Common Clinical Problems in Returned Travelers

Series Editor:
Mary E. Klotman, MD
Chief, Division of Infectious Diseases, Mt. Sinai School of Medicine, New York, NY

Contributor:
Daniel Caplivski, MD
Director, Travel Medicine Program, Assistant Professor, Division of Infectious Diseases, Mount Sinai School of Medicine, New York, NY

Table of Contents

Introduction ........................................ 2
Fever ............................................. 2
Skin Lesions ....................................... 5
Gastrointestinal Infections ........................ 9
Conclusion ......................................... 11
References ......................................... 11

Cover Illustration by Kathryn K. Johnson
Common Clinical Problems in Returned Travelers

Daniel Caplivski, MD

INTRODUCTION

The increasing frequency of international travel has led to an increased number of patients presenting with illnesses acquired abroad. It is therefore important that practicing physicians have an understanding of the common problems facing returned travelers. This review will discuss some of the principles that guide evaluation and management of these patients in a format that is based on actual cases from the Mount Sinai School of Medicine Travel Medicine Program.

FEVER

Fever can be an important sign in several life-threatening infections. The question “Could this be malaria?” must always be posed in the setting of the febrile returned traveler because of the high mortality associated with untreated malaria due to *Plasmodium falciparum*. The absence of fever should not discount the possibility of malaria infection, as some patients may present with more subtle symptoms.

When considering the possibility of travel-related illness, one must entertain the possibility that more local causes of infection are in fact the true culprit. A careful history of the patient’s itinerary, activities, and exposures as well as the chronicity of the symptoms will often help to differentiate among the various causes of fever without localizing symptoms.

CASE 1

A 43-year-old man from Nigeria returned to his home country for a 6-month stay while working for the United Nations. He had received appropriate pretravel vaccinations but was not taking malaria prophylaxis while there. Most of his daily activities were confined to offices, but he had made several trips to smaller rural villages in which he had spent a large portion of his time outdoors. The night before his return, he developed fever and headache. His symptoms then progressed to include chills, myalgias, and extreme fatigue. By the time he presented to the emergency department, he had also noted a darker color to his urine and a significant icterus (Figure 1). His laboratory studies revealed several abnormalities (abnormal results in italics):

- White blood cell count: 11,300/µL (71% neutrophils, 12% bands)
- Hemoglobin: 10.8 g/dL
- Hematocrit: 30%
- Platelet count: 29,000/µL
- Sodium: 127 mEq/L
- Potassium: 4.2 mEq/L
- Chloride: 91 mEq/L
- Carbon dioxide, total: 18 mEq/L
- Blood urea nitrogen: 84 mg/dL
- Creatinine: 5.7 mg/dL
- Lactate dehydrogenase: 1757 U/L
- Alanine aminotransferase: 59 U/L
- Aspartate aminotransferase: 131 U/L
- Bilirubin, total: 10.5 mg/dL
- Bilirubin, direct: 5.4 mg/dL
- Haptoglobin: 10 mg/dL

On peripheral blood smear, there were multiple ring forms with a 20% parasitemia (Figure 2).

What is the diagnosis? What is the most likely species?

This clinical presentation is consistent with severe malaria from *Plasmodium falciparum*. On the peripheral blood smear, the infected cells are the same size as the noninfected cells and there is an example of a cell infected by more than 1 *Plasmodium* parasite. These findings together with the clinical picture of a patient with severe malaria allow us to distinguish infection with *P. falciparum* from infection with other species of malaria. On peripheral blood smear, both *P. vivax* and *P. ovale* will infect immature erythrocytes that have not fully developed their cytoskeleton. These infected cells will appear larger than the noninfected adjacent cells. In *P. falciparum*, the schizont phase is rarely seen on
peripheral blood smear since these forms are adherent to the vascular endothelium and are sequestered away from the peripheral bloodstream. The banana-shaped gametocyte is diagnostic of *P. falciparum* infection.²

In a patient with fever, icterus/jaundice, and anemia, several other diagnoses should be considered. Although the icterus in this case was caused principally by an indirect hyperbilirubinemia from hemolysis, direct liver injury may also cause icterus or jaundice. Viral hepatitis in travelers is often secondary to hepatitis A virus transmitted through fecal-oral contamination of food or water. The hepatitis A vaccine is highly protective and is an important part of pretravel counseling. Patients who are originally from hepatitis A–endemic countries are likely to have protective immunity from previous exposure as children. Testing for both IgM and IgG antibodies to hepatitis A virus can help differentiate between acute infection and prior exposure.³

Hepatitis B virus can be acquired acutely during travel in patients who have direct contact with infected body fluids, either through sexual intercourse or via medical or dental procedures with incompletely sterilized instruments. The 3-dose hepatitis B vaccine series is indicated for travelers who anticipate medical procedures or new sexual partners during travel.

Yellow fever virus infection can occur in patients returning from equatorial Africa or the jungle region of South America. It is a mosquito-borne flavivirus that causes severe inflammation of the liver and carries an estimated mortality of 50%. The vaccine is highly protective, but it is an attenuated live virus vaccine and thus is contraindicated in certain populations. Pregnant women and patients with severe immunocompromise should not receive the vaccine. Patients over age 65 years and children under 9 months are also at higher risk for vaccine-related illnesses (visceral or neurotropic infections by the vaccine strain). The safety of yellow fever virus vaccine in patients with HIV infection with CD4+ cell counts above 200 cells/µL has been studied, but the risks and benefits should be carefully considered.⁴

Leptospirosis is a zoonotic infection that can present with fevers, jaundice, and renal failure. This severe form of infection with *Leptospira interrogans*, known as Weil’s syndrome, includes renal failure and liver inflammation (usually disproportionately high bilirubin with lesser degrees of transaminase elevation). In travelers, outbreaks have been described among adventure tourists and triathlon participants who are exposed to fresh water that has been contaminated with this spirochete.⁵

This patient is presenting with a severe case of *P. falciparum* malaria with a high degree of parasitemia and renal failure. The treatment of such a patient should include intravenous antiparasitics administered in the intensive care unit setting. First-line therapy includes intravenous quinine and doxycycline. Because intravenous quinine is not readily available in the United States, intravenous quinidine is used in its place. This antiparasitic can cause life-threatening arrhythmias and should therefore be administered in the setting of careful cardiac monitoring.

Oral quinine with doxycycline can be used for patients with less severe disease. Other complications of antimalarials such as quinine include hypoglycemia resulting from the stimulation of insulin secretion. Careful monitoring of blood glucose should thus accompany treatment, especially in any patient with a reduced level of consciousness.⁶

Alternatives to the above regimen can include high dose atovaquone/proguanil and mefloquine. Chloroquine should be used to treat *P. falciparum* malaria only in patients who have returned from parts of the world in which chloroquine-resistant strains are absent. These areas are essentially limited to some parts of the Caribbean, Western Central America, and certain areas of the Middle East.⁷

**CASE 2**

A 34-year-old woman from Spain was working as a physician for Doctors Without Borders during an 11-month mission in the Democratic Republic of Congo. She had 3 episodes of malaria while there and each time was treated with artesunate-based therapies. These agents are not approved for use in the United States but are highly effective against all species of malaria. Upon her return to the United States, she had a peripheral blood smear screening that was negative for parasites. Two weeks after her return, however, she developed fevers, chills, and headaches. She presented to the emergency department but felt fairly confident that this was not malaria since during the previous episodes she had felt much worse. Nonetheless, her peripheral blood smear now revealed several red blood cells with intracellular parasites (Figure 3).

- **What is the explanation for this finding?**

On the peripheral blood smear, the infected cells are larger than the noninfected cells and there are not only ring forms but also schizonts. The infected red blood cells have finger-like projections known as fimbriae. In this example of *P. ovale* infection, the patient experienced a form of relapsing malaria. All forms of malaria have a tissue phase in which the parasites replicate in...
the liver, but *P. ovale* and *P. vivax* have the ability to form dormant hypnozooite forms. These forms can cause relapsing malaria even after the blood form of the parasite has been treated.

Chloroquine is used to treat the blood forms of these forms of malaria in travelers returning from most parts of the world, but primaquine should also be administered to eradicate the hypnozooite form. Primaquine can cause a hemolytic anemia in patients with glucose-6-phosphate deficiency, so patients should be screened for this deficiency prior to its use.8

**CASE 3**

A 24-year-old man traveled to India to visit his friends and relatives in Jahlmed. He was there for 3 weeks and reported eating food from street vendors during his visit. He began having fevers to 103°F on his flight home and next developed chills and a generalized headache. Upon admission, his physical examination was unremarkable other than fever to 104°F. His laboratory studies revealed the following:

- White blood cell count: 6700/µL (67% neutrophils, 22% bands)
- Hemoglobin: 13.4 g/dL
- Hematocrit: 41.8%
- Platelet count: 176,000/µL
- Sodium: 137 mEq/L
- Chloride: 109 mEq/L
- Carbon dioxide, total: 25 mEq/L
- Blood urea nitrogen: 13 mg/dL
- Creatinine: 1.1 mg/dL
- Lactate dehydrogenase: 565 U/L
- Alanine aminotransferase: 49 U/L
- Aspartate aminotransferase: 40 U/L
- Bilirubin, total: 1.9 mg/dL
- Bilirubin, direct: 0.5 mg/dL
- Potassium: 4.3 mEq/L
- Sodium: 142 mEq/L
- Hemoglobin: 13.4 g/dL
- Platelet count: 122,000/µL

Blood cultures from admission were positive for gram-negative bacilli.

- **What is the most likely diagnosis? How should this infection treated?**

This case is a classic example of a returned traveler with typhoid fever caused by *Salmonella* infection. The organism is acquired via contaminated foods (fecal-oral spread). Travelers who are visiting friends and relatives are at higher risk for food-borne illnesses because they tend to be less cautious in their food choices, often believing themselves immune to diseases to which they were exposed to when living in endemic countries.

As opposed to *Salmonella* infections acquired in the United States caused by nontyphoidal strains, *Salmonella enterica* serovar *typhi* causes invasive disease with bacteremia even in patients without immunocompromise. While some patients will present with initial complaints of diarrhea, some may note constipation or undifferentiated fever. As the organism tends to replicate in the lymphoid tissue of the gut, ileal lymph node enlargement may be noted on CT scan. In progressive cases of typhoid fever, the rapid enlargement of the Peyer’s patches may result in intestinal perforation, peritonitis, and death. Patients who are being treated should be monitored for sudden-onset abdominal pain or rapid blood loss.

Blood cultures and antibiotic susceptibility testing are the most useful for guiding therapeutic decisions. Third-generation cephalosporins are often the initial choice while culture results are pending. It is important for the physician to be aware that some strains of *Salmonella* that appear to be susceptible to fluoroquinolones in vitro may actually be clinically resistant. This resistance can be confirmed by requesting testing with nalidixic acid. Patients with typhoid fever may have persistent fevers for several days despite appropriate antibiotics.9

- **How could this infection have been prevented?**

Basic food and water precautions are important parts of pretravel counseling. These measures include avoiding uncooked foods such as salads, unbottled water, as well as street vendor food given the lower hygiene practices. There are 2 commercially available typhoid vaccines in the United States. The inactivated, injectable typhoid vaccine confers approximately 2 to 3 years of protection. The oral typhoid vaccine is a live, attenuated bacteria that confers approximately 3 to 5 years of protection. Even after vaccination, travelers should be counseled to practice basic food precautions since both vaccines are estimated to have an efficacy of 60%.10

**CASE 4**

A 46-year-old man working for the United Nations spent 4 months working in Haiti. On the day of his return, he developed diffuse muscle pains, headache, vomiting, and diarrhea. One day later, he noted extreme fatigue, joint pains in his ankles and knees, chills, night sweats, and fever to 102°F. Over the next day he noted retro-orbital pain and a diffuse erythematous, blanching rash over his chest, back, and arms (Figure 4). No other abnormalities were found on physical examination. On laboratory evaluation, the patient had the following findings:

- White blood cell count: 2300/µL
- Hemoglobin: 13 g/dL
- Hematocrit: 38.5%
- Platelet count: 122,000/µL

---

The text continues with a discussion of common clinical problems in returned travelers, focusing on the management and prevention of typhoid fever and other food-borne illnesses.
**What is the most likely diagnosis?**

This patient is presenting with the classic signs and symptoms of dengue infection. Dengue virus is a vector-borne illness transmitted by the *Aedes aegypti* mosquito. Outbreaks are seen periodically throughout the tropics, and travelers frequently present after travel to the Caribbean, Central America, and Southeast Asia. Dengue virus infection has a short incubation period and travelers will generally present with symptoms soon after exposure to the virus.

In evaluating the patient, the findings of fevers, chills, and retro-orbital headache are nonspecific but typical features. Patients will sometimes present with the full spectrum of muscle and joint pains, a diffuse rash, and gastrointestinal and respiratory complaints, but undifferentiated fever may be the only manifestation of infection. Leukopenia, thrombocytopenia, and elevated markers of liver inflammation can also provide support for the diagnosis.

Patients who are infected with 1 serotype of dengue virus and are subsequently exposed to a different serotype are at increased risk for the hemorrhagic manifestations of dengue virus infection. Efforts to generate a safe and effective vaccine are complicated by this fact. No specific antiviral treatment exists and care is mainly supportive. Patients returning from India may present with a very similar illness called chikungunya. The term “bent-up disease” refers to the debilitating joint pains that often accompany this mosquito-borne viral infection. Confirmation of chikungunya virus infection is available via serologic testing through the U.S. Centers for Disease Control and Prevention (CDC). Infections are generally self-limited and treatment is supportive.11

**CASE 5**

A 28-year-old medical intern was unable to start his critical care unit rotation because of extreme fatigue and fevers. He had traveled to Peru in the month prior to starting his internship and had mainly spent time in the Andean cities of Cuzco, Machu Picchu, and Huaraz. He noted a severe sore throat, fevers, extreme fatigue, and dark-colored urine 1 month after his return. His physical examination was notable for fever to 101°F, extreme prostration, and an exudative pharyngitis. His laboratory values are shown below.

- White blood cell count: 15,000/μL (20% neutrophils, 63% lymphocytes)
- Hemoglobin: 14 g/dL
- Hematocrit: 41.3%
- Platelet count: 231,000/μL
- Sodium: 137 mEq/L
- Potassium: 4.3 mEq/L
- Chloride: 100 mEq/L
- Carbon dioxide: direct: 23 mEq/L
- Blood urea nitrogen: 13 mg/dL
- Creatinine: 0.9 mg/dL
- Alkaline phosphatase: 476 U/L
- Alanine aminotransferase: 617 U/L
- Aspartate aminotransferase: 267 U/L
- Bilirubin, total: 2.5 mg/dL
- Bilirubin, direct: 1.5 mg/dL

**Figure 5** shows his peripheral blood smear.

**What is the diagnosis in this case?**

This is a case of infectious mononucleosis confirmed by heterophile antibody test. The peripheral blood smear shows atypical lymphocytes. This case is a reminder that local causes of fever should be considered in conjunction with “tropical” causes when evaluating returned travelers with this symptom.

Another important message from this case is the geographic variation that occurs within certain countries. Malaria is endemic to the Amazon basin jungle regions of Peru but not to the highlands. In a patient with fever and anemia after travel to the highlands of Peru, it is important to consider another organism that might be seen on the peripheral blood smear. *Bartonella bacilliformis* is a bacterial pathogen that is the cause of Oroya fever. It can be detected on Wright-Giemsa–stained smears as bacillary forms inside the red blood cells. Antibiotic treatment with azithromycin is indicated for patients with both the acute and chronic forms of *Bartonella bacilliformis* infection. It is endemic only to certain regions of the Andes, but it is important to recognize since untreated cases may be fatal.12

**SKIN LESIONS**

Skin lesions in returned travelers represent an important reason for seeking the advice of a physician. Eruptions of the skin may be an isolated complaint or an
important clue to a systemic illness. Physicians evaluating returned travelers should be familiar with the diagnosis and management of some of the more common lesions.

**CASE 6**

A 60-year-old university administrator returned from a safari trip to South Africa and Zimbabwe with the skin lesion shown in Figure 6. She had been in the Kruger National Game Park and noted that during the safari she had to walk through a dense shrub brush to get to an outhouse. On the day of her return, she developed worsening fevers, chills, and fatigue. Within several days she was unable to get of bed. The skin lesion initially started as a red, raised, tingling nodule but eventually
became the black eschar shown in Figure 6. While she noted some tingling around the lesion, it was painless. The fevers were slowly resolving but she was still feeling very fatigued. She had not taken malaria prophylaxis during this trip and had no fresh water exposures.

- What is the diagnosis in this case?

This is a case of African tick-bite fever caused by *Rickettsia africae*. This organism is transmitted in the Southern Africa by *Amblyomma* cattle ticks. It has been an emerging cause of fever among returned travelers to Southern Africa, and this patient’s skin lesion and clinical presentation are characteristic of the infection.
Other features of the presentation may include a painful lymphadenitis, aphthous ulcers, and in a smaller percentage of patients a faint diffuse erythematous rash.

The black eschar seen in this case is typical of this disease and represents the inoculation of the organism in the skin. *Rickettsiae* have a propensity to invade endothelial cells and the resultant interruption of local blood supply causes an ischemic necrosis of the skin. Black eschars of this nature should also bring to mind the possibility of cutaneous anthrax, but these lesions are often accompanied by local swelling as the *Bacillus anthracis* organisms move up the lymphatic channels. Brown recluse spider bites (loxoceles) can also produce local tissue necrosis, but these lesions are typically quite painful.

- How should this patient be managed?

African tick-bite fever (like many other rickettsial diseases) is managed with doxycycline. The disease may be self-limited, but typical therapeutic regimens include doxycycline 100 mg orally twice daily for 10 to 14 days. There is no vaccine for this disease and the main preventative strategy is careful insect precautions.¹³

**CASE 7**

A 36-year-old software developer spent 2 weeks exploring the jungles and beaches of Costa Rica. Upon return, he noticed a small red papule on his forearm. Over several days, it began expanding until it eventually ulcerated into a lesion that was painless but several centimeters in diameter (Figure 7). A small amount of tissue was scraped from beneath the crusted center of the lesion and revealed the culprit organism (Figure 8).

- What is the diagnosis in this case?

This patient has cutaneous leishmaniasis. The organism in this case was confirmed by culture to be *Leishmania panamensis*. The intracellular parasite can be identified within macrophages on the Wright-Giemsa stained smears of tissue from the ulcer. The organism can be distinguished from the intracellular yeast cells of *Histoplasma capsulatum* by the presence of a kinetoplast—a small bar-like structure adjacent to the nucleus.

Leishmaniasis can manifest itself in various forms depending on the geographic region and infecting species. *L. panamensis* is a species that can present initially in the cutaneous form but years later may metastasize to the nasopharyngeal tissue and cause mucocutaneous disease. Other species of *Leishmania* can infect the liver and spleen and cause fevers, weight loss, and death (visceral leishmaniasis).¹⁴

- How should this patient be treated?

Some cases of cutaneous leishmaniasis will resolve without treatment; however, because of the concern for mucocutaneous disease, some patients do opt for treatment. Pentavalent antimonial drugs are intravenous compounds that are only available in the United States via the CDC’s antiparasitic drug service. These compounds carry a range of toxicities from flu-like symptoms to potential cardiac toxicity and generally are given over the course of 20 to 28 days. Amphotericin B is an alternative with activity against most species of *Leishmania* species. Nonetheless, its side effect profile and availability only in intravenous formulation also make it a less desirable option for purely cutaneous disease. A new oral agent, miltefosine, is produced in Germany but is not approved for use in the United States. Miltefosine has been used with success for Old World visceral leishmaniasis, but its use in species encountered in the New World is still the subject of study.¹⁵

**CASE 8**

A 55-year-old woman returned from a 2-week vacation on the beaches of Israel. She noted an intensely itchy streak on her leg that developed after her last day at the beach. A few hours later, the lesion had progressed to a proximal portion of her leg (Figure 9 and Figure 10).

- What is the diagnosis in this case?

This is a case of cutaneous larva migrans—a type of creeping eruption caused by the dog hookworm, *Ancylostoma braziliense*. The organism penetrates into intact skin after a traveler comes into contact with soil or sand that has been contaminated by dog feces. The organism goes on a migratory path through the skin but often is not able to penetrate into the blood stream and dies in the skin. The skin eruption is typically very pruritic, but biopsies generally miss the parasite since the inflammatory reaction usually appears in a site after the organism has already moved on. Treatment with ivermectin or albendazole is recommended to shorten the duration of the symptoms.¹⁶

**CASE 9**

A 29-year-old man traveled to Belize and visited the Mayan ruins in the Actun Tunichil Muknal trail. The trail involves a hike through dense rainforest, spelunking through caves, and wading through underwater streams. He returned with a small nodule behind his knee that was mildly pruritic but painless (Figure 11). Excisional biopsy revealed the culprit organism (Figure 12).

- What is the diagnosis?
This is a case of myiasis caused by the larva of the botfly *Dermatobia hominis*. This fly catches a mosquito in flight and deposits her eggs on the under-surface of the mosquito. When the mosquito takes a blood meal, the eggs are deposited and a larva begins to develop beneath the surface of the skin. A breathing hole is sometimes visible and occlusive therapy with petroleum jelly is often adequate to remove the organism. 

**CASE 10**

A 35-year-old woman traveled to the Caribbean for a scuba diving trip. She returned with the slightly raised, erythematous skin lesion shown in Figure 14.

- What caused this lesion?

This is a case of contact dermatitis after contact with coral. There are many types of marine envenomation that can affect travelers that swim, snorkel, or scuba dive in the oceans. Coral contact dermatitis can present as a pruritic or painful erythematous lesions that may also blister. Secondary bacterial infection may occur with typical cellulitis-inducing bacteria such as *Staphylococcus* or *Streptococcus*, but marine bacteria may also be the causative agents. In some cases of sea urchin spine penetration or jellyfish stings, organisms such as *Vibrio vulnificus* or *Aeromonas* species should be considered. Antibiotics that have activity against these organisms include the fluoroquinolone class. Other severe cases of marine envenomation can occur in patients who are stung off the coast of Australia by the box jellyfish—a potentially life-threatening envenomation.

**CASE 11**

A 37-year-old journalist spent a weekend in a resort in the Dominican Republic. She returned with a group of skin lesions on her left leg that were initially erythematous and blistering and then eventually became hyperpigmented (Figure 15). At the resort, she had had 1 or 2 frozen drinks while sitting beside the pool.

- What is the diagnosis in this case?

Phytophotodermatitis is a skin reaction that occurs in patients exposed to sunlight after having inadvertently spilled lime juice or other light-sensitizing substances on their skin. Certain tanning products also contain fruit or vegetable products and can cause this skin reaction. The lesions can be managed with topical steroids to blunt the inflammatory response.

---

**GASTROINTESTINAL INFECTIONS**

Gastrointestinal complaints are a common presenting symptom in patients who have traveled to developing countries. An understanding of the infectious and noninfectious causes of these symptoms is essential in initiating the appropriate diagnostic evaluation and management.

**CASE 12**

A 25-year-old fashion student presented to the emergency department after passing a visible worm with a bowel movement. Three years prior, she had spent 6 months working on a kibbutz in Israel. She had occasionally had episodes of diarrhea but noted that these symptoms had predated her travel. The culprit worm is shown in Figure 16. The round, pink-colored organism was still moving.

- What is the diagnosis in this case?

This was a case of infection with *Ascaris lumbricoides* (roundworm). This nematode is transmitted via fecal-oral spread, especially in rural settings. When an infected individual deposits feces near crops, the eggs of *Ascaris* undergo a maturation process in the soil. Once infectious, they can be transmitted to the next individual via contaminated uncooked vegetables or water supplies. The organism has a complex life cycle in which the larval forms pass through the bloodstream and the lungs before completing their reproductive cycle in the intestine. The vast majority of *Ascaris* infections are asymptomatic; however, symptoms can range from fleeting pulmonary infiltrates with eosinophilia (Loeffler’s syndrome) to intestinal obstruction by hundreds of worms. Children are more susceptible to intestinal obstruction because of the smaller diameter of the lumen of the bowel.

The diagnosis of *Ascarasis* may be based on finding the ova on stool microscopy or by finding the adult worm (as in this case). The adult worms are the only human nematode (round worm) to achieve the large size shown here. Their motility in vivo is a virulence factor in that it allows them to withstand the powerful peristaltic waves of the intestine. A benzimidazole such as albendazole or mebendazole is adequate to treat this parasite. The benzimidazole class has the advantage that it also treats infections with *Strongyloides stercoralis*, hookworm (*Ancylostoma duodenalis* and *Necatur americanus*), whipworm (*Trichuris trichiura*), and pinworm (*Enterobias*...
**CASE 13**

A 22-year-old woman spent a summer abroad in Ghana working for a nongovernmental organization. While there, she had had 1 or 2 episodes of loose, watery stools that resolved with self-treatment with ciprofloxacin. While there she had adhered to bottled water but once or twice had eaten a salad. She now presents 1 month after her trip with crampy, epigastric abdominal pain that is worse after meals. Her stools are now normal, but she has noted a 15-lb weight loss because of the pain that had been produced by food. Her laboratory findings revealed the following abnormalities:

- White blood cell count: 7000/µL
- Hemoglobin: 12.3 g/dL
- Hematocrit: 35.5%
- Platelet count: 381,000/µL
- Sodium: 139 mEq/L
- Potassium: 4.5 mEq/L
- Chloride: 103 mEq/L
- Carbon dioxide, direct: 27.8 mEq/L
- Blood urea nitrogen: 5 mg/dL
- Creatinine: 0.6 mg/dL
- Aspartate aminotransferase: 121 U/L
- Alanine aminotransferase: 98 U/L
- Bilirubin, total: 5.1 mg/dL
- Bilirubin, direct: 3.2 mg/dL

**What is the diagnosis?**

In this case, an ultrasound revealed a gallbladder stone obstructing the cystic duct. Biliary colic and cholecystitis may present with several symptoms that overlap with travel-related illnesses. *Ascaris lumbricoides* infection may present with biliary colic, cholecystitis, and even pancreatitis if the adult worms errantly migrate into the biliary ducts. The worms are sometimes extracted endoscopically: a gastroenterologist may find a motile roundworm in cases in which a gallstone was thought to be the culprit.

Traveler’s diarrhea is a very common infection in travelers to developing countries. Most of these cases will be caused by bacterial organisms such as enterotoxigenic *Escherichia coli*, *Campylobacter*, nontyphoidal *Salmonella* species, and *Shigella*. *Shigella* infections may be distinguished clinically by the presence of blood in the stool and severe tenesmus. Because most of these infections occur during travel, pretravel counseling should include a strategy for the prevention or management of traveler’s diarrhea.

Preventive strategies include the use of prophylactic antibiotics or the use of bismuth subsalicylate (Pepto-bismol). The latter strategy is effective if the medication is taken 4 times a day, but it is an inconvenient prevention because of the dosing schedule and the adverse effects of black tongue and black stools. Prophylactic antibiotics are effective but may carry adverse effects themselves. Fluoroquinolones may cause photosensitivity and this can be an unacceptable side effect for travelers who are traveling to very sunny locations.

Rifaximin is rifamycin that is not absorbed from the gastrointestinal tract and thus is a useful antibiotic for management and prevention of traveler’s diarrhea. Dosing inconvenience (twice or thrice daily dosing is required for prevention) and cost have limited the medication’s practical utility as a prophylactic agent. For self-treatment of traveler’s diarrhea, fluoroquinolones have been the most popular option; however, the emerging resistance among *Campylobacter* species has lead to increased use of macrolides (azithromycin) for travelers to this region. Often a single dose of the antibiotic with loperamide is sufficient for cure of these infections.

The consequences of traveler’s diarrhea may be minimal, but emerging data has supported an association between traveler’s diarrhea and some cases of postinfectious irritable bowel syndrome. This syndrome is another diagnostic consideration in returned travelers whom symptoms persist for several months and no infectious agent can be found. There may be some alterations to the absorption changes in the microvilli after an episode of infectious diarrhea that may persist for several months. Guillain-Barré syndrome has been associated with antecedent *Campylobacter* infection.

**CASE 14**

A 42-year-old woman presented after finding a visible flat worm in her stool. She had previously worked as a photographer in Thailand for a year. She was particularly fond of the local seafood and had eaten raw fish on several occasions. The worm and an egg found in her stool are shown in Figure 17 and Figure 18.

**What is the diagnosis?**

The organism shown is *Diphyllolothrium latum*, the fish tapeworm. This tapeworm is passed to humans when they consume undercooked fish infected with the plerocercoid stage of the parasite. The scolex of the worm attaches to the human small intestine and begins to elongate within the lumen of the bowel via a process called strobilization-addition of segments behind the
attached scolex. This process can lead to tapeworms that are several meters in length. The egg in this case is characteristic because of the presence of a lid-like operculum on 1 end and small knob on the abopercular end. While many patients with tapeworm infection are asymptomatic, nutritional deficiencies such as vitamin B12 deficiency and resultant macrocytic anemia are well described. Treatment of most cestodes (flatworm infections) is achieved with single doses of praziquantel.27

Among tapeworm infections, the parasite with the greatest clinical impact on humans is that of the pig tapeworm, Taenia solium. When humans consume undercooked pork, they are subject to the development of intestinal tapeworm infection. When the embryonated eggs of the tapeworm are ingested, the oncospheres hatch in the intestine and disseminate via the bloodstream throughout the body. When cysticerci develop in the brain, their degeneration over time may lead to seizures or obstructive hydrocephalus. The leading cause of adult-onset seizures in the developing world is this parasitic infection. Travelers may present with symptoms of neurocysticercosis many years after travel and the diagnosis may therefore be more difficult.

Typical radiographic features of neurocysticerci may be adequate to make the diagnosis when several calcified lesions are seen and when viable cysts are present, sometimes with an identifiable scolex inside the fluid-filled cyst. The diagnosis can be confirmed serologically with an antibody assay for Taenia solium. Treatment decisions are heavily dependent on the location, number, and viability of the cysts. Intraventricular cysts are best managed with surgical removal. Patients with greater than 100 cysts are at risk for encephalitis with treatment because of the massive release of antigen as the parasites are killed simultaneously. Patients with only calcified cysts do not generally require treatment. For patients with 5 to 100 cysts, most experts recommend treatment with albendazole with or without corticosteroids to blunt the inflammatory reaction. Praziquantel also has activity against the parasite, but albendazole is preferred because of its superior penetration across the blood–brain barrier.28

## Conclusion

The increased number of international travelers has led to an increased understanding of illnesses that are no longer endemic in most parts of the United States. A careful consideration of a traveler’s exact itineraries, timing and incubation periods, as well as specific exposures during travel can provide vital historical findings that help to narrow the diagnosis. Physical examination should include a careful skin examination since several syndromes in travel medicine can include diagnostic skin findings. Finally, the differential diagnosis for returned travelers should always include local, mundane causes of illness since these can easily be overlooked in travelers who have recently returned from exotic lands.

## References