



Tips for Preventing Travel-Related Illnesses

Healthy Living

Most travel-related illnesses can be prevented with pretravel planning, immunizations, and safety precautions.

Millions of Americans travel abroad each year, with many individuals spending time in rural areas or developing countries, locations where the risks of contracting an illness are great. Over the past 25 years, Americans have received a steady stream of news on emerging infectious diseases such as Lyme disease, Hantavirus, West Nile virus, and most recently, mumps. Due to an increased awareness of communicable infectious diseases and other illnesses associated with travel, pharmacists are often asked for advice regarding disease prevention. The following safety precautions can be used to help counsel individuals on avoiding travel-related illnesses.

General Travel Health Advice

Health problems associated with travel can result from such factors as exposure to infectious agents, use of certain types of transportation, such as cruise ships and air flight, and participation in certain activities, such as kayaking and camping. However, most travel-related ill-

nesses can be prevented with the use of pretravel planning, immunizations, and safety precautions during travel.¹ Pharmacists can be very helpful with this pretravel review, especially if they are certified to administer vaccines.¹

Pretravel planning should involve a visit to a physician at least one month before a trip to allow time for any recommended immunizations or other special preparations. Travelers should be advised to discuss the length of their trip, season of travel, areas that will be visited, planned activities, and lodging arrangements with their health care provider. Current medical status, current medications, conditions or treatments that may weaken the immune system, and special conditions such as pregnancy should also be considered.¹ Travelers that take medication regularly should take an adequate supply to last the duration of the trip. Travelers should carry their medications with them, rather than pack them in luggage, to avoid losing their medications.¹

Food and Water Safety

Individuals traveling to areas with poor sanitation should be advised to take food and water precautions. Contaminated food and water are common causes of infectious traveler's diarrhea and hepatitis A. Tap water can carry infectious organisms and should be boiled before being used for drinking, brushing teeth, or washing food. Since some sources of bottled water may be contaminated, it is safer to consume drinks made from boiled water, carbonated beverages, beer, or wine. Food precau-

tions include peeling fruits and vegetables before consumption, and avoiding raw vegetables, unpasteurized dairy products, and undercooked or raw fish or shellfish.¹

Traveler's diarrhea is the most common travel-related disease, affecting 20% to 50% of international travelers—about 10 million people annually.² About 80% of cases are caused by bacterial enteropathogens, with Enterotoxigenic *Escherichia coli* (ETEC) being the most common.² The primary symptom of ETEC-associated diarrhea is sudden onset, with four to five watery stools daily. Other symptoms include nausea, abdominal cramping, vomiting, fever, urgency, and malaise. Most cases resolve in one to two days, even without treatment, and are rarely life-threatening. Without treatment, 90% of cases resolve within a week and 98% of cases resolve within a month.²

Bismuth subsalicylate taken as two tablets four times daily or as two fluid ounces taken four times daily has shown to be an effective preventive measure.² Clear liquids for rehydration or to prevent dehydration are also important. If antibiotics are required, fluoroquinolones are the drugs of choice. Antibiotics are usually given to patients who experience three or more loose stools in an eight-hour period, especially if accompanied by nausea, vomiting, abdominal cramps, fever, or blood in the stool. People with fever or bloody stools should not use antimotility medications (e.g., loperamide, diphenoxylate), as they can increase the severity of the disease by reducing clearance of the

Jake Mossman, BSpH, RPh
President and Pharmacist in Charge
Taos Pharmacy and Total Health and
Wellness Center, Taos, New Mexico

causative organisms from the gut.²

Travelers should be advised to avoid infection-causing organisms in the open water, soil, and sand. It is important to avoid contact with water infected with schistosoma, a parasite, since even brief exposure can result in infection. Travelers should also avoid walking in sand or soil that might be contaminated by human or dog feces to avoid worm infections, such as hookworm.¹

Insect-Borne Diseases

Diseases transmitted by mosquitoes and arthropods include the domestic arboviral encephalitis, Lyme disease, tularemia, and plague. Common arboviral (arthropod-borne viruses) encephalitides in the United States include eastern equine encephalitis, western equine encephalitis, St. Louis encephalitis, La Crosse encephalitis, and West Nile encephalitis (TABLE 1). Viruses causing encephalitis are all transmitted by mosquitoes. Lyme disease is caused by bacteria transmitted by ticks; plague is caused by bacteria transmitted by rodent fleas; and tularemia is caused by a bacterium that can be transmitted by ticks,

deerflies, and other insects, as well as by handling infected animal tissue, contaminated food or water, and inhalation of the bacteria.³

Arboviral encephalitis: Arboviruses that cause encephalitis are maintained in complex life cycles that involve nonhuman vertebrate primary hosts (e.g., horses, birds) and primary arthropod vectors. Most human infections are asymptomatic or involve nonspecific flu-like symptoms, such as headache, fever, myalgia, and malaise. Only a small percentage progress to frank encephalitis. Since there are no effective medications to treat the viral infection and no vaccines for these diseases, treatment is supportive and is aimed at controlling inflammation of brain tissues and maintaining breathing. Treatment of secondary bacterial infections, such as pneumonia, may also be included.

Preventing mosquito bites and using insect repellents are the most effective ways of preventing the disease. Mosquito control measures include removing sources of standing water near the home, such as pet dishes and old tires, and the safe removal of dead animals. Most states

ask that people report dead birds to the department of health, as this can indicate the presence of viruses, especially West Nile virus.⁴

Lyme disease: Lyme disease is the most common vector-borne disease in the U.S., with 74,795 cases reported between 1999 and 2002. The disease, most common in the northeastern and upper midwestern states of the U.S., is caused by the bacterium *Borrelia burgdorferi*, transmitted to humans by infected blacklegged ticks. The bacterium normally lives in squirrels, mice, and other small rodents. Lyme disease is characterized by arthritis, encephalopathy, and neuropathy.⁵ Most cases can be cured with antibiotics, especially if started early. However, a small percentage of patients can suffer muscle and joint pain, cognitive defects, and fatigue, even after antibiotic treatment. The first sign of infection is usually a circular rash, seen in about 70% to 80% of cases, which appears three to 30 days after a tick bite. Patients also may experience fatigue, chills, fever, headache, muscle and joint aches, and swollen lymph nodes. If left untreated, the

Table 1
Arboviral Encephalitis Incidence and Distribution in the U.S.

Type	Distribution	Incidence
Eastern Equine	Freshwater hardwood swamps of the Atlantic, Gulf Coast, and Great Lake states. Most incidences are in Florida, Georgia, Massachusetts, and New Jersey.	220 cases in the U.S. from 1964–2004; average of five cases per year, range of 0–15 per year. Approximately one-third of these cases have resulted in death.
La Crosse	Upper midwestern (Minnesota, Wisconsin, Iowa, Illinois, Indiana, and Ohio), mid-Atlantic (West Virginia, Virginia and North Carolina), and southeastern (Alabama and Mississippi) states	About 70 per year; less than 1% result in death; may be underreported, as many cases are diagnosed as aseptic meningitis or viral encephalitis of unknown etiology.
Western Equine	Western states including California, Utah, and New Mexico. A few cases reported or suspected in Wyoming and Nebraska (North Platte River).	639 confirmed cases since 1964; occurs in epidemics that are hard to predict. Mortality rate is about 3%.
St. Louis	Lower 48 states	4,437 cases since 1964; average of 193 per year, with a range of 4–1,967. Mortality rate is 5% to 15% in those with severe illness.
West Nile	Lower 48 states	19,706 cases since 1999; average of 4,889 per year since 2002. Mortality rate is 3% to 15% in those with severe illness.

Source: Reference 4.

infection may produce a number of symptoms, including loss of muscle tone on one or both sides of the face (known as *facial palsy* or *Bell's palsy*), severe headaches, neck stiffness due to meningitis, shooting pains that may interfere with sleep, heart palpitations and dizziness due to changes in heartbeat, and pain that moves from joint to joint.

Many of these symptoms resolve without treatment.⁶ Lyme disease rarely results in death, but even treated cases can result in late Lyme disease characterized by arthritis, encephalopathy, and neuropathy.⁷

Tularemia: Tularemia, also known as *rabbit fever*, is a disease caused by the bacterium *Francisella tularensis*. People usually become infected through the bite of infected insects, such as ticks and deerflies, by handling sick or dead infected animals, eating or drinking contaminated food or water, or inhaling airborne bacteria. *F. tularensis* can stay alive for weeks in water and soil. About 200 human cases of tularemia are reported each year in the U.S., with most occurring in the south central and western states. Symptoms include skin ulcers, swollen and painful lymph glands, inflamed eyes, sore throat, mouth sores, diarrhea, and pneumonia. If left untreated, tularemia can be fatal. The incubation period for the disease is three to five days, with a range of one to 14 days. Several antibiotics, such as tetracyclines, fluoroquinolones, streptomycin, and gentamicin, are effective in treating tularemia infections. The appropriate antibiotic is determined by lab tests.⁸

Plague: Plague is caused by the *Yersinia pestis* bacterium, transmitted to humans through rodent flea bites. About 10 to 15 cases are reported each year in the U.S., mostly in rural areas of northern New Mexico, northern Arizona, southern Colorado, California, southern Oregon, or far west Nevada. Onset of bubonic plague is usually two to six days after a person is exposed. Initial

symptoms include fever, headache, and general illness, followed by the development of painful, swollen regional lymph nodes.

The distinguishing sign of plague is a very painful and swollen lymph node, called a *bubo*. Without treatment, a progressive and potentially fatal illness generally results. Progression leads to blood infection and, finally, to lung infection, termed *plague pneumonia*, which can be transmitted to others through the expulsion of infective respiratory droplets by coughing. The death rate for plague pneumonia patients is over 50%. Streptomycin or gentamicin are the antibiotics of choice, but other antibiotics, such as tetracyclines and chloramphenicol, are also effective. Drug therapy should begin as soon as possible after laboratory specimens are taken. As soon as a diagnosis of suspected plague is made, the patient should be isolated, and local and state health departments should be notified.⁹

Malaria: Forty one percent of the world's population lives in areas where malaria is considered endemic.¹⁰ There were 1,337 cases of malaria reported in the U.S. in 2002; all but five were acquired in malaria endemic countries and imported into the U.S.¹⁰ The World Health Organization estimates that 300 million to 500 million cases occur worldwide, resulting in more than one million deaths annually.

Malaria is caused by four kinds of parasites—*Plasmodium falciparum*, *P. vivax*, *P. ovale*, and *P. malariae*. Large areas of Central and South America, Hispaniola, Africa, the Indian subcontinent, Southeast Asia, the Middle East, and Oceania are considered malaria-risk areas. The disease, transmitted by an infected female *Anopheles* mosquito, can be prevented by avoiding mosquito bites, taking antimalarial drugs to kill the parasites, eliminating mosquito breeding places, spraying insecticides on walls, sleeping under bed nets (especially effective if

treated with insecticide), and wearing insect repellent and long-sleeved clothing when outdoors. Appropriate antimalarial medication is determined by the parasite involved and its resistance to the drug therapy. Travelers leaving the U.S. should visit their health care provider four to six weeks before foreign travel to obtain any necessary vaccinations (although there are no vaccines against malaria) and a prescription for an antimalarial drug, if needed. Antimalarial medication should also be taken exactly on schedule without missing doses.¹⁰

Insect Protection

Precautions should be taken to avoid insect and arthropod bites, since mosquitoes, flies, fleas, and lice, ticks, and mites can transmit serious infectious diseases, including malaria, West Nile virus, plague, Rocky Mountain spotted fever, tularemia, and arthropod-borne encephalitis.¹¹ The U.S. Environmental Protection Agency (EPA) has approved insect repellents containing permethrin, such as Permanone, for use on clothing, shoes, bed nets, and camping gear. Permethrin is a highly effective repellent and insecticide. Permethrin-treated clothing repels and kills mosquitoes, ticks, and other arthropods, and this effect is retained even after laundering. There appears to be little toxicity associated from permethrin-treated clothing.¹¹ Permethrin should be reapplied after five washings.

The EPA has registered several ingredients, including DEET (N,N-diethyl-meta-toluamide), picaridin, MGK-326 (di-n-propyl isocinchomeronate), MGK-264 (N-octyl bicycloheptene dicarboximide), IR 3535 (ethyl butylacetylaminopropionate), oil of citronella, and oil of lemon eucalyptus (p-menthane 3,8-diol), as safe and effective insect repellents for use directly on the skin. While all of these have some repellent activity, most authorities, such as the CDC, National Pesticide

Information Center, and American Mosquito Control Association, recommend using repellents that contain DEET, as it is the most reliable and longest lasting. DEET repels mosquitoes, ticks, and other arthropods. Generally, higher concentrations of DEET provide longer-lasting protection, but there seems to be no added benefit for concentrations above 50%.¹¹ DEET formulations as high as 50% concentration are recommended for adults and children older than 2 months.¹¹

Repellent application guidelines include using enough repellent to cover exposed skin and clothing, not applying repellents to cuts, wounds, or irritated skin, avoiding inhalation of aerosol repellents, not applying sprays directly onto the face, but rather, spraying repellent into the hands and applying to the face with the fingers, and not applying repellents to the hands of small children, as they are likely to put their hands in their mouth and ingest the repellent. Children younger than 2 months should be protected by draping mosquito netting with an elastic edge over the carrier to provide a tight fit.¹¹

Transportation Issues

Air travel can involve exposure to a low-oxygen environment and can exacerbate chronic obstructive pulmonary disease and heart conditions. Changes in air pressure can also cause ear and sinus problems;

travelers with these problems may want to use decongestants prior to flying to avoid discomfort. Sitting still during long flights can be dangerous for people with clotting or circulatory disorders, and these individuals should discuss the use of medications or compression stockings with their physicians. Adequate hydration, frequent stretching, changing positions one or two hours during a flight, and avoiding constrictive clothing can help prevent circulatory problems.¹

There have been occasional reports of outbreaks of disease on cruise ships, including infectious gastroenteritis, measles, rubella, varicella, meningococcal meningitis, hepatitis A, and Legionnaires disease.¹² The CDC established the Vessel Sanitation Program and has enforced strict sanitation guidelines for all cruise ships that dock in American ports. Information about health records for cruise ships can be obtained from travel agents, state health departments, and the CDC.¹

Travel Within the U.S.

Individuals traveling within the U.S. should be advised to take certain precautions. Plague, Rocky Mountain spotted fever, tularemia, and arthropod-borne encephalitis occur occasionally in North America, along with seasonal outbreaks of influenza.¹³ Coccidioidomycosis is considered endemic in the southwestern U.S., and histoplasmosis is

highly endemic in the Mississippi, Ohio, and St. Lawrence River valleys. Lyme disease is endemic in the northeastern, mid-Atlantic, and upper Midwest U.S and the southwestern provinces of Canada, while rodent-borne Hantavirus has been identified in the western states. In addition, food-borne diseases, such as *E. coli* and salmonellosis, have increased in some areas, and outbreaks of hepatitis A have occurred in areas of the U.S. and Canada.¹³

Pharmacist's Role

As one of the most accessible health care professionals, the pharmacist is often asked for advice prior to travel. Travel-related illness can be prevented through general pretravel planning and location-specific prevention measures, which can greatly reduce the risk of contracting an infectious disease. Pharmacists should stay current with infectious disease outbreak information and their common means of transmission, preventative measures, and signs and symptoms. In most cases, early diagnosis and treatment can significantly reduce severity of illness, risk of long-term sequelae, and death. Pharmacists can also help identify possible infections in individuals who present with symptoms and have recently returned from travel. Pharmacists are well-positioned to provide useful advice, products, and services that can make travel safer for their patients. ■

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