Infections in Hispanic Immigrants

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Hispanic immigrants are an increasing portion of the United States (US) population. In addition to being at risk for diseases common in the US-born population, Hispanic immigrants also are at risk for infections that do not usually occur in the US-born population. Thus, such diseases as tuberculosis, neurocysticercosis, brucellosis, typhoid fever, malaria, amebiasis, viral exanthems, and hepatitis need to be considered in Hispanics who present with fever or focal lesions. When included in the differential diagnosis, most of these infections can be readily diagnosed and treated with currently available methods.

The proportion of the US population born in foreign countries has increased during the past 30 years. More than 10% of the US population are now foreign born, and another 10% are the children of immigrants [1, 2]. These US Census Bureau figures likely underestimate the size of the foreign-born US population, because immigrants usually are undercounted. In the past, immigrants were predominantly from Europe. Today, the majority of immigrants to the United States were born in Latin America [1]. Mexico is the most common country of origin [2]. More than 7 million people who were born in Mexico live in the United States and are dispersed throughout the country [2].

RISK FACTORS FOR INFECTIONS

Several infectious diseases that are rare in the native US population occur often in the Latin American population (table 1). Risk factors for these infections include limited access to safe food and water, overcrowding, poor nutrition, and exposure to insect vectors. The infections noted in immigrants from Latin America partly reflect these exposures. For example, fecal contamination is common and results in an increased risk for enteric infections. Animal husbandry practices are less safe in Latin America than in the United States, and meat products are often sold informally without screening for parasites having been done. Milk products may not be pasteurized. Overcrowding and poor nutrition may amplify transmission of Mycobacterium tuberculosis and other respiratory pathogens. These exposures may continue after immigration to the United States [2].

Access to health care also is a problem for Hispanic immigrants. They are less frequently covered by employment-related health insurance [2], and many are reluctant to access government programs, except in emergencies. Language differences also can be a significant barrier to health care access, especially in areas with smaller immigrant populations.

A number of diseases that are common in Latin America are rarely diagnosed in the United States. Diarrhea due to toxigenic Escherichia coli is common among residents of and travelers to Latin America. However, toxigenic E. coli diarrhea is rarely recognized in immigrants because of the short incubation period and the limited duration of the illness. Chagas' disease is rarely diagnosed in immigrants. This may reflect the low prevalence of Chagas’ disease in Mexico, the birthplace of most immigrants to the United States. Confusion of Chagas’ disease with other causes of heart disease is a problem. It is also possible that, because of the long period when individuals with Chagas’ disease are asymptomatic, the number of cases diagnosed may increase with time. Hansen’s disease (formerly known as leprosy) is endemic in Latin America. Although it has a characteristic presentation (hypoesthesia and skin lesions), its incidence is very low in Mexico and Central America, and the disease is uncommon in Latin American immigrants.

TUBERCULOSIS

Tuberculosis, which occurs in nearly one-third of all people worldwide, is a leading cause of death throughout the world.
Table 1. Infectious diseases noted to have increased frequency among Latin Americans throughout the Western Hemisphere.

Diseases acquired abroad
- Tuberculosis
- Neurocysticercosis
- Brucellosis
- Typhoid fever
- Amebiasis
- Malaria
- Intestinal helminthic infection
- Endemic mycoses

Diseases acquired in the United States
- Enteric bacterial infections (due to *Shigella* and *Salmonella* species)
- Hepatitis A
- Measles
- Varicella
- Rubella

Diseases rarely diagnosed in the United States
- Dengue fever
- Enterotoxigenic *Escherichia coli*
- Leptospirosis
- Chagas’ disease
- Leishmaniasis
- Hansen’s disease

Eight million new cases of tuberculosis and an estimated 3 million deaths due to the disease occur annually. Tuberculosis was also the leading cause of death in the United States during the 19th century and the early 20th century. As housing and nutrition have improved, the presence of tuberculosis in the US-born population has been largely confined to low-income minority groups, homeless individuals, and alcoholics.

Similar declines have not yet been achieved in developing countries. Thus, in the United States, tuberculosis increasingly is becoming a disease of immigrants. Since 1995, >40% of patients in the United States who have tuberculosis have been foreign born [4]. More than one-quarter of tuberculosis cases among foreign-born individuals have occurred in immigrants from Mexico. In contrast to the US-born population with TB, foreign-born patients with the disease were less likely to be homeless, unemployed, substance abusers, prisoners, or HIV infected [4, 5]. Cases of tuberculosis among US-born individuals most often appear in clusters, whereas cases among foreign-born individuals are more likely to be unique, a finding that is consistent with foreign born individuals often experiencing reactivation of disease acquired in their homelands.

Most people with tuberculosis present with pulmonary disease. Extrapulmonary disease occurs in >20% of tuberculosis cases among foreign-born persons [4]. Common sites of the disease include the pleura, lymph nodes, bones (especially the spine), peritoneum, CNS, gastrointestinal tract, and genitourinary tract. Because of difficulties in confirming the diagnosis, patients with suspected extrapulmonary tuberculosis may need to initially be treated presumptively. A positive PPD skin test result, a clinical presentation suggestive of tuberculosis, and evidence of granulomatous inflammation (e.g., granulomas on biopsy or lymphocytic pleocytosis or CSF or ascites) are sufficient evidence for a presumptive diagnosis. PCR assays may aid in the diagnosis of meningeal disease.

Foreign-born patients should be treated with 4-drug combinations according to standard guidelines. However, the higher incidence of primary drug resistance among foreign-born patients [4] makes it particularly important to perform culture and sensitivity studies for such patients. Adherence to the long course of therapy required for effective treatment of tuberculosis is problematic. Directly observed therapy is particularly important for immigrants.

Several mycoses are also endemic in Latin America. Coccioidiomycosis is prevalent in northern Mexico and in foci in Central and South America. Histoplasmosis occurs in countries that border the Caribbean Sea and parts of South America. Paracoccidioidomycosis is endemic in much of Latin America. Cryptococcal infection also is seen throughout Latin America.

**NEUROCYSTICERCOSIS**

Neurocysticercosis is caused by CNS infection with the cysticercus form of the parasite *Taenia solium*. Porcine cysticercosis is common throughout Latin America. Humans are the only host for the tapeworm form, which is acquired from undercooked pork that contains cysticerci. After ingestion, the parasite transforms into the tapeworm form, which causes few symptoms. Carriers of the tapeworm may infect themselves or those with whom they have close contact through fecal-oral exposure to eggs, which leads to cysticercosis.

Neurocysticercosis was rarely diagnosed in the United States before 1980. The widespread use of CT and then MRI for the diagnosis of neurologic disease led to an explosive increase in the recognition of cases. Large case series were initially reported from California, with most cases occurring among immigrants from Mexico and Central America. Cases subsequently have been reported throughout the country. Locally acquired cases occur and are sometimes traced to carriers of tapeworms. Currently, 1000–2000 new cases of neurocysticercosis are diagnosed in the United States annually, with the majority occurring in Hispanic immigrants [6, 7].

The clinical presentations of neurocysticercosis vary according to the location and number of parasites and the host inflammatory response [7]. After a period of years during which
no symptoms appear, dying cysticerci lead to an inflammatory response and seizures. Seizures are usually controlled with antiepileptic therapy. These drugs often can be successfully withdrawn after CT findings return to normal and after a period without recurrence of seizures, unless calcifications develop.

Cysticerci in the ventricles can cause obstructive hydrocephalus, a medical emergency that should be approached surgically. Surgical removal of the parasite can often be accomplished endoscopically [8]. An alternative approach is to relieve hydrocephalus by use of a ventriculoperitoneal shunt and then to provide treatment with steroids and antiparasitic drugs.

A few patients present with cysticerci in the basilar cisterns or sylvian fissure, which may cause arachnoiditis or mass effect. Meningismus, communicating hydrocephalus, or vasculitis with strokes also may occur. Patients with arachnoiditis have a poor prognosis unless they are treated aggressively with antiparasitic drugs, corticosteroids, and CSF diversion, as needed for hydrocephalus [9]. Less common sites for cysticerci include the eye, spine, subcutaneous tissue, and muscle. Cerebral edema that results from large numbers of inflamed cysticerci is a rare occurrence for which treatment with antiparasitic drugs is contraindicated.

Neuroimaging studies, such as CT or MRI, are the main diagnostic tests [7, 10]. Cysticerci appear as rounded cystic lesions that are 0.5–2.0 cm in diameter. The appearance on neuroimaging studies of a typical cystic lesion containing a scolex is diagnostic of neurocysticercosis. However, in most cases, imaging studies only reveal lesions that are consistent with but are not diagnostic of cisticercosis (e.g., cystic or nodular lesions without a clear scolex). Diagnosis of neurocysticercosis is nearly certain for patients from areas of endemicity who have a single, round enhancing lesion that is ≤2 cm in diameter, no evidence of systemic disease, and no focal neurologic findings [11]. The immunoblot assay for detection of serum antibody is highly specific, but there are problems with its sensitivity when it is used for patients who have a single lesion or calcifications only. Evidence of exposure, compatible symptoms, and resolution of the lesion (either spontaneously or by the use of antiparasitic drugs) also supports the diagnosis. Revised diagnostic criteria recently have been proposed [10].

The role of antiparasitic drugs in the treatment of neurocysticercosis is controversial. Although albendazole and praziquantel are cysticidal, controlled trials have not demonstrated a clear clinical benefit [7]. At a recent meeting of experts on cysticercosis, it was agreed that patients with only 1 or a few inflamed parenchymal cysticerci do well with symptomatic therapy (e.g., antiepileptic drugs) [12]. There is no role for antiparasitic drugs in the treatment of patients who have calcifications only. Patients with diffuse cerebral edema should be treated with corticosteroids. Subarachnoid cysticerci and cysticerci in the sylvian fissure should be treated with corticosteroids plus antiparasitic agents [9]. However, the dose and duration of therapy for subarachnoid disease are not adequately defined.

BRUCELLOSIS, TYPHOID FEVER, AND INFECTIONS DUE TO ENTERIC BACTERIA

In the United States, brucellosis is mainly caused by Brucella melitensis, which primarily infects goats and sheep. In the animal host, Brucella organisms localize to the mammary glands, from which numerous organisms are shed in milk. Transmission of the organisms is associated with consumption of unpasteurized goat milk or cheese, which are important components of the diet of individuals in northern Mexico. Infections usually occur in immigrants after they return from travel to Latin America. However, contaminated milk products can expose immigrants in the United States to infection [13].

After an incubation period of 2–8 weeks, patients develop a nonspecific febrile illness [14]. Because the clinical manifestations of brucellosis are both subtle and protean in number, diagnosis requires a high index of suspicion. Because cultures of blood or bone marrow samples may require prolonged incubation (up to 4 weeks), serodiagnosis is critical. The serum agglutination test is widely available and reliable. A titer of ≥1:160 allows a presumptive diagnosis to be made. By contrast, the “febrile agglutination” test has poor sensitivity, the Rose-Bengal test has poor specificity, and ELISA has limited availability.

Treatment includes a combination of antibiotics given for ≥6 weeks. Tetracyclines, such as doxycycline, are the mainstay of therapy. Most cases are also treated with an aminoglycoside (either streptomycin or gentamicin) during the first 2 weeks [15, 16]. Rifampin can be used as an alternative to the aminoglycosides, and trimethoprim-sulfamethoxazole can be used as an alternative to doxycycline in pregnant women or young children.

Typhoid fever is a systemic infection caused by Salmonella typhi. Each year, 16 million cases occur worldwide, primarily in areas with limited access to safe food and water. Occasional outbreaks of typhoid fever in the United States have been traced to infected food handlers, many of whom are immigrants from Latin America. After an incubation period of a few days, gradual onset of fever and enteric symptoms develop. Diagnosis is made by culture. Blood cultures are usually positive for S. typhi. Bone marrow cultures are more sensitive for the detection of S. typhi but usually are not needed. Results of urine cultures are often positive for S. typhi early in the course of disease, and stool culture results are more likely to be positive later in the course of disease. Fluoroquinolone antibiotics are the treatment of choice. Alternatives include ceftriaxone and azithromycin.
Older antibiotic agents are effective if isolates are susceptible, but resistance is an increasing problem [17].

Enteric infections with Salmonella and Shigella species and other diarrheal illnesses are also more common among Hispanic immigrants. Some of these infections are associated with travel or recent immigration. Infections also occur in the United States as a result of exposure to carriers and poor sanitary conditions.

**MALARIA**

Malaria remains a major public health problem worldwide. Most malaria cases diagnosed in the United States occur among immigrants and their children either shortly after immigration or after their return from travel to their homelands. In contrast to malaria transmission in sub-Saharan Africa, malaria transmission in Latin America is uncommon in major population centers. Thus, although high rates of transmission occur in the Amazon River basin and the forests of Central America, only scattered cases occur elsewhere.

Diagnosis of malaria depends on evaluation of blood smears for intraerythrocytic parasites. Treatment varies with the species and site of acquisition. Most US cases of malaria that were acquired in Latin America are caused by Plasmodium vivax and can be treated with chloroquine initially. Chloroquine does not affect the latent hepatic forms of malaria, so primaquine is used to prevent relapse. Because primaquine can cause severe hemolysis in patients who lack glucose-6-phosphate dehydrogenase, levels of glucose-6-phosphate dehydrogenase should be checked before primaquine is administered. Resistance to both chloroquine and primaquine rarely occurs in the Americas [18].

Infection due to Plasmodium falciparum occasionally is acquired in Central America and is common in the Amazon River basin. To date, strains from west and north of the Panama Canal have been found to be chloroquine susceptible. Strains from South America may be chloroquine resistant and should be treated with quinine (or with quinidine, if parenteral therapy is needed) plus doxycycline, atovaquone-proguanil, or melquon.

**AMEBIASIS AND OTHER INTESTINAL PARASITES**

Worldwide, 500 million persons are infected with Entamoeba organisms. However, most infections are due to the nonpathogenic species Entamoeba dispar rather than the invasive organism Entamoeba histolytica. In the United States, most cases of amebiasis are imported [19] and are diagnosed among Mexican immigrants.

Intestinal disease classically presents as dysentery with bloody diarrhea, abdominal pain, and tenesmus [20]. Diagnosis has relied on demonstration of the trophozoite forms in the stool. Antigen-detection assays that are specific for E. histolytica are commercially available. Endoscopic studies may reveal hemorrhagic colitis and demonstrate typical flask-shaped ulcers.

Extraintestinal disease primarily involves the liver [19, 20]. Its onset typically occurs several weeks after individuals return from an area of endemicity. Patients present with fever, anorexia, and abdominal pain. Laboratory tests usually reveal leukocytosis with a left shift. Most patients have elevated alkaline phosphatase and/or transaminase levels. Imaging studies (e.g., ultrasound and CT scan) reveal 1 or more hypodense lesions in the liver. Pleural, pericardial, and pulmonary diseases are also seen. Diagnosis can be confirmed by assays for antibody detection. Antigen-detection assays that use serum are positive if sent before initiating treatment [21]. If they receive empiric treatment, most patients will demonstrate a lessening of fever within 1–2 days [19]. Treatment should include administration of metronidazole and a second drug (e.g., iodoquinol) for the cyst phase in the lumen.

Other intestinal parasites are common in Latin America but rarely cause significant disease. Ascaris, hookworm, Trichuris, and Hymenolepis infections are all highly endemic.

**VACCINE-PREVENTABLE VIRAL INFECTIONS**

The Advisory Committee on Immunization Practices (ACIP) recommends routine childhood immunization to prevent measles (rubeola), rubella, mumps, varicella, hepatitis B, and poliomyelitis. Measles and polio vaccines are administered as part of routine immunization programs for children in all countries in the Americas. Plans have been made to add rubella to the list of diseases for which routine vaccination is given [22]. In the United States, vaccination coverage rates have been lower among Hispanic children for the following reasons: decreased access of Hispanics to health care, families frequently moving to new locations, and decreased use of preventive services [23]. Because many Hispanic immigrants return to their country of origin or receive visitors from their native country, they have increased exposure to viral diseases. These vaccine-preventable infections have incubation periods of no more than a few weeks’ duration. Thus, disease in Hispanic populations is the result of introduction and transmission of the virus into a population with increased susceptibility. These infections can also spread to non-Hispanic neighbors [24].

**Hepatitis A.** The ACIP recommends the routine use of hepatitis A vaccine for individuals in high-risk communities, including those who live in communities in which such disease is highly endemic [25]. Hepatitis A is more common among Hispanics than among non-Hispanics [24], and its prevalence is much higher among Hispanic children who live in rural communities (colonias) along the Texas-Mexico border [26].
These communities often have substandard housing, water, and sewage sanitation systems. Although hepatitis A infection usually is asymptomatic in children, children can serve as sources for virus transmission. Symptomatic hepatitis usually occurs in adults. The frequency with which children who are either immigrants or the children of immigrants engage in return travel to their homelands further suggests that use of the hepatitis A vaccine should be part of routine care for such children.

**Measles (rubeola).** The most recent large measles epidemic in the United States occurred from 1989 through 1991. Low rates of immunization of preschool children and young adults played a major role in the epidemic, and Hispanics were disproportionately affected. After the recommendation guidelines for measles immunization were revised, national infection rates decreased to all-time lows. However, epidemic transmission of measles continues to occur in Bolivia, Brazil, Argentina, and the Dominican Republic [27], and there is an excess incidence of measles along the United States–Mexico border, compared with that noted in other parts of the United States [24].

**Rubella and mumps.** From 1997 through 1999, a total of 792 cases of rubella were reported in the United States [28]. Approximately 80% of the cases occurred in individuals 15–44 years of age, and ~75% of patients were Hispanic, including the mothers of 20 of 24 children with laboratory-confirmed cases of congenital rubella syndrome. All countries in the Americas now offer universal childhood immunization for rubella, but many of these countries have only recently instituted routine immunization. Thus, young Hispanic women often are susceptible to rubella. The ACIP recommends ascertainment of the rubella immune status of foreign-born persons and vaccination of susceptible persons during routine outpatient care or at discharge from a medical facility. Vaccination of susceptible postpartum women at the time of their discharge from a hospital, birthing center, or abortion clinic could prevent up to one-half of the cases of congenital rubella syndrome [29].

There also is a higher incidence of mumps along the United States–Mexico border, compared with the incidence of mumps in other parts of the United States [24]. Until recently, mumps vaccination has not been a part of routine childhood immunization in many Latin American countries.

**Varicella.** During 1998, most varicella-associated deaths in the United States occurred among persons ≥20 years of age [30]. For unknown reasons, persons raised in tropical areas are less frequently infected during childhood, so the adult population remains susceptible. Varicella vaccination is recommended for all susceptible persons >13 years of age who are at high risk for exposure to or transmission of varicella organisms, including nonpregnant women who are of childbearing age and adolescents and adults who live in households with children [30].

**Poliomyelitis.** The Western Hemisphere was declared poliovirus free in 1994. However, in 2000 and 2001, twelve cases of laboratory-confirmed poliomyelitis were identified in the Dominican Republic [31, 32]. The epidemic was caused by a strain of poliovirus type 1, which apparently was derived from the oral vaccine strain but which has neuropathogenicity and transmissibility characteristics typical of wild-type virus [31].

**OTHER VIRUSES**

Dengue fever is spread by mosquitoes of the genus *Aedes.* All 4 serotypes associated with dengue fever have been identified in Latin American countries. The incubation period is 4–7 days, and clinical manifestations of the disease include abrupt onset of fever, rash, and severe pain. Although >300,000 cases were reported annually in Latin America in 1997 and 1998, <100 cases were reported in the United States during the same period [33]. A few cases were acquired on the US side of the Mexican border [34]. The risk of infection is limited to persons who have recently traveled to areas of endemicity or who live in such areas. Serologic assays are used for diagnosis.

Yellow fever is endemic in several countries in Latin America, but it is rarely seen in immigrants. Human T cell lymphotropic virus type 1 (HTLV-1) also is endemic in parts of Latin America (in the Caribbean basin and parts of South America). The most common diseases associated with HTLV-1 infection are tropical spastic paraparesis (also called “HTLV-1–associated myelopathy”) and adult T cell leukemia and/or lymphoma.

**SUMMARY**

Hispanic immigrants are an increasing portion of the US population and are at increased risk for some infections that are unusual in the US-born population. Such diseases as tuberculosis, neurocysticercosis, brucellosis, typhoid fever, amebiasis, viral exanthems, and hepatitis need to be considered in Hispanics who present with fever or focal lesions. When included in the differential diagnosis, most of these infections can be readily diagnosed and treated with currently available methods.

**References**

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