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CHEST Global Medicine

Acute Respiratory Infections in a Recently Arrived Traveler to Your Part of the World*

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Many acute infectious pulmonary diseases have incubation periods that are long enough for travelers to have symptoms after returning home to a health-care system that is not familiar with "foreign" infections. Respiratory infections have a relatively limited repertoire of clinical manifestations, so that there is often nothing characteristic enough about a specific infection to make the diagnosis obvious. Thus, the pathway to the diagnosis of infections that are not endemic in a region relies heavily on taking a thorough history of both itinerary and of specific exposures. One important caveat is that on occasion, the history of a recent trip creates an element of "tunnel vision" in the evaluating health-care provider. It is tempting to relate a person's problem to that recent trip; however, when evaluating recent returnees, it is always important to remember that the travel may have nothing to do with the patient's presentation. Recent travel may add diagnostic considerations to the list of possibilities, but an astute clinician must not disregard the possibility that the patient's illness has nothing to do with the recent trip.

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Key words: airplane safety; avian influenza; coccidioidomycosis; hantavirus pulmonary syndrome; histoplasmosis; Legionellosis; Loeffler syndrome; melioidosis; paragonomiasis; plague; psittacosis; Q fever; respiratory infections; schistosomiasis; Sin Nombre virus; travel; tropical eosinophilia; tuberculosis; tularemianematodes

Abbreviations: CDC = Centers for Disease Control and Prevention; HPS = hantavirus pulmonary syndrome; SARS = severe acute respiratory syndrome; WHO = World Health Organization

Respiratory tract infections are among the most common causes of medical problems that physicians manage. Recent foreign and domestic travel can add additional diagnostic considerations to the list of likely possibilities. Transportation is rapid enough that it can exceed the incubation period of many illnesses, so that patients might initially present after returning to health-care providers who are not accustomed to dealing with them. An outbreak of coccidioidomycosis in Washington State in a church group recently returned from Mexico is an example.[1] A number of reviews have noted that respiratory infections are common in international travelers, accounting for up to 25% of the febrile illness that health-care workers are asked to evaluate.[2–6] Table 1 shows important diagnostic possibilities based on the region of the world traveled that should be added to the local possibilities for returning travelers with respiratory problems. Each will be discussed in this review. Not only is the region of the world important, but any specifics of exposure might be the clue to trigger appropriate diagnostic tests and treatment. Table 2 list some specific exposures to consider in the history.

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Respiratory Infectious Risks of Commercial Travel

Concerns about the infectious risks of travel have been heightened recently. In 2002 to 2003, the

Table 1—*Possible Respiratory Pathogens by Region of Travel*

Region	Bacteria	Viruses	Parasites	Fungi
Africa	Tuberculosis, plague	Hemorrhagic fever, viruses; influenza	Paragonomiasis, schistosomiasis, strongyloidiasis, tropical eosinophilia	Histoplasmosis
Asia	Tuberculosis, melioidosis, plague	Influenza, SARS	Paragonomiasis, schistosomiasis, strongyloidiasis, tropical eosinophilia	
North America	Plague	HPS, influenza		Histoplasmosis, coccidioidomycosis
Central and South America	Tuberculosis, plague	HPS, influenza	Schistosomiasis, strongyloidiasis, tropical eosinophilia	Histoplasmosis, coccidioidomycosis
Europe	Legionella	Influenza		

outbreak of severe acute respiratory syndrome (SARS) in the Far East was associated with aircraft transmission.[7] In May 2007, a person with possible extremely drug-resistant tuberculosis was quarantined by the Centers for Disease Control and Prevention (CDC) after air travel. Events such as these alert the public to infectious disease transmission on planes. Accurate data about the infectious risks of air travel are limited, and therefore this risk is difficult to quantify. Published reports of such transmission are rare. There were 120 people, 1 of whom with symptomatic SARS, on a Boeing 737-300 traveling from Hong Kong to Beijing. Laboratory-confirmed SARS developed in 16 passengers, and 6 others possibly were infected. Passengers with infection were clustered in a few rows directly in front of or behind the ill passenger.[8] Despite this outbreak the risk is low. By May 2003, the World Health Organization (WHO) reviewed information on 35 flights in which a patient with symptomatic SARS had been onboard. Only four flights appeared to be associated with possible transmission.[9] Vogt et al[10] found no transmission on seven international flights carrying SARS patients. In May 2003, the WHO issued guidelines for the containment of in-flight SARS.[11]

Tuberculosis has also been transmitted on aircraft, and like SARS the risk appears to be very small.[12,13] Since screening for active tuberculosis is not required for most air travelers, persons with active disease may travel on commercial aircraft without being aware of their contagion. From 1992 to 1994, the CDC investigated seven flights that carried persons with highly active tuberculosis. There was evidence of transmission on three of the flights (one case was from a flight attendant to other crew members). As with SARS, the risk was related to the proximity to the index patient.[14] However, despite intensive investigation, these seven exposures to active tuberculosis on aircraft resulted in few new tuberculous infections and no tuberculous disease. Air travel represents a negligible risk factor for the acquisition of tuberculosis.[15]

Aircraft have been a great concern as a potential vector for the global spread of influenza. Air travel has resulted in international outbreaks of influenza and will likely be a major vector when the next pandemic occurs.[16–18] However, during an epidemic, actual transmission of influenza during flight is much less of a health concern.

Although a worry of the traveling public, "common cold" outbreaks related to airplane transmission have not been reported. A study[19] that compared the risks for an upper respiratory tract infection developing during air travel in 50% recirculated vs 100% fresh cabin air noted no difference in the two groups.

Environmental control measures on commercial aircraft have recently been reviewed by Mangili and Gendreau.[20] While an aircraft is parked at the gate with the engines off, passenger cabin ventilation is normally supplied by the air conditioning system and the natural airflow through the open door(s) of the aircraft. During flight, the aircraft cabin has systems that control air exchanges. At cruising altitude, outside ambient air is virtually free of microorganisms. Air enters the cabin from overhead vents and flows downwards toward the outflow grills along both side walls of the cabin near the floor. Air enters and leaves the cabin at approximately the same row;

Table 2—*Environmental Exposures and Potential Respiratory Pathogens (Depends on Geography)*

Exposure	Pathogen
Fresh-water swimming	Schistosomiasis
Caving	Histoplasmosis
Working with soil	Histoplasmosis
Desert dust storms	Coccidioidomycosis
Farms	Q fever
Wilderness	Tularemia
Small rodents	Plague
Birds	Psittocosis
Seasonal cabins	Hantavirus

airflow along the length of the cabin is minimal. All commercial jet aircraft built after the late 1980s recirculate the cabin air: from 10 to 50% of the cabin air is filtered, mixed with outside, and then reintroduced into the passenger cabin. On most aircraft, the recirculated air passes through high-efficiency particulate air filters before reentering the passenger cabin. The most efficient high-efficiency particulate air filters will remove 99.99% of particles (bacteria, fungi, and larger viruses).[21] All large commercial jet aircraft provide approximately 20 air exchanges per hour during cruising. This can be compared to that of the standard modern office building that averages 12 exchanges per hour. The concentration of microorganisms in cabin air is much lower than shopping malls and the air terminal.[22]

There is no evidence that recirculation of cabin air facilitates transmission of infectious disease agents on board, and the mechanisms described above to manage air flow should make risks minimal for passengers other than those sitting within close proximity to an index patient.[23] However, when the aircraft is delayed on the ground and the doors are closed, the ventilation system should be operating. An influenza outbreak associated with an airplane flight resulted when a ground delay lasted 3 h, during which the ventilation system did not operate and the passengers did not receive outside air.[18] Thus, although inflight risks are minimal, ground delays without adequate ventilation could be a problem. According to a study by the US Department of Transportation: "If the ventilation system is not operating, passengers should not stay aboard the plane for long time periods (*ie*, $>$ 30 min)."[24]

Overall, airplane travel appears to represent a low risk of acquiring a respiratory infection. This risk is probably not out of line with other situations in which people are in close proximity to each other, such as office buildings and theaters. This risk is a function of the contagion and proximity to the index case and the duration of the flight. This risk is also related to the efficacy of the cabin ventilation system. Properly functioning systems are probably very effective at decreasing this risk; however, when systems are not working, such as when passengers are kept aboard grounded aircraft, outbreaks are facilitated.

Cruise ships have also been associated with outbreaks of respiratory diseases, particularly Legionnaires disease.[25,26] As with land-associated outbreaks, those aboard ship have been linked to contaminated water sources. Given the nature of the prolonged exposure on cruises, it is not surprising that outbreaks of influenza have also been reported.[27]

Specific Respiratory Diseases To Consider in a Returning Traveler

Tuberculosis

Although tuberculosis rarely presents acutely, it can; and this is such an important disease worldwide that it deserves some brief mention here. Primary tuberculosis most commonly has a lower-lobe presentation and can be indistinguishable clinically from other causes of pneumonia. There are few data on the actual risk for a traveler.[28] In a Dutch study[29] of 656 young adults who traveled to areas of the world with high tuberculosis endemicity, the overall risk of skin test conversion was 3.5 per 1,000 person-months. In our ongoing study of medical personnel working in a hospital in Botswana where 80% of the patients are infected with tuberculosis, we have found a rate of skin test conversion of 42/1,000 person-months (Z. Szep, MD; personal communication; December 20, 2007). Any traveler who returns from an area of high incidence of tuberculosis to an area of low incidence should be tested for latent tuberculosis.[30]

Legionellosis

There is an extensive literature on travel-related outbreaks associated with cruise ships; however, a number other sources of travel-related outbreaks have been reported.[31,32] According to the CDC, 20% of patients hospitalized with Legionnaires disease in the United States acquired their infection while traveling.[33] Pneumonia is the major clinical manifestation of infection with *Legionella pneumophila.* The onset tends to be subacute. Respiratory symptoms may not be initially prominent. Although accompanying GI symptoms and hyponatremia might be more prominent with Legionella pneumonia, there are no clinical, radiologic, or initial laboratory features that allow one to reliably distinguish this from other causes of lobar pneumonia.[34,35] There are several options for diagnosis. Testing for urinary antigen can be done in hours, and is very specific if the infection is with *L pneumophila* serogroup I, which accounts for 80% of the cases. It will not identify any of the other Legionella species or serogroups. Culture on selective media is also very specific but takes several days and has a relatively low sensitivity. Serology can only confirm the diagnosis after recovery. Most patients should have sputum sent for urinary antigen testing and culture. Treatment should be with a newer macrolide or a quinolone. In resource-poor settings, erythromycin plus rifampin can be used.

Melioidosis

Burkholderia pseudomallei is distributed throughout most of the world but is endemic in parts of China, Australia, and Southeast Asia. Subclinical infection is common in endemic areas. Risk factors for clinical disease include diabetes, chronic alcoholism, chronic lung disease, and chronic renal disease.[36] Most disease is pulmonary, although bacteremic spread can involve virtually any organ. Pulmonary syndromes include acute pneumonia, chronic pneumonia, and latent pulmonary infection with reactivation. Latent infection can clinically manifest many years after initial exposure. Acute pneumonia has an incubation period of days and has a presentation with fever, productive cough, rigors, and dyspnea that is similar to other bacterial pneumonias.[37] Both subacute pneumonia and reactivation pneumonia are clinically indistinguishable from tuberculosis and some fungal pneumonias manifesting fever, night sweats, productive cough, and hemoptysis. Chest radiographic appearance can vary widely depending on the pulmonary syndrome. In acute pneumonia military nodules, lobar or multilobar consolidation and pleural effusions can be seen. As the disease progresses, cavitation can occur. In chronic melioidosis, infiltrates may be cavitating, nodular, or linear and fibrotic mimicking tuberculosis. The diagnosis of melioidosis is established by culture of sputum and/or blood. *B pseudomallei* is resistant to penicillin, ampicillin, aminoglycosides, and first- or second-generation cephalosporins. Recommended antibiotics include ceftazidine or carbapenems. In severe infections, many would add trimethoprim-sulfamethoxazole. In resource-poor, settings chloramphenicol and trimethoprim-sulfamethoxazole have been used. Initial IV therapy should be given for 2 to 8 weeks depending on the severity of the illness, and then oral therapy with high-dose trimethoprim-sulfamethoxazole to prevent relapse should be continued for at least 3 months.[38]

Plague

Yersinia pestis is widely distributed in the world. It is particularly prevalent in the developing world. In the United States, there is an endemic pocket in the Southwest. Worldwide, the major reservoir is the rat, although in the United States it is the prairie dog. The flea is the vector for transmission from animals. In addition to bubonic and septicemia syndromes, pneumonia can be a manifestation. After a relatively brief incubation period of 2 to 7 days, fever, productive cough, pleuritic chest pain, and often hemoptysis develop. The disease progresses rapidly with cavitation common. Plague pneumonia is not reliably distinguishable from other causes of rapidly progressive necrotizing pneumonia on clinical grounds alone.[39] The diagnosis is confirmed by isolating *Y pestis* from sputum, blood, and/or an aspirate of an enlarged lymph node. Up to 40% of patients have the organism visible on peripheral blood smear. The sputum is highly contagious, and patients should be in strict isolation for the first 48 h of therapy. Treatment needs to be initiated quickly. The traditional medication has been streptomycin. However, a number of other drugs have been shown to have *in vitro* activity and clinical success, including tetracyclines and gentamicin.[40] Postexposure prophylaxis with tetracycline, doxycycline, or trimethoprim-sulfamethoxazole should be administered to all persons with close contact.[41]

Tularemia

Francisella tularensis is only found in the northern hemisphere. Reservoirs are rabbits and small rodents, and the vectors are several different hemophagic arthropods. Pneumonia, one of a number of clinical presentations, begins abruptly after a several-day incubation period. The cough is typically nonproductive. Chest radiographs reveal lobar consolidations, sometimes with hilar adenopathy and pleural effusions.[42] The organism can be isolated from sputum and blood but will not grow on standard media, and it represents a transmission risk for laboratory workers. Although the clinical syndrome is not unique, recognition is greatly facilitated by obtaining a potential exposure history related to outdoor activity. Diagnosis is usually confirmed serologically. Treatment options include streptomycin, gentimicin, tetracyclines, and chloramphenicol.[43]

Hantavirus Infections

New-world hantaviruses such as the Sin Nombre virus, found primarily in the Southwest United States, and strains found in Central and South America cause hantavirus pulmonary syndrome (HPS).[44] Old-world hantaviruses cause hemorrhagic fever with renal syndrome. All medically important hantaviruses have rodent reservoirs. Although person-to-person transmission has been described, most transmission to humans occurs via aerosolization in buildings with heavy rodent infestations.[45] HPS has clinical features that along with a potential exposure history should make it a strong consideration. The incubation period can be relatively long, lasting 1 to 4 weeks before the onset of initial symptoms of a "typical" viral syndrome with fever, headache, nausea, vomiting, and myalgias; respiratory symptoms are generally at presentation. After several days, the abrupt onset of severe tachypnea and dry cough indicates noncardiogenic pulmonary edema due to severe

capillary leak into the lungs. This stage lasts 24 to 48 h and ends with either death in 50% of those infected or a rapid recovery. In addition to the exposure and characteristic clinic history, clues that suggest the diagnosis include thrombocytopenia, hemoconcentration, and circulating immunoblasts.[46] Diagnosis can be confirmed serologically or by polymerase chain reaction on blood. Treatment is supportive. Extracorporeal membrane oxygenation has also been successfully used to sustain patients through the capillary leak part of the illness.[47] No antiviral treatment is presently recommended.

Viral Hemorrhagic Fever

There are a number of viruses that can produce a hemorrhagic fever syndrome. These include yellow fever, dengue, Lassa fever, Rift Valley fever, Crimean-Congo hemorrhagic fever, Marburg, and Ebola. Dengue is widespread throughout the developing world, and yellow fever is endemic in perieequatorial Africa and South America, while the others tend to occur in localized outbreaks primarily in Africa. Incubation period is 1 to 2 weeks. The initial presentations are typical of a viral illness with fever, headache, and myalgias. Pulmonary manifestations are seen and are due to ARDS. These viral infections are diagnosed serologically, and treatment is supportive.

Influenza

Travelers are often in close contact with relatively large numbers of individuals in hotels, airport terminals, ships, and other destinations where tourists congregate. This increases the possibility of exposure to influenza and other respiratory pathogens. In 2003, the Haji pilgrimage was associated with an estimated 24,000 cases of influenza.[48] Influenza is typically a winter-time disease in the temperate regions of both the northern and southern hemispheres, but it circulates throughout the year in equatorial regions. Both the Canadian Committee to Advise on Tropical Medicine and Travel and the US Advisory Committee on Immunization Practices recommend influenza vaccination for a traveler going to the southern hemisphere from April through September and at any time of year when in tour groups if the traveler has not been vaccinated in the previous year. A potential problem with this recommendation is the lack of available vaccine in the "off" season in the northern hemisphere. It is reasonable to consider giving a traveler a treatment dose of oseltamivir to carry if they have been inadequately vaccinated and are in a risk group for severe disease. In addition to this background concern the emergence of Avian influenza (H5N1) in Asia in 2003 has further heightened concerns. Avian influenza is now a firmly established zoonosis in birds in many countries. The risk to humans involves close exposure to poultry; human-to-human transmission remains very uncommon at this time. The WHO does not suggest travel restrictions based on concerns about avian influenza but does suggest avoidance of poultry farms and markets in countries affected by avian influenza. The CDC has offered similar guidelines.[49,50] Additional recommendations regarding travel and avian influenza are listed in Table 3.

Table 3—*WHO and CDC Recommendations for Travelers to Countries With Avian Influenza H5N1*

1. Avoid poultry farms and poultry markets
2. Avoid direct contact with surfaces contaminated with poultry feces
3. Wash hands (or use alcohol-based gels) after touching raw poultry
4. If not vaccinated in the past year obtain influenza immunization prior to travel
5. Avoid ingestion of undercooked poultry or eggs
6. Minimize direct contact with birds

Paragonimiasis

Several species of the fluke, paragonimus, are distributed throughout the world. Most human infections are associated with the Far East and are due to *Paragonimus westermani*. Human infection occurs after the ingestion of undercooked fresh-water crabs or crayfish. After ingestion, the acute larval migratory phase lasts 4 to 8 weeks, and symptoms include abdominal discomfort, pleuritic chest pain, and nonproductive cough. Fever and hemoptysis are rare. Radiologic findings can include pleural effusions and migratory parenchymal infiltrates.[51] Important laboratory clues include eosinophilic pleural fluid and a marked peripheral eosinophilia. After several months, the larva develop into adult flukes and most infections then become asymptomatic. When chronic symptoms occur, the most common are recurrent hemoptysis and pleuritic chest pain. Eosinophilia is no longer present. This can last for many years. The differential diagnostic concerns for chronic paragonimiasis are principally tuberculosis and malignancy.[52,53] During the acute larval migratory phase before adult worms have developed to produce eggs, the diagnosis of paragonimiasis is primarily clinical. After about 2 months, identification of the ova in the sputum or feces confirms infection. Serologic testing is also available. Treatment is highly effective with a 2-day course of praziquantel,[54,55] but triclabendazole (available through the CDC) appears to be as effective or better tolerated.

Schistosomiasis

Pulmonary manifestations of schistosomiasis are uncommon and, if present, generally occur early in the illness as part of the Katayama fever syndrome.[56] Fresh-water swimming in endemic areas of South America, Africa, and Asia exposes the patient to the larva that penetrate the skin. During the initial 2 to 6 weeks of infection, some persons have a hypersensitivity reaction characterized by fever, arthralgias, myalgias, headache, generalized adenopathy, and pulmonary infiltrates with eosinophilia. Nodular infiltrates seem to be particularly common.[57] The diagnosis of Katayama fever is based on an appropriate exposure history and consistent clinical findings. As with paragonimus, it is too early in the infection for eggs to be detectable in the stool. There is no specific treatment for acute pulmonary schistosomiasis. The benefit of praziquantel for acute schistosomiasis is controversial because it only has efficacy against the adult worms. If praziquantel is used for acute infection, it should be administered at about 8 weeks when the adult worms have developed. Corticosteroids are often prescribed to lessen symptoms.[56–58]

Intestinal Nematodes

Strongyloides (*Strongyloides stercoralis*), ascaris (*Ascaris lumbricoides*) and occasionally hookworm (*Necator americanus* and *Ancelostema duodenale*) can all produce a syndrome of pulmonary infiltrates with eosinophilia during the larval migratory phase (Loeffler syndrome). Patients complain of a nonproductive, blood-tinged cough plus dyspnea and occasionally fever. During larval migration, the stool is generally negative, although larva can be identified in sputum specimens. Eosinophils and Charcot Leyden crystals in the sputum should suggest the diagnosis in a recent traveler. The pulmonary syndrome is generally self-limited; however, the infection should be treated. Strongyloides are treated with ivermectin. Ascaris and hookworm are treated with mebendazole. Tropical eosinophilia is a related syndrome, although a more serious disease due to a hypersensitivity reaction and the larval migration of microfilaria. The vector for the filaria is the mosquito, and it can found throughout the tropics, especially India. Diagnostic clues are a very high blood eosinophilia and high IgE levels. Elevations of filarial antibodies support the diagnosis.[59] Diethylcarbamazine has some efficacy, especially when administered early in the infection, but progressive interstitial fibrosis can result even if treated. A number of parasites are associated with the syndrome of pulmonary infiltrates with eosinophilia. They are listed in Table 4.

Table 4—*Possible Infectious Causes of Pulmonary Infiltrates With Eosinophilia*

Paragonimiasis
Schistosomiasis
GI nematodes (Loeffler syndrome)
Strongyloides
Ascaris
Hookworm
Filaria (typical eosinophilia)
Coccidioidomycosis

Histoplasmosis

Histoplasmosis is a fungus that is found throughout the world. It is particularly endemic in the Midwestern United States in the Mississippi and Ohio River valleys. Exposure history often involves soil that has been enriched with bird or bat droppings. Most infections are asymptomatic, but when symptomatic pulmonary disease is the most common manifestation. Mild disease appears as a subacute "flu-like" illness 2 to 4 weeks after exposure with nonproductive cough, myalgias, and fever. Chest radiograph reveals pulmonary infiltrates and hilar or mediastinal adenopathy. In most cases, the symptoms resolve without treatment over several weeks, but a sustained period of asthenia is not unusual. Antifungal therapy is generally not needed in these patients. This form of pulmonary histoplasmosis is not distinctive enough to be able to distinguish it on clinical grounds from other atypical pneumonias; the clue should be in eliciting an exposure history such as working with soil (cleaning a chicken coop) or spelunking in the weeks prior to the onset of symptoms. Heavy exposure results in a much more severe illness after an incubation period of a week. Patients can be severely dyspneic and can progress to respiratory failure. Chest radiographs have a military pattern. There are a number of modalities available for diagnosing acute pulmonary histoplasmosis. The sensitivity of the tests varies with the severity of the syndrome. In mild disease, sputum smear and culture results are rarely positive; urinary antigen testing is better but still only positive in up to 25 to 75% of infected persons, increasing in sensitivity with the severity of the illness. Antibody testing is the most sensitive, although it usually takes at least 4 weeks for antibodies to be detected.[60] If the patient undergoes BAL, the fluid can also be tested for antigen and stained for histoplasma. Culture of this fluid and/or biopsy material has the highest yield but can take several weeks to become positive. Since most acute pulmonary disease is mild and self-limited, most persons do not need treatment. Treatment is generally indicated in severe disease (hypoxia) and in

prolonged disease (no improvement by 2 weeks). Severe disease should be treated with amphotericin B. This can be transitioned to itraconazole as the patient improves. Itraconazole can be used initially in milder symptomatic infection. Although *in vitro* and animal studies[61,62] suggest excellent activity, there is not enough human experience with posaconazole or voriconazole to recommend them and echinocandins should not be used. Steroid therapy is generally indicated when using antifungals to treat histoplasmosis; their use is associated with a rapid clinical improvement and allows a quicker transition to itraconazole. Treatment should be continued for 2 to 3 months.

Coccidioidomycosis

Coccidioides immitis is endemic in the soil of the arid regions of the Western Hemisphere (not just the US southwest). Most infections are subclinical, with acute disease occurring with an incubation period of 1 to 4 weeks in less than one half of those infected.[63] The syndrome is that of an atypical pneumonia with fever, nonproductive cough, myalgias, chest pain, and headache (Valley fever). Erythema nodosum is seen in approximately 10% of cases, and when present is a helpful clue to distinguish coccidioides infection from other causes of community-acquired pneumonia. Erythema multiforme is also associated with infection with this organism. The only unusual laboratory marker is an eosinophilia seen in approximately one fourth of cases. Chest radiographic findings can be normal or may show infiltrates with associated hilar adenopathy. These may result in residual nodules and/or thin-walled cavities. Symptoms resolve in most patients in 2 to 3 months without treatment. Particularly severe infections or infections in persons with impaired cell-mediated immunity often show pulmonary progression and/or dissemination and should be treated. In addition, pregnant women, diabetics, and persons of African or Philippine origin are more likely to have complications. Diagnosis is generally made serologically, although the organism can be isolated from respiratory secretions and coccidioides spherules can occasionally be seen in sputum. When treatment is necessary, imidazoles and amphotericin are used.[64–66]

Q Fever

Coxiella burnetti is found throughout the world. Infection with this organism can produce a number of different syndromes, but one of the more commonly diagnosed is pneumonia. The incubation period is relatively long, 2 to 6 weeks. Pneumonia in Q fever is clinically indistinguishable from other atypical pneumonias with fever, a nonproductive cough, and interstitial infiltrates. The disease is generally mild, although severe cases can occur with about a 1% mortality.[67] Exposure history involves sheep and goats, especially around the time of delivery. A normal leukocyte count is the rule, and thrombocytopenia is frequently seen. Moderately elevated transaminase levels are seen in most patients.[68] The diagnosis is confirmed serologically, and standard treatment is with a tetracycline for 2 weeks, although macrolides, trimethoprim-sulfamethoxazole, and floroquinones all are of benefit. β-Lactam antibiotics should not be used.

Psittacosis

Chlamydophila psittaci (formerly Chlamydia) is found throughout the world, and most infected persons have a history of contact with birds. This disease is clearly not just associated with psittacine birds; many bird species are reservoirs including domestic poultry. The birds may not be ill. Psittacosis presents abruptly with a 1- to 2-week incubation period after bird exposure. It is a systemic illness with a respiratory component characterized by lobar pneumonia syndrome that can occasionally be fatal. Severe headache is a very prominent symptom in most patients.[69] The diagnosis is generally confirmed serologically. Treatment is with tetracyclines or macrolides.

Many other infections can have respiratory symptoms as generally a minor manifestation of the clinical picture. Table 5 list several of the more common travel-related infections.

Approach to the Patient

Because, as noted, respiratory infections have a limited repertoire of signs and symptoms, it is un-

Table 5—*Common Travel-Related Infections With Typically Minor Respiratory Manifestations*

Disease	Comments
Malaria	Cough common; ARDS with *plasmodium falciparum*
Rickettsia (other than Q fever)	Cough; worldwide distribution, tick vector
Typhoid fever	Cough common; pneumonia rare
Dengue	Cough common; worldwide distribution except Europe, mosquito vector
Leptospirosis	Cough common; worldwide distribution, though primarily tropical
Penicillium marneffi	Southeast Asia, AIDS, skin lesion common

likely that one can make a specific diagnosis of an infection on clinical grounds alone. The following can be used as a guideline for approaching the returning traveler with a potential respiratory infection: (1) consider non–travel-related pulmonary problems, including noninfectious causes; (2) consider the itinerary; (3) consider the incubation period; how long after return did the symptoms develop? (4) are there other travelers with a similar illness? (5) were there specific exposures on the trip that might predispose to a particular illness, *eg*, fresh-water swimming and schistosomiasis?

Summary

Travel is common, and most incubation periods for acute infectious pulmonary diseases are long enough that patients may have symptoms after returning home to a health-care system that is not familiar with "foreign" infections. Respiratory infections have a relatively limited repertoire of clinical manifestations, so that there is often nothing characteristic enough about a specific infection to make the diagnosis obvious. Thus, the pathway to the diagnosis of infections that are not endemic in a region relies heavily on taking a thorough history of both itinerary and of specific exposures (*eg*, fresh-water swimming in Africa, caving in Virginia, desert hiking in Arizona). One final caveat is that on occasion, the history of a recent trip creates an element of "tunnel vision" in the evaluating health-care provider. It is tempting to relate a person's problem to that recent trip; however, when evaluating recent returnees it is always important to remember that the travel may have nothing to do with the patient's presentation. Recent travel adds diagnostic considerations to the list of possibilities.

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