

Medical Force Protection: Bolivia

Medical Force Protection countermeasures required before, during, and after deployment to Ecuador are as follows:

Major Threats

Diarrheal disease, viral hepatitis A, typhoid and paratyphoid fever, malaria, dengue fever, Venezuelan Equine Encephalitis, leishmaniasis, sexually transmitted diseases, rabies (primarily from stray dogs), heat injury, industrial pollution, and altitude sickness (central region).

Presume local water sources are not safe for drinking.

Requirements before Deployment

1. **Before Deploying report to Medical to:**
 - a. Ensure your immunizations are up to date, specific immunizations needed for area: **Hepatitis A, MMR, Typhoid, Yellow fever, Tetanus (Td), and Influenza.**
 - b. If you have not been immunized against Hepatitis A (two dose series over 6 months) get an injection of Immunoglobulin with the initial Hepatitis A dose.
2. **Malaria Chemoprophylaxis:** Risk in areas below 2,500 meters (8,202 feet) in the following departments: Beni, Cochabamba, Chuquisaca, La Paz, Pando, Santa Cruz, and Tarija. Drug resistant strains are present in some locales (chloroquine and possibly Fansidar). Increased risk for malaria occurs countrywide between February and August at elevations below 2,000 meters, primarily in rural areas.
3. **Recommended regimen: Mefloquine 250mg per week** begun 2 weeks prior to entering country and continued weekly until 4 weeks after return from country.
Personnel in flight status: Doxycycline 100mg per day begun 2 days before entering country. Continue daily while in country and until 28 days after return.
Terminal prophylaxis (for both chemoprophylaxis regimens): **Primaquine 15 mg per day** for 14 days starting on day of departure from country of risk. **G6PD status must be determined prior to starting Primaquine.**
4. **Get HIV testing if not done in the past 12 months.**
5. **Complete attached Pre-Deployment Screening form and turn into your Medical Section.**
6. **Make sure you have or are issued from unit supply: DEET, permethrin, bednets/poles, sunscreen and lip balm. Treat utility uniform and bednet with permethrin.**

Requirements during Deployment

1. Consume food, water, and ice only from US-approved sources; "**Boil it, cook it, peel it, or forget it**".
2. Involve preventive medicine personnel with troop campsite selection.
3. Practice good personal hygiene, hand-washing, and waste disposal.
4. Avoid sexual contact. If sexually active, use condoms.
5. Use DEET and other personal protective measures against insects and other arthropod-borne diseases. Personal protective measures include but are not limited to proper wear of uniform, use of bed nets, and daily "buddy checks" in tick and mite infested areas.
6. Continue malaria chemoprophylaxis.
7. Minimize non-battle injuries by ensuring safety measures are followed. Precautions include hearing and eye protection, enough water consumption, suitable work/rest cycles, and acclimatization to environment and stress management.
8. Eliminate food/waste sources that attract pests in living areas.
9. Avoid contact with animals and hazardous plants.
10. Consider **Acetazolamide (Diamox) 250 mg every 6 – 12 hours** for 1 – 2 days before ascent and continued for 48 hours **if traveling to elevations >2,500 meters**.

Requirements after Deployment

1. Continue malaria chemoprophylaxis.
2. Begin terminal malaria prophylaxis as described above.
3. Receive preventive medicine debriefing after deployment.
4. Seek medical care immediately if ill, especially with fever.
5. Get HIV and PPD testing as required by your medical department or Task Force Surgeon.

BOLIVIA
DISEASE VECTOR RISK ASSESSMENT PROFILE
(VECTRAP)

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1. **GEOGRAPHY:** **Area** - 1.1 million sq. km. (425,000 sq.mi.); about the size of Texas and California. **Cities** - **Capital** - La Paz (Administrative pop. 976,000); Sucre (judicial 105,000). **Other Cities** - Santa Cruz (529,000) Cochabamba (403,00). **Terrain** Major geographic zones: High plateau (altiplano), temperate and semitropical valleys, and the tropical lowlands. **Climate** - Varies with altitude from humid and tropical to semiarid and cold.

2. **VECTOR-BORNE DISEASES:**

a. **MALARIA:** *Plasmodium vivax* and *P. falciparum* are endemic year-round, country-wide at elevations below 2500 meters. Risk-free areas include urban areas and highlands of La Paz province, the province of Oruro, and the cities of Cochabamba, and Sucre. Malaria transmission is elevated in El Beni province, particularly in the northern areas (River Yata region). An epidemic occurred in 1988 in Chuquisaca, Cochabamba, and Tarija Departments, east of the Andean Cordillera. *P. vivax* is the most prevalent form of malaria in Bolivia. However, the incidence of *P. falciparum* (13%) is increasing country-wide. It is found in all rural areas below 2500 meters east of the Andes, except Chuquisaca and Tarija Departments. Chloroquine resistant *P. falciparum* malaria (CRPF) is reported primarily in the North central lowlands (Beni Dependency) and along the border with Brazil, although CRPF likely occurs in all falciparum-endemic areas. The risk of acquiring malaria is considered high in endemic areas without proper chemoprophylaxis and would result in a serious loss of combat effectiveness.

b. **DENGUE FEVER:** Dengue is a year-round risk. It is associated with the presence of mosquito vector populations. Risk may be higher in urban areas at elevations below 1,200 meters. A dengue fever epidemic occurred between Dec 87-Mar 88 and affected parts of Santa Cruz and Tarija, particularly the city of Santa Cruz. There have been reports of a dengue-like illness, possibly attributable to Mayaro virus. The suspected urban vector is *Aedes aegypti*. Once acquired, dengue fever would seriously reduce combat effectiveness.

c. **YELLOW FEVER:** During 1996, outbreaks of yellow fever caused 30 cases and 21 deaths which occurred in endemic zones of three provinces of Cochabamba Department and one province of La Paz Department. At the end of the year a further outbreak occurred and continued into January and February 1997 in Cochabamba Department(12 cases, 10 deaths), Beni Department(4 cases, 2 deaths) and Santa Cruz Department(1 case under study). In the first 4 months of 1991, 25 deaths of yellow fever occurred in Andres Ibenez Province, Beni, Cochabamba, La Paz and Santa Cruz Departments. Seven cases of yellow fever had been "registered" in a small town in Santa Cruz Department during early 1991, and that the actual case total for yellow fever in Bolivia during 1990 had been nearly triple the official total of 34 cases. An outbreak in 1989 resulted in 188 cases with 135 fatalities. The urban vector is *Ae. aegypti*, while the jungle vectors are canopy dwelling *Haemagogus* spp. The risk of acquiring Yellow Fever is considered low if the proper personal protection measures are taken. Once acquired, Yellow Fever would seriously reduce combat effectiveness. As of late May 1999, 53 confirmed cases with 21 deaths have occurred in the Department of Santa Cruz. Data as of March, 2000: Up to the end of December 1999, 70 cases had been officially registered of sylvan origin (forest origin). Bolivia reported 68 cases with 33 deaths in 1999.

d. **Bolivian hemorrhagic fever**

(BHF): Confirmed reports indicates an outbreak in a limited area of central Beni Department, where the only known enzootic foci of BHF exist. The arenaviral causative agent for BHF is called the Machupo virus and can be found in the peridomestic rodent *Calomys callosus*.

e. **Chagas' disease** is present at high levels of endemicity in the more temperate areas of Bolivia, in particular the Altiplano where up to 75% of the population carry the parasite.

f. **Cutaneous Leishmaniasis** is endemic in the forested foothill regions (250-1,800 meters) east of the Andean Cordillera. Cutaneous and mucocutaneous caused by *Leishmania b. braziliensis*. The recent violent outbreak of cutaneous leishmaniasis (CL) reported from adjoining provinces in La Paz and Beni departments could reflect overall enzootic levels higher than previously assessed. According to a May 1994 report, a household survey in the area affected by the outbreak found that more than 10 percent of the 3,700 inhabitants surveyed had an active CL lesion and that a additional 22 percent had scarring from earlier CL infections. A few cases of visceral leishmaniasis caused by *L. chagasi* have been reported from the Los Yungas region 150 km ENE of La Paz.

g. **Plague** occurs in limited foci, with the most recent outbreak occurring in Santa Cruz Department near the Cochabamba-Chuquisaca border in late 1987. Twenty-six cases (4 fatal) were reported during December 1996 to January 1997.

h. **Louse-borne typhus** is present in limited foci in rural regions near La Paz. The last outbreak occurred in 1991. The risk of acquiring one of these diseases is considered low. Of these, Plague and Louse-borne Typhus would significantly reduce combat effectiveness.

i. Risk from **Rabies** apparently is elevated in southeastern Bolivia.

3. DISEASE VECTOR INFORMATION:

a. The main vector of malaria in Bolivia is *Anopheles darlingi*. *An. pseudopunctipennis* and *An. nunez-tovari* are secondary vectors. *Anopheles darlingi* is a domestic mosquito, breeding in shaded bodies of still water, water under swamp vegetation, grassy edges of rivers and pools. Endophilic/endophagic, often resting near bedding. *An. pseudopunctipennis*, a highland mosquito, breeds in shallow pools, seepages, drying stream beds, and tanks. Feeds avidly on humans indoors; also endophilic, but predominantly extradomestic in some areas. *An. nunez-tovari* is a mosquito of open marshy areas, ponds and lakes. It breeds also in temporary ground pools, animal and wheel tracks. Biting activity begins in late afternoon. It is endophagic and exophilic.

b. The mosquito, *Aedes aegypti*, is the vector of dengue and urban yellow fever. *Aedes aegypti* is common throughout the forested lowlands east and south of the Andes, urban settlements of Cotioca, Warnes, and Montero near Santa Cruz. Present distribution is probably incompletely known. It breeds in artificial containers found in association with humans as well as treeholes, leaf axils, and rock pools. Diurnally active, it will readily feed on man and other animals indoors and out. *Aedes aegypti* is reported to be resistant to the insecticides DDT, Dieldrin, and Lindane, but susceptible to malathion and sumithion.

c. The principal vectors of Chagas' disease are the hemipteran bugs *Triatoma infestans* and *T. sordida*. Triatomid habitat usually associated with thatched-roof huts and earthen floors. These vectors are common in urban slums and substandard housing. Blood meals are taken at night. The bite is usually painless, delivered on any exposed skin. DEET is ineffective as a repellent. However, permethrin-impregnated clothing and bednets offer the best protection against bites.

d. Leishmaniasis is vectored by sand flies; *Lutzomyia llanos-martinisi* and *Lu. yucumensis*. Both species are anthropophilic and will bite readily when their habitat is disturbed. The visceral form is thought to be vectored by *Lu. longipalpus*. Sand flies deposit eggs in small fissures, natural and manmade. In warmer locations, adults are present year round, densities varying seasonally with rainfall. Feed on humans and a wide variety of animals. Biting usually occurs at dawn and dusk, extending into night if winds are favorable. However, darkened conditions found indoors or on overcast days in dense vegetation may induce diurnal feeding. Most species are exophagic, but some may feed indoors.

e. The principal vectors for Plague are the fleas, *Xenopsylla cheopis* and *Pulex irritans*. These typically lay their eggs off the host in protected areas in rodent burrows, cracks and crevices of buildings, etc. Both sexes feed 2-3 times daily at any hour. Plague is transmitted by the bite of the flea, whereas murine typhus is transmitted through flea feces or body parts rubbed into the bite wound. The only known vector for Endemic typhus (Murine typhus) is the flea, *Xenopsylla cheopis*.

f. The vector for Louse-borne Typhus is the human body louse, *Pediculus humanus*.

4. DISEASE AND VECTOR CONTROL PROGRAMS:

a. **Prevention & Control:** Malaria chemoprophylaxis should be mandatory. Consult the Navy Environmental Preventive Medicine Unit #2 in Norfolk, VA (COMM: 804-444-7671; DSN: 564-7671; FAX: 804-444-1191; PLAD: NAVENPVNTMEDU TWO NORFOLK VA) for the current recommendations for chemoprophylaxis. Yellow fever immunizations should be current.

The conscientious use of personal protective measures will help to reduce the risk of many vector-borne diseases. The most important personal protection measures include the use of DEET insect repellent on exposed skin, wearing permethrin-treated uniforms, and wearing these uniforms properly. The use of DEET 33% lotion (2 oz. tubes: NSN 6840-01-284-3982) during daylight and evening/night hours is recommended for protection against a variety of arthropods including mosquitoes, sand flies, other biting flies, fleas, ticks and mites. Uniforms should be treated with 0.5% permethrin aerosol clothing repellent (NSN 6840-01-278-1336), per label instructions. NOTE: This spray is only to be applied to trousers and blouse, not to socks, undergarments or covers. Reducing exposed skin (e.g., rolling shirt sleeves down, buttoning collar of blouse, blousing trousers) will provide fewer opportunities for blood-feeding insects and other arthropods. Additional protection from mosquitoes and other biting flies can be accomplished by the use of screened eating and sleeping quarters, and by limiting the amount of outside activity during the evening/night hours when possible. Bednets (insect bar [netting]: NSN 7210-00-266-9736) may be treated with permethrin for additional protection.

b. The most important element of an *Aedes aegypti* control program is SOURCE REDUCTION. Eliminating or covering all water holding containers in areas close to human habitation will greatly reduce *A. aegypti* populations. Alternatively, containers may be emptied of water at least once a week to interrupt mosquito breeding. Sand or mortar can be used to fill tree holes and rock holes near encampments.

c. Because the breeding habitats of most sand fly species are not easily identified, not easily accessible, or unknown, control strategies focus mainly on adult sand flies. Peridomestic sand fly species can be controlled by spraying residual insecticides on buildings (including screening on portals of entry) animal shelters, and other adult resting sites. Area chemical control of sylvan sand fly species is impractical. Personal protective measures will reduce sand fly bites and environmental modification (e.g., clearing forests, eliminating rodent burrows/breeding sites, relocating domestic animals away from human dwellings) has been used to reduce local sand fly populations.

d. Expanded Vector Control Recommendations are available upon request.

5. IMPORTANT REFERENCES:

Contingency Pest Management Pocket Guide - Fourth Edition. Technical Information Memorandum (TIM) 24. Available from the Defense Pest Management Information Analysis Center (DPMIAC) (DSN: 295-7479 COMM: (301) 295-7479). Best source for information on vector control equipment, supplies, and use in contingency situations.

Control of Communicable Diseases Manual - Sixteenth Edition. 1995. Edited by A. S. Benenson. Available to government agencies through the Government Printing Office. Published by the American Public Health Association. Excellent source of information on communicable diseases.

Medical Environmental Disease Intelligence and Countermeasures - (MEDIC). September 1997. Available on CD-ROM from Armed Forces Medical Intelligence Center, Fort Detrick, Frederick, MD 21702-5004. A comprehensive medical intelligence product that includes portions of the references listed above and a wealth of additional preventive medicine information.

Internet Sites- Additional information regarding the current status of vector-borne diseases in this and other countries may be found by subscribing to various medical information sites on the internet. At the Centers of Disease Control and Prevention home page subscriptions can be made to the Morbidity and Mortality Weekly Report (MMWR) and the Journal of Emerging Infectious Diseases. The address is www.cdc.gov. The World Health Organization Weekly Epidemiology Report (WHO-WER) can be subscribed to at www.who.int/wer. The web site for PROMED is www.promedmail.org:8080/promed/promed.folder.home. Although PROMED is not peer reviewed, it is timely and contains potentially useful information. The CDC and WHO reports are peer reviewed. Information on venomous arthropods such as scorpions and spiders as well as snakes, fish and other land animals can be found at the International Venom and Toxin Database website at www.uq.edu.au/~ddbfr/. Information on anti-venom sources can also be found at that site. Information on Poisonings, Bites and Envenomization as well as poison control resources can be found at www.invivo.net/bg/poison2.html.