pathogens (*Leishmania* species) are endemic throughout much of southwest and central Asia, their associated diseases have occurred in veterans returning from several recent conflicts there. The widespread distribution of various species of *Leishmania* elsewhere throughout the developing world suggests that leishmaniasis may complicate future conflicts as well.

Leishmaniasis may present clinically as cutaneous, mucocutaneous, or visceral disease; all forms are transmitted to humans by the bite of infected phlebotomine sandflies via zoonotic (small mammal) reservoirs. In rare circumstances, infection may be transmitted through blood transfusion. Transmission to humans is enhanced by factors that bring them into close proximity to animal reservoirs, such as life in dense, mobile populations; disruption of ecologic niches; and infrastructural breakdown. All these factors are common sequelae of war.

At least 1300 cases of cutaneous leishmaniasis caused by *L. major* or *L. tropica* have been diagnosed in American soldiers deployed to Iraq and Afghanistan over the past decade; however, the actual burden of infection may be higher due to underreporting, as lesions spontaneously resolve in many cases. The infection manifests clinically as one or more chronic, painless skin ulcers or nodules that may persist for 6–12 months. Rarely, lesions of cutaneous leishmaniasis may disseminate locally or diffusely.

Visceral disease (*kala-azar*) is typically caused by *L. donovani* and may be life-threatening. There have been at least five confirmed reports of U.S. veterans returning from recent deployments with classic visceral leishmaniasis associated with chronic fever, weight loss, pancytopenia, hypergammaglobulinemia, and organomegaly. As systemic leishmanial infection is known to manifest clinically years after exposure and may recrudesce if host immunity wanes due to unrelated causes, it remains possible that additional cases may yet surface.

Chronic Diarrhea Although acute bacterial gastroenteritis remains a major noncombat cause of morbidity and duty days lost during troop deployments, chronic illness is unusual. However, selected bacterial and parasitic enteric pathogens may cause chronic infections or illnesses in returning veterans. Although such infections have been uncommonly noted in recent deployments, they pose potential threats in future wars because of their worldwide prevalence.

Giardiasis **(Chap. 254)**, amebiasis **(Chap. 247)**, and cryptosporidiosis **(Chap. 254)**, which usually cause self-limited protozoal gastroenteritis in immunocompetent hosts, may result in persistent symptoms in immunocompromised populations or when complicated by secondary illness. *Giardia* infection has been associated with chronic diarrhea due to postinfectious irritable bowel syndrome and with chronic signs and symptoms of systemic illness in association with postinfection fatigue or protein-losing enteropathy. Cryptosporidiosis also may cause chronic diarrhea or malabsorptive syndromes in immunocompromised individuals. Amebic infection of the colon may be associated with several serious complications, including perforation, fistulae, and obstruction; extraintestinal spread of amebiasis may result in hepatic invasion leading to abscess formation.

Systemic Illness Due to Enteric Pathogens Certain helminthic infections are endemic in many parts of the developing world and may pose continuing risks to infected military personnel after their return. Larvae of the intestinal nematode *Strongyloides stercoralis* **(Chap. 257)** either may be passed in the feces and develop into the infective stage in the external environment or may persist in the human small intestine and initiate new infective cycles in a process known as *autoinfection*. Autoinfection with *Strongyloides* may result in chronic clinical manifestations such as pruritus, rash, abdominal pain, weight loss, diarrhea, and eosinophilia. In immunocompromised hosts, chronic strongyloidiasis may cause a life-threatening hyperinfection syndrome, likely triggered by high parasite burdens and resulting in a multiorgan, systemic illness consistent with severe inflammatory response syndrome. In some cases, *Strongyloides* hyperinfection syndrome may be complicated by gram-negative sepsis or meningitis related to bacterial seeding from parasitic involvement of the lungs or gastrointestinal tract. Although not described in association with recent wars, chronic strongyloidiasis was an uncommon phenomenon affecting a small number of World War II and Vietnam War veterans; one study estimated that there were up to 400 affected individuals still living in Great Britain. The pathogen may pose a risk to troops deployed in the future to tropical and subtropical regions of the world where the parasite is endemic.

Chronic schistosomiasis **(Chap. 259)** results from intravascular infection by trematode parasites whose larval forms penetrate the skin of humans through contact with freshwater inhabited by the snail intermediate host. The pathogens are widely distributed throughout large portions of the developing world. A chronic inflammatory response in the portal circulation to the eggs of *S. mansoni* and *S. japonicum* leads to fibrosing disease in the liver and eventually to cirrhosis. Similar pathophysiologic events occur in the vascular plexus of the human genitourinary tract in response to chronic *S. haematobium* infection, leading to fibrosing changes in the human bladder and ureters—a precursor to bladder cancer. Rarely, individuals with chronic schistosomiasis develop a syndrome of persistent or relapsing bacteremia with *Salmonella typhi*, which is the etiologic agent of typhoid fever and is not otherwise a typical infectious cause of chronic disease in veterans.

Other Chronic Infections/Syndromes Awareness of the potential threat of troop exposure to agents of biological warfare **(Chap. 261e)** has been heightened over the past two decades by revelations regarding Iraq's state-sponsored chemical weapons program in the 1990s, the known broad availability of such technology, and escalations of global and geopolitical conflicts as well as of international acts of terrorism. Most of the high-risk pathogens posing a threat of bioterrorism cause acute clinical manifestations; however, selected agents, such as those causing Q fever and brucellosis, may result in chronic diseases, whether exposure is natural or intentional. Isolated cases of naturally acquired Q fever and brucellosis have been reported in recent U.S. veterans of the wars in Iraq and Afghanistan. To date, there has been no confirmed evidence of infections related to exposure to biological weapons in returning war veterans.

HIV-1 infection **(Chap. 226)**, ubiquitous throughout the world, continues to pose a potential bloodborne and sexually transmitted risk to soldiers engaged in armed conflict in high-prevalence areas. Several reports describe war veterans returning to their countries of origin harboring HIV-1; in some of these cases, novel viral genotypes have been imported into the population. Tuberculosis **(Chap. 202)** also is endemic throughout much of the developing world and is prevalent in several areas of recent multinational conflicts. Although there is no evidence that active, chronic tuberculosis has affected veterans of recent wars, the rate of tuberculin skin test conversion, which indicates new infections, was noted to be 2.5% among U.S. military personnel deployed to southwest Asia in the early 2000s.

Several chronic infections that pose a risk to war veterans tend to recur or become clinically active in immunocompromised individuals and may be particularly aggressive in this population. Latent infections such as leishmaniasis, tuberculosis, histoplasmosis, brucellosis, Q fever, and strongyloidiasis in otherwise healthy veterans returning from war may become clinically expressed only much later in the setting of chronic glucocorticoid use, monoclonal antibody therapy, organ transplantation, cytotoxic chemotherapy, advanced HIV-1 disease, hematologic malignancy, or other immunosuppressive conditions. Thus, physicians should remain vigilant regarding the potential development of symptomatic disease due to such latent microbes in immunologically compromised veterans who may have initially acquired an infection years previously while serving in the military.

A number of syndromes of possible infectious etiology, some of which may present with chronic clinical manifestations, have been noted in veterans returning from recent wars. After the Gulf War in 1990–1991, numerous veterans from several countries experienced constellations of various common, nonspecific symptoms, including fatigue, musculoskeletal pain, sleep disturbances, and difficulty concentrating. Despite exhaustive investigations and several hypotheses regarding potential etiologies of this chronic multisystemic illness, including infectious agents, no unifying or single cause has been identified. In a randomized, placebo-controlled trial, a prolonged course of