

## **Medical Force Protection: Brazil**

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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 states of Acre, Rondonia, Amapa, Amazonas, Roraima, and Tocantins. Risk in parts of the states of Maranhao (western part), Mato Grosso (northern part), and Para (except Belem City). There is also transmission in urban areas, including large cities such as Porto Velho, Boa Vista, Macapa, Manaus, Santarem, and Maraba. The coastal states from the "horn" south to the Uruguay border, including Iguassu Falls, are not risk areas. Drug resistant strains are present in some locales (chloroquine and possibly Fansidar).  
**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.**
3. **Get HIV testing if not done in the past 12 months.**
4. **Complete attached Pre-Deployment Screening form and turn into your Medical Section.**
5. **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.

**BRAZIL**  
**VECTOR RISK ASSESSMENT PROFILE**  
(VECTRAP)

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1. **GEOGRAPHY:** **Area** - 8,511,965 sq. km. (3,290,000 sq. mi.). **Cities** - (1989) **Capital** - Brasilia (pop. 1.8 million). **Other Cities:** Sao Paulo (11 million), Rio de Janeiro (6 million), Belo Horizonte (2.3 million), Salvador (2 million). **Terrain** - Dense forests in northern regions, including Amazon Basin; semiarid along northeast coast; mountains, hills and rolling plains in the southwest (including Mato Grosso); and coastal strip. **Climate** - Mostly tropical or semitropical with temperate zone in the south.

2. VECTOR-BORNE DISEASES (VBD):

a. **MALARIA:** Malaria cases have maintained a level of 500,000 to 600,000 a year in the last 10 years, 95% of them in the Amazon Region; this is a significant increase from 50,000 cases a year in 1971. *Plasmodium falciparum*, *P. vivax*, and *P. malariae* are present. According to a mid-1997 report, malaria transmission is occurring in Rio de Janeiro State after a 30-year absence. Cases of vivax malaria recently had occurred in Lumiar, about 100 km northeast of Rio de Janeiro City, and Itaipuacu, about 40 km southwest of Rio de Janeiro City.

In Rondonia state, *P. malariae* accounts for much more than the 1.2% frequently quoted. *P. falciparum* is most prevalent (55%) in the Amazon Basin; elsewhere it accounts for up to 22-42%. Malaria risk was reported being 74% higher in 1994 compared to 1993 in the Maranhao state (northeastern Brazil). In 1996, Brazilian newspapers reported an outbreak of malaria occurring in the municipality of Anajas on the coastal island of Marajo - 201% more cases than in 1995. Cases reportedly were due to *P. vivax* and *P. falciparum*.

Because of widespread flooding in early 1997, malaria risk may be elevated in these areas for the near term. Declining flood levels may create extensive areas suitable for anopheline mosquito reproduction.

Multi-drug resistance is present in all malarious areas (Chloroquine, Fansidar and Amodiaquine resistant strains).

Following states risk

free: Alagoas, Ceara, Distrito Federal, Paraiba,,Pernambuco, Rio Grande do Norte, Rio Grande do Sul, Sao Paulo, Santos, Sao Vincete, Sergipe, Fernando de Noronha Archipelago. Urban centers of the following states are risk free: Amazonas, Bahia, Espirito Santo, Goias, Maranhao, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Para, Purana, Piaui, Santa Caterina.

Risk is present in urban and rural areas of the following states. Acre, Amapa, Rondonia, Roraima.

b. **DENGUE AND YELLOW FEVER:** **Dengue** distribution/risk period: Year-round. Most recent outbreaks have occurred from December through June in southern areas; however, risk may be elevated from April through August in more northern areas. Risk appears elevated in coastal urban areas, but occasional large outbreaks have occurred in the interior. Outbreaks in 1995 resulted in 113,000 cases, including 105 cases of dengue hemorrhagic fever. During the first five months of 1996, about 58,000 cases were reported, mostly from northeastern areas. Brazilian newspaper reports stated that 155,000 cases of dengue occurred in Brazil in 1996, 66.5% of these in northeastern states. The Sao Paulo state was considered infested with *Aedes aegypti* and was undergoing an outbreak of Dengue and Yellow Fever. The outbreak was spreading northward and was estimated to have caused several hundred thousand cases of Dengue Type 1 Fever. *Aedes albopictus*, a possible secondary vector, is also well established in the rural sections of the country. During the first 10 weeks of 1998 60,980 cases were reported nationwide. Most of these were in Minas Gerais and Espirito Santo (9 DHF, 1 fatal). In Belo Horiaonte 25,833 were confirmed during this period and 2,285 (1 DHF) were reported from Rio de Janeiro City from January 1 to April 8, 1998. The State Health Secretary reported at least 4567 cases as of mid-June 1999. The

number of cases in 1998 was 4134, which was an increase of 388% on the 847 infected in 1997. Data as of March 2000: In Foz do Inguacu, the number of dengue cases rose from 39 to 90, and with 34 imported case, the total is 124 confirmed, according to the laboratory of the 9th Health Region. This is the 12th week of the epidemic in the tri-frontier region known historically for high transmission rates (Paraguay, Brazil & Argentina).

Urban and jungle **Yellow Fever** are reported to be increasing in incidence in the northwestern half of Brazil. Brazil has the highest incidence of Yellow Fever of the South and North American Continents. It is endemic in the Amazon and midwestern region. However, the risk of acquiring Yellow Fever is considered low. Once acquired, both Dengue and Yellow Fever would seriously reduce combat effectiveness. A total of 24 confirmed cases of yellow fever with 9 deaths has been reported to PAHO/WHO for the period February to May 1998. For 1999, the total number of confirmed sylvatic yellow fever cases reached 18 with 3 deaths as of late May. The outbreak is concentrated largely in two municipalities; Afua and Breves, in the State of Para. Brazil reported 70 cases with 25 deaths in 1999. As of February 2000, there have been 48 cases with 24 deaths, and 16 additional suspect cases pending confirmation. According to the National Health Foundation, from 100-200 cases of sylvatic YF occur annually, mainly in the North (Amazonia) & West-Central regions, & mostly during the rainy months of January-April.

c. OTHER ARBOVIRUSES: Both **St. Louis** and **Venezuelan Equine Encephalitis** have been reported sporadically in the past. **Rocio Virus**, vectored by *Psorophora* mosquito species, was reported from Sao Paulo State in 1981. **Mayaro Virus**, vectored by *Haemagogus* mosquitoes, causes a dengue-like illness in the Amazon areas. **Simbu** group viruses such as **Oropouche** virus are transmitted by some peridomestic mosquitos and *Culicoides* (biting midges).

d. OTHER VBDs: **Chagas' disease, Leishmaniasis, Onchocerciasis, and Lyme borreliosis** are hyperendemic in certain areas.

**Chagas'** is found in the southeastern and coastal States in the exact opposite half of Brazil as malaria (see Malaria States above). It is predominately in the rural and jungle areas, but is also found in the slums of major urban areas. In seroepidemiologic surveys in population samples of 7-14-year-olds, carried out in 1993 in nine endemic states, the incidence of infection in eight states was less than 0.5%. These results indicated a reduction of over 96%, as compared to the figures for 1980. As a result of a long-term, national control program, a dramatic reduction in house infestation rates by the vector and in disease transmission was reported in early 1997.

**Leishmaniasis** is found in the same areas as Chagas' Disease. Both cutaneous leishmaniasis (*Leishmania braziliensis*, *L. b. guyanensis*, *L. mexicana amazonensis*) and visceral leishmaniasis (*L. chagasi donovani*) are present. As of the end of July 1999 two fatal cases of visceral leishmaniasis were reported in the municipality of Aracatuba, in the State of Sao Paulo. Reports are that 739 dogs in the city are positive in a population of approximately 10,000.

**Onchocerciasis** is found only in the northern Amazonas and Roraima States. Most foci are associated with swift-flowing streams in densely forested highlands.

**Lyme borreliosis** has been found only in the Sao Paulo, Rio Grande do Norte and Santa Catarina states. Presence of spirochetes and clinical signs suggest an infection by certain *Ixodid* ticks with the spirochete, *Borrelia burgdorferi*.

**Bancroftian filariasis** (*Wuchereria bancrofti*) is present at low levels of endemicity in the north-coastal areas.

**Plague** is focally enzootic in drier northern and eastern states from Ceara south to Minas Gerais. Sporadic cases and small outbreaks occurred in the early 1990's.

The risk of acquiring these diseases is considered low to moderate.

e. OTHER THREATS: Reports of **rabies** affecting humans and livestock have been noted in the extreme western Minas Gerais State and northeastern areas. Recent reports indicate an outbreak of zoonotic rabies in eastern Sao Paulo State.

Contact with the larvae (caterpillar) of the butterfly *Lamonia* (or *Lonomia*) *achelous* reportedly caused a hemorrhagic syndrome in 70 cases (38 deaths) along the Amazon delta region between 1983 and 1985. Another outbreak of "caterpillar plague" was reported from southern Brazil in January of 1995. If untreated, contact with the venom (secreted through the skin of the caterpillar) can lead to high fever, bleeding from the nose and ears, kidney failure and death. The caterpillar is present from December to March. The pupal and adult forms are harmless.

### 3. DISEASE VECTOR INFORMATION:

a. Vectors for malaria include the mosquito: *Anopheles darlingi*. It is zoophagic and exophilic in the center of its range while at the periphery it is anthropophilic and endophilic. In its domestic form, it breeds in shaded bodies of still water. It feeds on humans inside human habitation and rests in the houses. *An. aquasalis* is a coastal mosquito that breeds in fresh or brackish water, feeds at dusk, and rests inside dwellings. *An. albitarsis* and possibly *An. nuneztovari* are mosquitoes of open marshy areas, ponds, and lakes; these species bite late in the evening indoors and rest outdoors.

The mosquito *An. albitarsis* is reported to be resistant to the insecticide DDT. *An. aquasalis* is reported to be resistant to DDT, Lindane and Dieldrin.

b. The mosquito *Aedes aegypti* is the main vector of Yellow Fever and Dengue. This is a domestic mosquito that is preferentially an artificial container breeder. It is diurnally (i.e., daytime) active and feeds indoors or out, often biting around the neck or ankles. It typically rests indoors after feeding. *Aedes albopictus* is another potential vector of Dengue and Yellow Fever. It formerly was found only in Asia, but has been introduced into the New World and now is widely established in southern and eastern Brazil. *Aedes aegypti* and *Aedes albopictus* are reported to be resistant to DDT, Lindane and Dieldrin.

c. The principal vectors for plague are the fleas, *Pulex irritans* and *Xenopsylla cheopis*. Both vectors are reported to be resistant to DDT, Lindane and Dieldrin.

d. The reduviid bug, *Triatoma infestans*, is the primary vector of Chagas' disease. It is a domestic insect, found mostly in rural habitations with thatched roofs and earthen floors and walls. These types of habitations provide numerous harborage sites for the bug. It will hide during the day in cracks and crevices, and will bloodfeed on humans or animals at night. *Triatoma braziliensis*, *T. sordida*, and *Panstrongylus megistus* are other vectors of Chagas' Disease. The opossum (*Didelphis albiventris*) is the primary reservoir.

e. Principal vectors for onchocerciasis are the black flies, *Simulium oyapockense* and *S. roraimense*.

f. The sand fly, *Lutzomyia longipalpis*, is a potential leishmaniasis disease vector. This species lays its eggs in cracks and crevices, small holes, and leaf litter. Adults are present year round in warm climates. They are night biters; exophagic, and are not strong fliers). *L. intermedia*, (the principal vector in Rio de Janeiro State), *L. umbratilis*, *L. ubiquitous*, and *L. flaviscutellata* are also important vectors of leishmaniasis. Highest densities of these sand flies are observed when temperatures are between 16-20 degrees centigrade and 60-90% RH. Normally, this optimum is reached from 2200 - 2300 hours with population peaks in June, August, and October.

g. The mosquito *Culex pipiens* is the main vector of bancroftian filariasis. This mosquito will readily breed in polluted or highly organic water sources.

h. The vampire bat *Desmodus rotundus* has been implicated in the transmission of rabies.

### 4. DISEASE AND VECTOR CONTROL PROGRAMS:

a. Prevention and Control: Malaria chemoprophylaxis should be mandatory. Consult the Navy Environmental Preventive Medicine Unit #2 in Norfolk, VA (COMM: 757-444-7671; DSN: 564-7671; FAX: 757-444-1191; PLAD: NAVENPVNTMEDU TWO NORFOLK VA) for the current recommendations for chemoprophylaxis.

b. Yellow Fever immunizations should be current.

c. In January 1997, the Brazilian National Control Program reported the elimination of transmission of Chagas' disease in Brazil. An independent international commission will convene in 1998 to determine whether this reported interruption of vectorial and transfusional transmission will be certified.

d. 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.

e. 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.

f. 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.

g. 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](http://www.cdc.gov). The World Health Organization Weekly Epidemiology Report (WHO-WER) can be subscribed to at [www.who.int/wer](http://www.who.int/wer). The web site for PROMED is [www.promedmail.org:8080/promed/promed.folder.home](mailto: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/](http://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](http://www.invivo.net/bg/poison2.html).