaccinations require multiple doses and time for immunity to develop.

Observation

Sufficient time must be spent monitoring the patient for adverse reactions to immunisations, and all clinics caring for travellers should be able to deal with anaphylaxis, syncope, seizures, bleeding, and shock.

Counselling and education

The consultation must allow sufficient time for educating the traveller on how to stay healthy and, if ill, how and when to self-medicate and seek medical care. The best way to do this is by one-to-one discussion. Use can also be made of video recordings or written information, but there has to be some personal contact time to answer questions. Doctors and nurses must be properly trained and up to date. Some information is obligatory and some is optional, depending on itinerary, risk group, type of travel, and on desire to learn (panel 2). The object is to help the traveller avoid illness and to handle illness if he or she does fall sick while on their travels.

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Obligatory advice

Traveller's diarrhoea and diet

Traveller's diarrhoea affects 30–60% of travellers to less-developed areas of the world.[16,29] It is defined as the passage of three or more unformed stools in 24 h.[30] The usual causes are enterotoxigenic and entero-aggregative *Escherichia coli* and *Campylobacter*, *Shigella*, and *Salmonella* spp.[29,31] Most cases, usually resulting from contaminated food rather than water, occur in the first 2 weeks of travel and last an average of 4 days.[29,32] Rarer but more serious enteric fever with *Salmonella typhi* or *Salmonella paratyphii* is possible even in areas with high concentrations of tourists, whereas cholera is uncommon in travellers.[33] Viral threats include Norwalk, rotavirus, hepatitis A, and hepatitis E. Less common causes include protozoa and helminths.

Prevention

Since it is almost impossible for travellers to establish whether food or water is safe, they need to know how to combine prevention with self-treatment (panels 5 and 6). Food handlers may not follow basic principles of hygiene, and local sanitary regulations may be non-existent, even in seemingly high-quality restaurants and resorts. Selection of safe food and water is important, but travellers should not deny themselves the pleasure of international cuisine. Travellers should check the integrity of caps before buying bottled water to avoid bottles filled with tap water.[32] Personal water filters, in particular those with iodinated cores, are effective, but the most preventive action is hand-washing after visiting the toilet and before eating.

Self-treatment

Travellers need to be aware of when to self-treat diarrhoea and that prophylaxis is rarely indicated.[32] Aggressive action should be taken early with rehydration, oral re-hydration salts, antimotility agents, antibiotics, and supplementary measures (panel 6). Antimotility agents such as natural (paregoric, codeine) or synthetic opioids

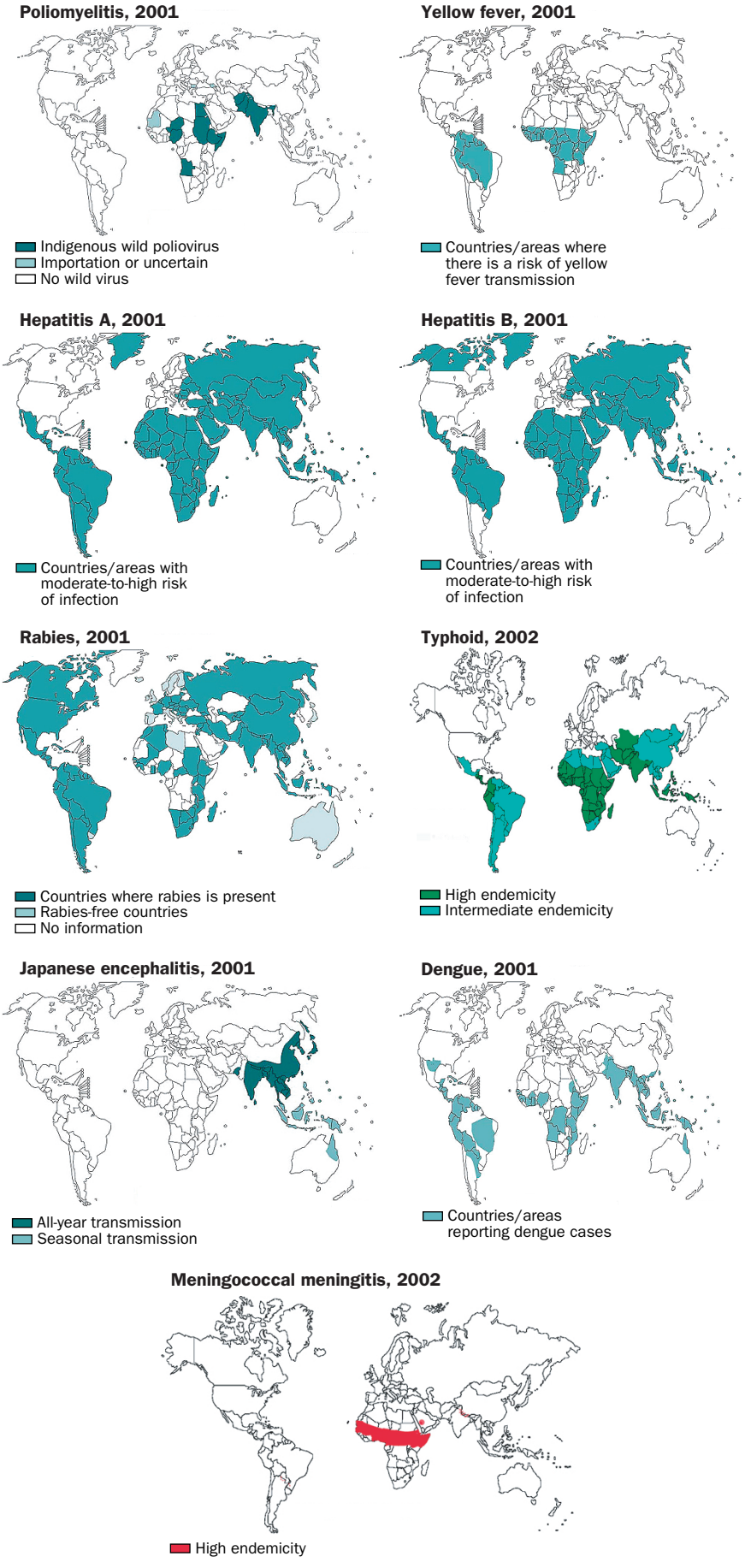


Figure 1: **Worldwide disease prevalence**
Typhoid and meningococcal meningitis maps adapted using data from http://www.who.int/ith/diseasemaps_index.html; Global Infectious Disease Epidemiology Network; and Guerrant RL, Walker DH, Weller PF, eds. Tropical infectious diseases. Philadelphia: Churchill-Livingstone, 1999. All other maps are from WHO (website address as above).

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Panel 5: **Food and water precautions**

Passive
Avoid tap water, bottled water where seal is not intact, and ice (including alcoholic drinks with ice)
Avoid buffets, salads (unless washed in water known to be clean), unpasteurised fruit juices, cold sauces, and unpasteurised dairy products
Avoid thin-skinned fruits such as raspberries or strawberries
Avoid raw seafood
Active
Drink boiled water or carbonated beverages
Consume freshly cooked, piping hot food
Purchase processed/packaged foods
Peel thick-skinned fruits yourself
Use a portable water filter
Bismuth subsalicylate: two tablets with meals and at bedtime (8 tablets/day) offers about 60% protection. Side-effects include black tongue/stools, tinnitus, and similar cautions as with aspirin
Cautions
Halogens, such as iodine and chlorine, do not eliminate all enteric pathogens and iodine should not be used during pregnancy and used cautiously in those with thyroid disorders
Lactobacillus preparations have some, but slight, efficacy. They should be taken as pills, not yoghurt, and not simultaneously with antibiotics

Adapted from: Backer H. Water disinfection for international and wilderness travelers. *Clin Infect Dis* 2002; **34:** 355–64. Ansdell VE, Ericsson CD. Prevention and empiric treatment of traveler's diarrhea. *Med Clin North Am* 1999; **4:** 945–73. Ericsson CD, DuPont HL, Johnson PC. Prevention of traveler's diarrhea by the tablet formulation of bismuth subsalicylate. *JAMA* 1987; **263:** 1347–50. Hilton E, Kolakowski P, Singer C. Efficacy of Lactobacillus GG as a diarrhea preventative in travelers. *J Travel Med* 1997; **4:** 41–43. Kozarsky PE. Prevention of common travel ailments. *Infect Dis Clin North Am* 1998; **12:** 305–24.

(diphenoxylate, loperamide) can be used to reduce the flow of diarrhoea, even with fever, and can be as effective as rehydration, especially when combined with an appropriate antibiotic.[34] Bismuth subsalicylate and dietary supplements, such lactobacilli, can also be used, but bismuth should not be taken at the same time as a fluoroquinolone because it may chelate the antibiotic.[35] Fluoroquinolones, in particular ciprofloxacin, are the most popular drugs for self-treatment, but they are contraindicated in pregnancy and resistance is rapidly increasing. These drugs are not recommended for children younger than 8 years, but this restraint may be unreasonable since fluoroquinolones have been shown to be safe in children with cystic fibrosis.[36] In southeast Asia, rates of *Campylobacter jejuni* resistance to fluoroquinolones approach 77%.[25,37] Alternatives include azithromycin and furazolidone[37,38] and rifaximin, a poorly absorbed rifamycin derivative, shows promise as a safe and effective alternative to fluoroquinolones.[39] If self-treatment is not followed by rapid improvement the traveller ought to seek medical care, and other reasons for seeking urgent care include inability to keep down fluids as a result of vomiting, high fever, chills, blood in the stool, or prostration.

Panel 6: **Self-treatment approach to traveller's diarrhoea**

When and how to treat

Mild: 1–2 stools/24 h with mild or no symptoms	→ Choose	No treatment Loperamide Bismuth subsalicylate
Moderate: >2 stools/24 h with:		
No distressing symptoms	→ Do	Loperamide or bismuth subsalicylate and single dose antibiotic if worsening
Distressing symptoms	→ Do	Loperamide and antibiotic. Reassess in 12–24 h: if resolved, stop antibiotic, otherwise repeat up to 3 days
Severe: >6 stools/24 h with fever or bloody stools	→ Do	Antibiotic for 1–3 days. Seek medical care if unable to keep down fluids or food, prostration, or abdominal pain

Antibiotics
Fluoroquinolones (ciprofloxacin, norfloxacin, levofloxacin)
Azithromycin
Furazolidone
Other
Loperamide
Diphenoxylate/atropine
WHO oral rehydration salts
Other rehydration*
Bland diet†

If therapy does not rapidly work or if condition worsens, traveller should seek prompt medical attention. Adapted from: Ericsson CD. Traveler's diarrhea: epidemiology, prevention, and self-treatment. *Infect Dis Clin North Am* 1998; **83:** 285–303. Adachi JA, Ostrosky-Zeichner L, DuPont HL, Ericsson CD. Empirical antimicrobial therapy for traveler's diarrhea. *Clin Infect Dis* 2000; **31:** 1079–83. Ansdell VE, Ericsson CD. Prevention and empiric treatment of traveler's diarrhea. *Med Clin North Am* 1999; **4:** 945–73. *Sodium bicarbonate 2·5 g/L; or about 0·25 L (8 ounces) of fruit juice (dilute acidic juices such as orange juice) and about 5 g (0·5 tsp) honey or sugar and a pinch of salt (the amount trapped between thumb and index finger). †BRAT diet includes bananas, rice, apple sauce, and toast until feeling better; any non-provocative and binding foods will do.

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Respiratory illness

Respiratory infections are common in travellers, second only to diarrhoea.[16] The traveller at high risk or on a long-lasting journey might need to carry a general antibiotic for self-treatment. A tuberculin test before and after long-lasting or high-risk travel may be helpful, but interpretation can be difficult in people who have received BCG. In many less-developed nations, industrial and other sources of air pollution are a serious threat to the respiratory system. For travellers prone to respiratory infections, a bronchodilator or decongestant might improve the quality of their trip.

Insect and arthropod-borne diseases

Insects are attracted to people by carbon dioxide, lactic acid, and body odour.[40–42] Travellers should wear protective clothing, preferably light-coloured, loose-fitting, and covering the arms and legs. DEET (N,N-diethyl-3-methylbenzamide) repellent (20–50% concentration) should be placed on exposed skin.[11] DEET is safe, despite comments to the contrary by the lay press.[43] Permethrin or deltamethrin insecticide sprayed on clothing and bed nets will protect against mosquitoes and ticks for weeks to months.[44] Mosquito coils can reduce exposure. But, contrary to rumour, ingesting garlic or vitamin B complexes does not prevent bites. When at high risk, limit time outdoors and stay inside in screened or air-conditioned rooms.

Dengue

Dengue, a virus infection from day-biting, urban mosquitoes, is on the rise throughout the world, but most travellers contract only mild and self-limiting disease.[45] A second infection may develop into dengue haemorrhagic fever or dengue shock syndrome, both of which can be fatal but are uncommon in travellers (figure 1).[25]

Japanese encephalitis

Japanese encephalitis is an arbovirus spread by the bite of night-biting culicine mosquitoes and tends to be rural, although urban outbreaks do occur.[26] It is found only in Asia and the peak season is between April and October, during and just after the rainy season. About 1 in 300 infections results in clinical disease and of those around a third are fatal with residual neurological damage in 50% of survivors.

Other insect or arthropod-borne diseases

Mosquitoes spread yellow fever and filariasis, neither of which are high threats to travellers, although several unvaccinated travellers have died of yellow fever.[46,47] Sandflies cause sandfly fever, leishmaniasis, and bartonellosis. Tsetse flies cause African trypanosomiasis and there have been several cases in tourists visiting east Africa in the past few years.[48,49] Fleas cause murine typhus and plague, but these are quite rare in travellers. Several infections are caused by ticks: tick typhus, Lyme disease, Rocky Mountain spotted fever, ehrlichiosis, tick borreliosis, and tick encephalitis. Rickettsial infections in particular are an increasing cause of infection in travellers.[50] Malaria, a mosquito-borne disease that is potentially fatal but preventable, merits a separate section.

Malaria

Malaria is the most important disease for travellers to avoid when travelling through endemic areas. It is largely a preventable disease in travellers, who should combine personal protective measures against mosquito bites with chemoprophylaxis and know that if they fall ill after travelling through a malarious area they should consult a doctor, even months later. Malaria has a long incubation period and no prophylaxis is 100% protective.[51]

According to WHO, 300–500 million people are infected with this blood parasite, and malaria causes 2 million deaths every year.[12] An estimated 30 000 European and North American travellers are infected yearly, but this might be only one-fifth of the true incidence.[52] In the decade 1992–2001, there were 20 594 cases of malaria imported into the UK (Bradley DJ. Data from the PHLS Malaria Reference Laboratory, 2002; personal communication). In the same period, 4685 malaria cases were identified in US citizens.[53] The genus *Plasmodium* has four species that infect people: *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium malariae*, and *Plasmodium ovale*. The risk of contracting malaria varies with destination, season, climate, altitude (very rare above 2000 m), and number of mosquito bites. Most travellers have a low risk of contracting malaria, although there is potential for high risk in Africa, Oceania (Solomon Islands and Papua New Guinea), the Indian subcontinent, and Amazonia (figure 2). Most serious malaria, due to *P falciparum*, is contracted in Africa.

Malaria deaths in travellers are typically due to inappropriate chemoprophylaxis or non-compliance[54] as a result of confusion, poor advice, difficult regimen, side-effects, or personal beliefs.[55,56] Health providers, especially primary-care physicians, often prescribe inappropriate chemoprophylaxis and advice,[57] and a pre-travel consultation does not always translate into protection.[52] A worldwide lack of consistent policy and confusing regimens contributes to this situation.[55] 81% of travellers from the UK who contracted malaria either took no or inappropriate chemoprophylaxis; in the USA and Canada the percentages are 84% and 97%, respectively.[52,58,59] Physicians themselves do not always comply with their malaria chemoprophylaxis, so how will they be able to convince a traveller to do so?[60]

The main goal of chemoprophylaxis is to prevent deaths from falciparum malaria. Medications suppress malaria by killing asexual blood stages of the parasite before they cause disease, so protective levels of medication must be present in the blood before developing parasites emerge from the liver. Thus, prophylaxis should usually be started before the first possible exposure and continued for a set period after the last possible bite (panel 7). The choice of drug requires assessment of the duration of the journey, resistance patterns, potential adverse events, and cost. The prescribing physician needs to know whether compliance will be a problem,[51,55] and the benefits must outweigh the risks.

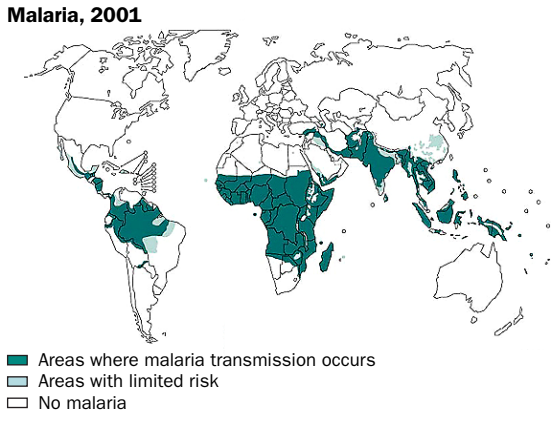


Figure 2: **Malaria prevalence**
From http://www.who.int/ith/diseasemaps_index.html

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Panel 7: **Malaria chemoprophylaxis and self-treatment (stand-by) options**

Chemoprophylaxis	
Medication	Comments
Atovaquone/proguanil	Take with food or milk. Not approved for use in pregnancy
Mefloquine	Take with food. Can use loading dose if limited time before departure or for testing for adverse events. Do not use if any history of fits, mental disorder, or serious cardiac conduction disturbances
Doxycycline	Take with food and full glass of water, preferably early in the day. Do not use during pregnancy
Chloroquine phosphate Hydroxychloroquine sulfate	Severe toxicity in children with overdoses
Chloroquine/proguanil	Low protective efficacy. Lower compliance (16 tablets taken weekly)
Primaquine phosphate	Do not use in pregnancy. Must check G6PD activity before administration
Self-treatment*	
Atovaquone/proguanil	
Mefloquine	
Sulfadoxine-pyrimethamine†	

*Travellers must seek medical care promptly after self-treatment for malaria. †Risk of aplastic crisis, Stevens-Johnson syndrome, dangerous in immunocompromised people and widespread resistance is emerging. Adapted from: WHO. International travel and health. Geneva: WHO, 2002. Centers for Disease Control and Prevention. Health information for international travel 2001–2002. Atlanta: Centers for Disease Control, 2001. Bradley DJ, Bannister B. Guidelines for malaria prevention in travellers from the United Kingdom for 2001. *Commun Dis Pub Health* 2001; **4:** 84–101. Jong EC, Nothdurft HD. Current drugs for antimalarials chemoprophylaxis: a review of efficacy and safety. *J Travel Med* 2001; **8** (suppl)**:** S48–56.

Panel 8: **Medications for travellers***

Category	**Comment**
Traveller's diarrhoea	See panel 6
Ciprofloxacin, norfloxacin, ofloxacin, levofloxacin, co-trimoxazole, azithromycin	
Malaria prevention	See panel 7
Emergency contraception	
Ethinylestradiol/levonorgestrel	
Respiratory or ENT infections	
Decongestants	Can combine with decongestant
Inhalers	Can use β agonists alone or in combination with steroid metered-dose inhalers
Pain or injury	
Non-steroidal antiinflammatory drugs	Caution with gastric problems, renal insufficiency, bleeding diatheses
Narcotics	Caution with crossing borders
Motion sickness	
Meclozine	
Transdermal hyoscine	Can wear patch behind ear for 3 days
Allergic reactions	
Diphenhydramine	
Epinephrine	Dispense as autoinjector
Steroids	Steroid taper over 1 week
Skin problems	
Sunscreen SPF⩾30	Should protect against UVA and UVB. Reapply as directed, especially after water exposure
Bite salves	Commercial products may contain diphenhydramine, lidocaine, and low-dose steroid for application to lesions
Antibiotic ointments	For minor wounds
Altitude sickness	
Acetazolamide	Potential for sulphonamide reaction but low probability. Side-effects include diuresis, paraesthesia, and metallic taste in mouth or flat taste of carbonation
Dexamethasone	Not for routine use. Symptoms recur when medication stopped.
Nifedipine	Not for routine use. Use to prevent HAPE only in those with previous HAPE
Leptospirosis prevention	
Doxycycline	Not for use in children <8 years or if pregnant
HIV exposure	
Triple antiretroviral therapy: zidovudine and lamivudine and nelfinavir mesilate)	Take for 5 days—until PCR testing can be obtained

ENT=ear, nose, and throat. SPF=sun protection factor. HAPE=high altitude pulmonary oedema. *High flexibility, varying with ease of use, availability, efficacy, and specific needs. Travellers should attempt to use the fewest drugs that give the most effect.

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The most effective drug, mefloquine, unfortunately has the worst reputation, and its lower tolerability, perceived or otherwise, leads to non-compliance.[61,62] There is a 1 in 100–200 risk of mild-to-moderate neuropsychiatric adverse events such as sleep disturbances, emotional lability, anxiety, and cognitive changes and about a 1 in 10 000 risk of severe reactions such as seizures, psychosis, or hallucinations.[63–66] Clearly, mefloquine must not be used in anyone with a history of psychiatric disease, epilepsy, or arrhythmia. Moreover, resistance to mefloquine is now common in southeast Asia along the Thai-Cambodian and Thai-Myanmar borders and there are also reports of emerging resistance in Africa and Latin America.[67–69] Generally, it is still highly effective and convenient, being taken once weekly. A loading dose of mefloquine can be given to rule out side-effects or to provide adequate blood concentration quickly by taking one dose daily for 3 days, and if tolerated, continuing with the standard weekly dosage.[63,70]

An alternative to mefloquine is atovaquone-proguanil, a combination drug taken daily, which is highly effective against *P falciparum* and reasonably effective against *P vivax*; it has fewer side-effects than mefloquine and some causal prophylaxis (activity against liver-stage parasite), and thus can be stopped 1 week after leaving the malarious zone, which increases compliance.[71] The most common side-effects are headache, abdominal pain, vomiting, and dyspepsia, but with a frequency similar to that of placebo.[72] Doxycycline is another effective antimalarial, but may cause phototoxicity, vaginal candidiasis, bone and dental damage in fetuses and children (8 years old or younger), and oesophageal ulcers; furthermore, it has to be taken daily during the trip and continued for 4 weeks on return.[52,55]

It is time to stop using the worn-out distinction of chloroquine-sensitive *P falciparum*, since chloroquine is no longer useful for protecting most travellers. Most *P falciparum* are resistant to chloroquine, and so is an increasing percentage of *P vivax*.[73–75] Chloroquine is best used on prolonged trips through Central America.[11] The combination of chloroquine-proguanil, popular because of its favourable safety profile, is only 60–70% effective and should not be a first-line drug for the prevention of malaria.[55,76] Exposure to *P vivax* or *P ovale* warrants the use of primaquine phosphate to eradicate hypnozoites from the liver, but only after measurement of the serum glucose-6-phosphate dehydrogenase (G6PD) activity in the traveller. If at high risk for exposure to *P vivax* or *P ovale* the traveller should begin a course of primaquine for 2–4 weeks on leaving the malarious area.

Self (or stand-by) treatment for possible malaria has long been controversial. The target is possible *P falciparum* infection in someone who is far from medical care. The arguments against self-treatment are: drug toxicity with no medical supervision; the fact that travellers can usually reach medical care within a day; inappropriate use of the regimen; treating a disease that is not malaria but needs medical attention; and failure to follow up with appropriate medical care as soon as possible after self-treatment.[1,52,55] Self-treatment may be warranted if a traveller is visiting a high-risk area from which medical assistance cannot be reached within 24 h,[51] but only as a temporary measure (panel 7).

Current outbreaks in the destination

A practitioner providing advice to a traveller is obligated to be aware of current disease outbreaks around the world. To send a traveller unprepared to a destination where an epidemic is ongoing is unacceptable. To keep up to date, there are many sources that should be consulted at least weekly, but preferably daily (panel 3).

Environmental risks

Water-borne disease

Travellers who swim, wade, bathe, or otherwise expose themselves to fresh water may be vulnerable to infections with leptospira or schistosomes. Leptospirosis is an infection with a spirochaete that can cause renal, hepatic, and pulmonary damage. It is spread in fresh water by the urine of rodents, dogs, or cattle. The infection is being increasingly detected in returning travellers, especially in those taking adventurous trips to remote places.[77,78] Leptospirosis can be prevented with doxycycline chemoprophylaxis (panel 8).[79] Schistosomiasis (bilharzia), an infection with blood trematodes, is also an increasing problem in travellers.[80] Application of DEET before entry into water that contains schistosomes might prevent skin penetration by cercariae, but is not long-lasting unless applied as a lipid-based formula.[81] Swimming in warm, dirty freshwater can result in infection with free-living amoebae and resultant primary amoebic meningoencephalitis.[11] Furthermore, swallowing a small amount of faecally-contaminated water can lead to traveller's diarrhoea. If a swimming pool has inadequate amounts of chlorine, there is a risk of contracting cryptosporidium, giardia, hepatitis A, or Norwalk-virus infections.[11] Walking barefoot poses a risk for several diseases such as cutaneous larva migrans (from canine hookworm larvae), *Strongyloides stercoralis*, and hookworm infections.

Sun exposure

Excessive exposure to solar radiation causes both acute (sunburn) and chronic (carcinoma) injury to skin. Sunscreens to protect against both ultraviolet A and ultraviolet B radiation are graded by SPF (sun protective factor), which is a ratio of the time required to burn with or without sunscreen. For example, an SPF of 10 confers 150 min of solar exposure in a person who would burn in 15 min without any protection. Sunscreens can reduce the risk of skin cancer if applied correctly; however, many travellers overestimate their effectiveness and do not apply a sufficient amount to confer protection.[82] Sunscreen effectiveness can be reduced by wind, heat, humidity, sweat, and altitude. When applying both sunscreen and insect repellent, it is sensible to apply sunscreen first to allow skin absorption, then repellent.

Heat or cold

Heat carries the risk of heat exhaustion and heat stroke. Prevention is through limited exertion in hot weather with adequate hydration. Travellers should be informed of the importance of staying well hydrated. The best gauge of hydration is not thirst—a late and poor gauge—but urine. Urination should be possible every 4 h and the urine should look clear. Cold exposure can lead to hypothermia or cold injury such as frostbite. Properly layered clothing and limiting exposure are the keys to avoiding these problems.

Motion sickness

Motion sickness is best avoided since once it has begun it is difficult to treat. Prevention begins with sitting in the most stable part of the vehicle—near the forward section of the wings by a window in a plane or, if afloat, the centre of the boat at waterline—and looking at the horizon. In a car or bus, sit next to a window and open the window for fresh air. Drugs to combat motion sickness include antihistamines, phenothiazines, and belladonna alkaloids. Natural remedies that may have benefit include ginger-root tablets and acupressure wristbands.

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Panel 9: **Travel first-aid kit***

Standard medications
General infections
Minor infection of the skin: dicloxacillin or cephalexin
Respiratory tract infections: erythromycin or amoxicillin-clavulanate
Dysentery: co-trimoxazole or ciprofloxacin (which also work well against urinary tract infections)
Fungal infections: clotrimazole or tolnaftate
Malaria prophylaxis
Very important if travelling through a malaria endemic region
Pain or injury
Aspirin or non-steroidal anti-inflammatories (eg, ibuprofen). Beware of stomach upset or ulcers
Paracetamol
Narcotic analgesics such as paracetamol with codeine. Some countries are suspicious of such medications, so make sure the prescription is labelled officially by a pharmacy or take a doctor's note
Fevers
Paracetamol or aspirin
Decongestant
Choose one that does not make you drowsy. Loratadine works 24 h, but have some restrictions with other drugs and diseases.
Pseudoephedrine lasts 6 h
Gastrointestinal
Antidiarrhoeal: loperamide or diphenoxylate/atropine (following a BRAT diet is just as important)
Antinausea: meclozine, metoclopramide, or prochlorperazine
Dysentery: no prophylaxis. Take a just-in-case prescription as for antidiarrhoea
Serious allergic reaction
Epinephrine: this comes as a premeasured amount in an autoinjector or in a kit, which has syringe needle and medications, but is more complicated. Epinephrine can reverse life-threatening allergic reactions, life threatening asthma attacks, and is used for cardiac resuscitations in hospital
Antihistamine: diphenhydramine or hydroxyzine. Taken after epinephrine in serious attacks or alone in mild-to-moderate reactions
Calamine, caladryl, or cortisone creams are useful for the itch and rash of hives
Personal medications
Especially important for people with pre-existing disease—problems from asthma, diabetes, or a heart condition are more likely while travelling than from exotic infections. Make sure that these medications are not checked-in during flights
Wound care
Dressings and bandages should include simple adhesive bandages and also gauze—both flat and rollable; non-adherent dressings can be useful too
Elastic wraps support injured areas and can be used as slings
Tape should be water-resistant
Bandanas work as slings, pressure dressings, and have many other uses
Safety pins, scissors, tweezers/forceps for removing splinters and ticks
Steristrips (paper sutures for skin lacerations): put across wound after cleaning to help heal
Synthetic compounds used for clotting blood, available under different trade names
Antibiotic ointment: use in cleaned wounds
Vitamin E or aloe vera can help wound healing
Irrigation fluid for wounds and eyes to remove debris
Towelettes for cleaning hands before and after working with wounds
Medical essentials
Oral rehydration salts: sachets, mix with clean water in dehydration or diarrhoea
Thermometer
Sunscreen: SPF 30 or 50
Lip screen
Water purification system
Moleskin to avoid pressure blisters
Sealed package of syringes and needles for travel to remote areas where medical care and sterility is questionable
Dental kit
Temporary fillings and pain control
Accessories
First-aid booklet
Flashlight with fresh batteries
Chemical lightstick
Special considerations
Medications and equipment for high altitude, jungle, desert, marine environments, children, pregnancy, etc
Extra pair of prescription eye glasses

BRAT=bananas, rice, apple sauce, toast. SPF=sun protection factor. *Travellers must follow all label warnings.

Flying

Issues associated with flying include motion sickness, vascular thrombosis, and barotrauma. "Economy class syndrome" describes an increased risk for deep vein thrombosis and pulmonary embolism from prolonged immobility during a flight. Those at highest risk include

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pregnant women, elderly people, those who have had deep vein thrombosis or cancer, smokers, and women taking oral contraceptives.[83] Risk reduction involves moving about the cabin every few hours when awake, staying adequately hydrated, wearing support stockings, and taking an aspirin before the flight.[84]

Jet lag

Jet lag occurs after crossing three or more time zones and tends to be worse after flying eastwards. If travelling west, travellers should be advised to go to bed later than usual and awaken later; and to reverse this if travelling east. They should set timepieces to their destination's time zone once aboard the aircraft and stay awake on arrival until a suitable local time to go to sleep. Melatonin has a good reputation for helping travellers adapt but, most being derived from bovine pineal glands, is probably wise to avoid.[85] Prescription sleeping medications such as zolpidem help travellers sleep during long flights or upon arrival at their destination.

Trauma

Injury is a far greater threat to travellers than infections or unusual illnesses. The most common preventable causes of death during travel are accidents, mainly caused by motor vehicles, but falls, swimming, and animals contribute as well, with intoxication a common cofactor.[86,87] Tourists are four-to-five times more likely to be involved in road trauma than local residents.[88] Wounds sustained in the less-developed world carry higher risk of turning septic and require prompt attention. If the wound is from a mammal there is a risk of contracting rabies. Rabies is transmitted mainly by dog or bat bites, but can also be carried by raccoons, foxes, monkeys, cats, skunks, hyenas, and even ruminants such as cattle. About 50 000 cases of rabies occur worldwide every year. Pre-travel immunisation may be indicated for expatriates, adventurers, missionaries (especially their children), animal handlers, those who will be far from medical care, and others at risk while in less-developed nations—especially in view of the chronic, worldwide shortage of rabies immune globulin, which must be given along with vaccine for postexposure treatment.

Hymenoptera (bees, wasps, hornets), reptiles, and arachnids (spiders, scorpions) are the most likely causes of envenoming during travel. Snakebite can occur in urban as well as rural areas.[25] Although roughly 50% of bites do not result in envenoming, they should be taken seriously. Antivenins must be obtained in serious cases and are likely to be manufactured locally.[11,25] Ice packs and cool compresses can relieve burning and pain from stings; if pruritis, anxiety, or urticaria develop, topical and oral antihistamines should be given. In cases with throat or tongue swelling, shortness of breath, or plummeting blood pressure, 0·3 mL epinephrine should be immediately administered subcutaneously with an autoinjector, and followed with oral steroids, diphenhydramine, and professional medical attention. Travellers with known histories of severe allergic reactions or anaphylaxis should travel with these drugs at all times.

Local medical care and insurance

Depending upon the destination, each day of travel carries a 3–4% risk of illness.[89] Up to 8% of all travellers and 12% of those who become ill abroad seek local medical care; of these travellers, 17% receive an injection,[89] raising the risk of contracting HIV, hepatitis B, or hepatitis C infection. Blood and body-fluid exposures are also possible through tattooing, piercing, acupuncture, and sharing razors. The need for emergency blood transfusion in travellers is quite rare and there is no indication for travellers to take blood with them on their journeys.[11] Travellers with illness must take some form of documentation with them, which often can be recorded on the International Certificate of Vaccination. Those with cardiac conditions ought to travel with a copy of their most recent electrocardiogram. Finding quality medical care abroad can be difficult; good resources include the International Society of Travel Medicine and IAMAT (International Association of Medical Assistance to Travellers).

Travellers should have insurance specific for travel that covers emergency evacuation and 24-h emergency telephone access as well as local providers who can assist in minor medical problems. Unfortunately, only 4% of family practitioners in the UK and 39% of travel clinics worldwide give their travellers advice about such insurance.[4,90] Ideally, a traveller should purchase the maximum amount of coverage for medical, surgical, and dental costs in addition to evacuation. Travel insurance varies widely in coverage and capability: medical care in the USA, for example, is notoriously expensive, and without insurance can easily cost tens of thousands of US dollars. Travellers should carry proof of insurance with them, as well as documentation of personal health history and contact numbers for physicians and relatives at home.

First-aid kits

A sensible first-aid kit is invaluable. It should contain basic supplies and specific components as needed (panel 9).

Clothing

A basic virtue in travel is to travel lightly and dress appropriately for the climate and culture. Well fitting, comfortable shoes or boots help avoid foot trauma such as blisters, cuts, and snake bites. Under hot and humid conditions, fungal infections can rapidly arise, which must be kept under control with antifungal powder or cream. In climates where weather changes quickly, dress in layers, taking off and putting on additional clothing to adapt to changing conditions.

Medications

Several travel-specific medications should be taken on a journey, dependent on type of travel and risk of exposure to various problems (panel 8). These medications can be divided broadly into two categories: prophylaxis and self-treatment. Medications should be designed for simplicity in self-treatment, with clear, explicit instructions so travellers can use them correctly under duress. Travellers should be warned about common adverse events, their management, and indications for stopping treatment.

Travellers with underlying illnesses need to take extra amounts of their routine prescriptions, and the generic name with dosages should be recorded on the vaccine certificate. Spare medication should be kept in separate luggage in case of loss or theft.

Some countries restrict drugs even if prescription, especially in Asia. Medications should be kept in pharmacy-labelled bottles, and if carrying narcotics, a signed and stamped note from a physician may help if questioned by immigration authorities.

Attitude

Travelling to a foreign country can be stressful. Sights and sounds, language difficulties, and cultural and dietary differences can have a great effect on travellers. Travel with an open mind, expect the unexpected, and retain a sense of humour; mental health goes hand-in-hand with physical health.

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Sexual activity

Inhibitions often diminish with travel, and travellers often engage in activities that they would normally eschew at home, including increased and reckless sexual activity. 5–67% of travellers engage in sexual activities with local inhabitants or fellow travellers who are not their regular sexual partners.[91,92] Many travellers (up to 68%) intend to have casual sex during their journey.[91,92] Furthermore, despite many travellers carrying condoms, only 25–69% use them,[91–93] putting travellers at increased risk for HIV, hepatitis B, and hepatitis C infections and other sexually transmitted diseases. Additionally, resistance patterns for gonorrhoea around the world have reached alarming rates: in Asia, resistance to penicillin is commonly greater than 90% and to ciprofloxacin greater than 30%.[94,95] Although abstinence may be the best policy, it is frequently unrealistic, and physicians should advise travellers to follow safe practices. Use of condoms is essential, but in hot, humid conditions their integrity may be compromised.

Travellers at high-risk of exposure to HIV, such as missionary or medical workers volunteering in the less-developed world, could be provided with HIV postexposure prophylaxis with triple antiretrovirals for use until they can obtain PCR identification of viral genetic material.[96] For women, physicians should consider the possibility of unwanted pregnancy and even rape. The risk of acquiring a sexually transmitted disease in addition to pregnancy warrants extra counselling time for women travellers, especially if travelling alone. Emergency contraception for female travellers might be necessary in cases of condoms rupturing, decreased absorption of oral contraceptives due to traveller's diarrhoea, or a rape occurs—a scenario in which postexposure prophylaxis for HIV is strongly advised.[97,98]

Optional advice

Some journeys and travellers require specific advice, for example on altitude illness, scuba-diving holidays, pregnancy, immunocompromised states, children, elderly people, and unusual or region-specific pathogens.

Altitude sickness

Altitude sickness poses a threat to any traveller who will be more than 2500 m above sea level. The degree of risk for acquiring this illness is related to altitude and the rate of ascent. Other risk factors include previous altitude sickness, exertion, and some cardiovascular diseases—but fitness does not protect against this illness.[99] Altitude sickness has several manifestations; acute mountain sickness is the most common and is defined as headache in a person recently arrived at an altitude above 2500 m with one or more of: nausea, vomiting, anorexia, light-headedness, fatigue, or insomnia, typically beginning within 8 h of ascent. Less common, but more serious, are high altitude pulmonary oedema and high altitude cerebral oedema, both of which can be fatal. Prevention of altitude illness is accomplished through acclimatisation and drugs. Acetazolamide (which contains a sulphonamide component) is the only drug that truly accelerates acclimatisation; steroids such as dexamethasone, which can be used in emergency ascents and nifedipine which can be used for HAPE, do not aid acclimatisation and can have severe adverse effects in some individuals.[99–101] Non-pharmacological methods of avoiding altitude sickness include acclimatisation through staged gradual ascents and spending 2–3 nights at intermediate altitudes and avoiding alcohol and sedative-hypnotics. Travellers must not ascend higher if symptoms are present and must be advised that the definitive treatment for this condition is to descend at once.

Marine environment and scuba diving

Swimming or diving can expose travellers to envenoming from coelenterates with nematocysts (eg, jellyfish and fire coral), venomous spines (lionfish, stone fish, cone shells, urchins), and bites (blue-ring octopus, barracuda, and sharks). In the Indo-Pacific, the box jellyfish, *Chironex fleckerii*, is particularly dangerous, and stings can lead rapidly to death.[25] Cuts and abrasions in the marine environment are at high risk for infection. Travellers who will be in the marine environment should travel with 5% acetic acid to treat nematocyst stings and instant hot packs (to place in water buckets in which the injured part is placed until the pain dissipates) to treat venomous spine injuries.

Drowning is a common cause of death in travellers; it is often associated with intoxication, cardiac events, or overestimation of capabilities. Scuba diving carries the potential for severe, life-threatening conditions such as pulmonary barotrauma with air embolism and decompression sickness. Mefloquine can produce side-effects that can mimic symptoms of decompression sickness, and divers in a malarious region who are not mefloquine-tolerant or have not taken it before should use atovaquone/proguanil or doxycycline. Scuba divers should not fly for at least 24 h after their last dive.[102] Before departure, it is wise to learn the location of the hyperbaric chamber nearest the destination.

Pregnancy

Since during the first trimester there is a risk of miscarriage and in the third trimester of premature labour, abruption, and other serious complications, the second trimester is the safest period to travel. Flying on airlines is generally allowed until the last 4 weeks of pregnancy, but policy can vary between airlines. Pregnant travellers should stay well hydrated and move about the cabin to reduce the risk of venous thrombosis.[11,103] Pregnant travellers ought not to receive live vaccines, but if the risk is high enough then even yellow fever can be given.[103] If travelling through a malarious area, fastidious personal protective measures against mosquito bites are essential: malaria, especially in primigravida, increases fetal loss and maternal mortality. WHO and CDC (Centers for Disease Control) have endorsed the use of mefloquine during the second and third trimesters, and both proguanil and chloroquine have a long history of safe use during pregnancy; women do not need to wait after taking mefloquine if they wish to become pregnant.[11,12] The safety of atovaquone/proguanil during pregnancy has not been established. Pregnant travellers must be careful to avoid traveller's diarrhoea. Antibiotics such as fluoroquinolones, doxycycline/tetracycline, and trimethoprim-sulfamethoxazole are contraindicated during pregnancy; if antibiotic treatment is needed for traveller's diarrhoea a third-generation cephalosporin is the best choice.[11] Contracting hepatitis E during pregnancy has a maternal mortality rate of up to 40%.

Children

Children can travel as well as, if not better than, many adults. However, they have special needs that vary with age, health, and their behaviour.[104] Children may have greater problems with hygiene and with their natural curiosity can expose themselves to infection and injury, especially from animals. Medications, such as malarial chemoprophylaxis and antibiotics for presumptive treatment, that are dosed by weight require special attention.

Immunocompromised travellers

Travellers with weakened immune systems, such as those with HIV infection, malignancy, transplantation, severe

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diabetes, end-stage renal disease, or on high-dose corticosteroids (>2 mg per kg daily or >20 mg prednisone) are at greater risk than others for illness during their trips, and for adverse events from vaccinations, especially with live-virus vaccines.[11,105] HIV-infected individuals who have CD4+ percentages greater than 25% (no evidence of suppression) can take live vaccines including measles and yellow fever; inactivated vaccines are generally safe irrespective of CD4+ status, although the immune response to vaccines may be reduced. Such patients need to be more aggressive about self-treatment and seeking prompt medical care at the first signs of illness.

Back home

Most travellers do not need assessment on return from their journeys. If, during the trip or on return home, the traveller has fever, diarrhoea, disordered digestion, jaundice, skin lesions, excessive fatigue, or other symptoms he or she should seek medical care from a specialist in travel and tropical medicine.

Conflict of interest statement
None declared.

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