

Cutaneous Manifestations of Neglected Infectious Diseases in US Military Personnel

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PRACTICE POINTS

- Military personnel stationed overseas are at risk for encountering infectious organisms that are not regularly observed domestically—many of which have cutaneous manifestations.
- Health care professionals treating military personnel should consider uncommonly encountered infections in the differential diagnosis for certain dermatologic presentations.
- Clinicians should inquire if patients have been stationed in *Coccidioides immitis*-endemic areas prior to the initiation of immunosuppression.

Infectious diseases continue to pose a substantial threat to the health and operations of military personnel around the world. Deployment to endemic regions, environmental exposures, and trauma increase susceptibility to both common and rare pathogens. Many of these infectious agents manifest with dermatologic findings that may serve as early clinical indicators, particularly in austere environments where diagnostic resources are limited. This review describes select rare infectious agents encountered by United States military personnel that manifest with cutaneous findings. Epidemiologic risk factors, geographic considerations, and practical management strategies are discussed to aid clinicians practicing in resource-limited settings. Prompt recognition of these conditions is essential to ensure timely diagnosis and treatment of affected patients.

Infectious diseases historically have posed major challenges to the operations and health of military forces. In recent conflicts, nonbattle injuries including infections have caused more evacuations than combat trauma.¹

Deployment to endemic regions, poor sanitation, and trauma increase susceptibility to both common and rare infections, many of which have cutaneous manifestations.

Surveillance programs such as the Armed Forces Health Surveillance Division serve a critical role in monitoring outbreaks among deployed personnel.² Cutaneous manifestations of systemic disease often serve as early clinical indicators, especially in settings with limited diagnostic resources. This review describes rarely encountered infectious agents for which US military personnel are at increased risk and outlines management strategies for clinicians practicing in austere environments.

EPIDEMIOLOGIC RISK FACTORS IN MILITARY POPULATIONS

United States military personnel face an elevated risk for infectious diseases when deployed in tropical and subtropical regions where endemic pathogens are prevalent. Exposure to soil, water, and insect vectors facilitates transmission. Direct exposure during combat or training combined with high-density housing, combat-related trauma, and constraints on hygiene access during operations increases infection risk.³

REGION-SPECIFIC PATHOGENS Middle East

Leishmania species—*Leishmania*, a protozoa transmitted via sand fly bites, has caused multiple documented outbreaks among US troops in Iraq and Afghanistan, with a reported incidence of 14%.⁴ Leishmaniasis can present as 3 main clinical variants: cutaneous, visceral, and mucocutaneous. Cutaneous leishmaniasis typically manifests as painless ulcers covered with hemorrhagic

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The authors have no relevant financial disclosures to report.

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Cutis. 2026 April;117(4):118-121. doi:10.12788/cutis.1373

crusts on exposed regions of the body. While typically self-limited, lesions frequently result in irreversible scarring. Many *Leishmania* species respond well to antimonials such as sodium stibogluconate. Preventive measures include wearing protective clothing and sleeping inside insecticide-treated bed nets.⁵

Coxiella burnetii—*Coxiella burnetii* transmits through inhalation of aerosolized particles originating from the urine, feces, birth products, or milk of infected bovine. In 2003, a small number of cases were identified in US service members exposed to livestock while serving in Iraq.⁶ Outbreaks also occurred during World War II, but it is unclear whether they were caused by naturally occurring *C burnetii* or biowarfare.⁷ Though primarily a systemic illness with severe pneumonia, Q fever may manifest with an associated purpuric or morbilliform rash.⁸ Doxycycline is recommended both for treatment and empiric coverage.⁶

Acinetobacter baumannii—This multidrug-resistant organism is known to infect combat wounds and is associated with nosocomial outbreaks in military hospitals. Studies suggest environmental contamination and health care transmission contribute substantially to outbreaks in military hospitals.⁹ Cutaneous manifestations can include cellulitis with a peau d'orange appearance or necrotizing fasciitis; however, pneumonia and bacteremia have been reported. Prompt culture and antibiotic initiation with debridement are essential for treatment.¹⁰ Antibiotic stewardship and strict infection control are critical to prevent outbreaks and limit resistance.⁹

Africa

Plasmodium species—Malaria remains a life-threatening disease found in tropical and subtropical areas around the world. Despite preventive measures, 30 cases among US service members were reported in 2024.¹¹ Cutaneous findings include purpura fulminans, petechiae, acral necrosis, or reticulated erythema.¹² Service members stationed in endemic areas should take prophylactic antimalarials. Symptoms include fevers, headaches, and malaise, with possible rapid deterioration.¹³

Mycobacterium ulcerans—*Mycobacterium ulcerans* causes extensive necrotic ulcers—commonly known as Buruli ulcers—which generally begin as a nodule, plaque, papule, or edematous lesion, eventually progressing to extensive ulceration. Despite no documented cases of US personnel contracting Buruli ulcers, those stationed in endemic regions remain at risk. Environmental reservoirs of *M ulcerans* are unknown, but its DNA has been isolated from water sources.^{14,15} These ulcers take months to heal, making wound management and antimycobacterial therapy essential. Primary preventive measures include avoidance of swimming in rivers or agricultural work in endemic areas.¹⁴

Mpox Virus—During the 2022 mpox outbreak, male service members who engaged in sexual activity with other men were at the highest risk, with 88.8% of infected

service members reporting this practice.¹⁶ While the virus is endemic to Africa, 89.0% of cases were reported from service members stationed in the United States.¹⁷ Typical infection results in fever, headache, lymphadenopathy, and myalgias, followed by a facial rash that spreads over the body, palms, and soles. Safe-sex practices help prevent transmission, and there is a vaccine available for high-risk patients.¹⁶

Southeast Asia

Leptospira species—*Leptospira* is an aerobic spirochete found in tropical regions worldwide. Transmission occurs when water contaminated with urine from infected animals exposes humans to the organism. Infection manifests as a mild febrile illness, though approximately 10% of patients develop Weil syndrome, consisting of conjunctival suffusion, jaundice, and acute kidney injury. Treatment and prophylaxis include doxycycline, but severe disease warrants intravenous antibiotics.^{17,18} A 2014 outbreak among Marines in Japan highlighted poor prophylactic compliance as a key risk factor.¹⁹ Proper education for those at risk is essential to prevent future outbreaks.

Mycobacterium leprae—Leprosy is an acid-fast mycobacterium that remains endemic in the Pacific Islands and Southeast Asia. Case reports of US service members diagnosed with leprosy exist, though only in patients who emigrated from endemic areas.²⁰ This disease has a spectrum of manifestations depending on the immune response, with tuberculoid leprosy showing a cell-mediated (T helper 1) response and lepromatous leprosy having more of a humoral (T helper 2) response.²¹ It manifests with hypopigmented anesthetic macules and peripheral neuropathy. Diagnosis is made by skin biopsy, which shows perineural lymphohistiocytic inflammation and non-necrotizing granulomas.²⁰ The infection typically is curable with a multidrug regimen.²¹

Strongyloides stercoralis—This nematode causes infection by transdermal penetration of bare feet. They then migrate to the lungs where the patient coughs and swallows the nematode into the gastrointestinal tract. *Strongyloides stercoralis* autoinfect by penetrating the intestinal wall, resulting in chronic digestive, respiratory, and cutaneous symptoms. Worldwide prevalence of *S stercoralis* infection is estimated to be 10% to 40%, with foreign-born US military members at increased risk compared to the general military population.^{22,23} Larva currens may manifest with a pruritic erythematous plaque at the site of penetration that progresses to an intensely pruritic, creeping dermatitis as the nematode migrates under the skin. Avoidance of barefoot soil exposure and treatment with ivermectin are effective preventive and therapeutic measures.²³

South America

Ancylostoma braziliense—Found throughout the subtropical world, this hookworm primarily infects dogs and cats and is found in their stool. Larva currens has a similar manifestation and life cycle to cutaneous larva

migrans, but autoinfection does not occur. Transmission occurs similarly to *S stercoralis* and responds well to oral albendazole or ivermectin; however, the infection is self-limited.²⁴ Military cases have been reported,²⁵ though overall morbidity remains poorly characterized.

Dengue Virus—An arbovirus transmitted by *Aedes* mosquitoes, dengue remains a major military threat. Service members in the Vietnam War experienced an attack rate as high as 80%.^{26,27} Infection often manifests with retro-orbital pain and a morbilliform rash that occurs 2 to 5 days after fever, though severe cases may progress to hemorrhagic dengue with skin petechiae or ecchymosis.²⁸ Immediate intervention is essential in symptomatic patients to prevent life-threatening progression. There are no dengue vaccines approved by the US Food and Drug Administration for adults, thus military personnel in endemic areas remain at risk.²⁷

Trypanosoma cruzi—Chagas disease is transmitted when a reduviid infected with *T cruzi* bites and defecates on the patient's skin. A skin nodule (chagoma) or painless eyelid edema (Romaña sign) may appear at the site of parasite entry. Chronic disease may result in dilated cardiomyopathy.²⁹ Several cases of Chagas disease have been reported in South American military operations, including an outbreak in 9 Columbian military personnel.³⁰ Cases in the southwestern United States have recently emerged, emphasizing the need for increased awareness.³¹ Proper insect repellent helps to ward off reduviid bugs. Nifurtimox and benznidazole are the only drugs with proven efficacy against *T cruzi*.²⁹

Continental United States of America

Coccidioides immitis—The first reported case of coccidioidomycosis was described in 1892 in a service member with debilitating masses and ulcers.³² Endemic to arid regions of the western United States, coccidioidomycosis affects military trainees at rates up to 32% annually in high-risk settings.³³ Primary infection occurs in the lungs and may spread hematologically. The fungi prefer dry desert soils, which may aerosolize during military maneuvers. Coccidioidomycosis occasionally causes erythema nodosum, and diffuse infection shows verrucous plaques, ulcers, or abscesses. Dust avoidance and mask wearing are advised for those in endemic regions. Ketoconazole and amphotericin B are the only treatments approved by the US Food and Drug Administration.³² When starting immunosuppressive drugs, clinicians should inquire if patients have previously been stationed in *Coccidioides*-endemic areas, such as Fort Irwin, California, to avoid reactivation of the fungi.³³

Francisella tularensis—Acquired via ticks or contact with wild animals, tularemia causes an ulceroglandular disease with regional lymphadenopathy. Inoculation requires as few as 10 to 25 organisms; thus it is considered a Category A agent for bioterror.³⁴ Natural outbreaks have occurred during war times, most recently during the civil wars in Bosnia and Kosovo.³⁵ Patients may present with

a painful ulcer that enlarges to form a plaque with raised borders. Personnel in wooded areas should use tick precautions and handle wild animals cautiously. Treatment includes gentamicin for severe disease, with tetracyclines effective in mild cases.³⁴

PREVENTION AND MANAGEMENT STRATEGIES IN AUSTERE SETTINGS

For health care professionals practicing in military settings, austere environments can provide a challenge for diagnosis of neglected diseases. Despite a lack of advanced diagnostic tools, practical options can be applied to the diagnostic process; for example, teledermatology is utilized for treatment of service members deployed to remote environments.³⁶

Management of uncommon infectious diseases in military personnel often requires treatments outside those practiced in domestic clinics. Field management may indicate prompt empiric therapy while balancing the risks of overtreatment against those of missed diagnoses³⁷; however, medical evacuation to a higher level of care may be indicated in patients with severe presentations to expedite diagnosis and treatment.³⁸

Prevention remains the primary goal to avoid local outbreaks. Long-sleeved uniforms, DEET (N, N-diethyl-meta-toluamide)-based repellents, permethrin-impregnated clothing, and bed nets are effective for vector protection. Prophylactic medications and vaccinations often are provided when personnel are deployed to endemic locations.³⁹

Onsite entomology teams also can provide surveillance of the local insect populations. They may contribute to vector control through insecticide application and environmental modification. The Armed Forces Health Surveillance Division and the Global Emerging Infections Surveillance Program monitor infectious threats in real time to locate any potential outbreaks, guiding operational responses.⁴⁰

FINAL THOUGHTS

Dermatologic signs often provide early evidence of infection in military personnel. With increasing antimicrobial resistance and the emergence of new pathogens, it is imperative for clinicians treating members of the military to recognize cutaneous signs, employ efficient diagnostic strategies, and encourage proactive prevention. A collaborative approach spanning dermatology, infectious disease, and public health is essential to protect the modern service member.

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