



## Medical Force Protection: Ecuador

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

### Major Threats

**Food or Waterborne Disease:** Food or waterborne disease results from poor sanitation leading to fecal contamination of water. Risk of diarrheal disease is countrywide with high risk in coastal areas and areas lacking piped water and adequate sanitation. Specific infectious agents include *E. coli*, *Campylobacter*, *Shigella*, *Salmonella*, *Aeromonas* spp., *Balantidium coli*, cholera, and protozoa. Some **resistance to TMP/SMX** has been reported. Brucellosis and typhoid and paratyphoid fever also occur. Viral hepatitis A is endemic countrywide and can be transmitted person to person via contaminated food or water. **Presume local water sources are not safe for drinking.**

**Vector-Borne Disease:** Risk of malaria is variable depending on region, and drug resistant strains are present in some areas. Increased risk for malaria occurs countrywide between February and August at elevations below 1,500 meters, primarily in rural areas. Overall risk for malaria is higher in the northern lowlands on both sides of the Andes. Risk may be increased in coastal urban areas. Galapagos Islands are risk free. *P. vivax* causes 75% of reported cases. Almost all other cases are due to *P. falciparum*, which predominates in some coastal areas. There is **resistance** of *P. falciparum* to **chloroquine** and possibly to **Fansidar** as well. Risk for dengue fever occurs countrywide and may be increased in urban coastal areas. Mosquito vector populations for dengue fever are reportedly increasing. Leishmaniasis is present year round with increased infection rates during the rainy season (FEB – JUL). Cutaneous leishmaniasis is a major public health problem.

**Water-Contact Disease:** Leptospirosis poses a threat to troops directly exposed to bodies of water such as lakes, streams and irrigated fields. The organism is found throughout the country.

**Sexually Transmitted Disease:** Gonorrhea, chlamydia, hepatitis B and HIV are present in Ecuador.

**Respiratory Disease:** Tuberculosis risk is year round and countrywide. Strains **resistant** to the standard therapeutic agents **isoniazid**, **rifampin**, and **ethambutol** have been reported though it is unclear if this resistance is widespread. Transmission typically requires prolonged exposure to an individual with active TB.

**Animal Contact Disease:** Rabies: Infrequent or sporadic numbers of personnel with direct contact (bites or scratches) with local animals could be affected. Zoonotic in both wild and domestic animals. Dogs are the primary route of human exposure, primarily because of ineffective canine immunization programs.

**Medical Facilities:** The best health care in Ecuador is concentrated in Guayaquil and Quito. The Kennedy Clinic in Guayaquil is suitable for emergency care and minor elective surgery. Most US personnel in Guayaquil use this facility.

The Military Hospital in Quito is one of the best hospitals in the region, is clean, new, and modern. Voz Andes Hospital in Quito is suitable for massive trauma, burn treatment, and most general medical and surgical problems. Adequate for stabilizing emergencies but not elective surgery.

### Requirements before Deployment

- Before Deploying report to Medical to:**
  - Ensure routine immunizations for deployable personnel are up to date: **MMR, Polio, Hepatitis A, Tetanus (Td), Typhoid, Influenza, Yellow fever and Meningococcal vaccines.**
- Malaria Chemoprophylaxis: Begin if exposure anticipated. Recommended regimens follow:**
  - Mefloquine (Non-aviators only):** 250 mg per week starting 2 weeks before entering risk area. Must continue until 4 weeks after leaving risk area. **OR**
  - Doxycycline (approved in flight status):** 100 mg per day starting 2 weeks before entering risk area. Must continue until 4 weeks after leaving risk area.
  - Must include Primaquine terminal prophylaxis** (see “Requirements after deployment”)
- HIV, PPD (Tuberculin Skin Test), G-6-PD testing** should be up to date.
- Obtain Adequate Personal Protective Supplies:** DEET anti-arthropod skin lotion must be issued and used by all personnel. Permethrin treatment is highly recommended for all field uniforms and bednets. Sunscreen, lip balm, and hearing protection should be used as needed.
- Complete pre-deployment health assessment (DD Form 2795)\*** per NEHC TM 6490.00-1 (<http://www-nehc.med.navy.mil/prevmed/epi/depsurv.htm>) The form can be downloaded from the website: [http://amsa.army.mil/deploy\\_surv/DD2795\\_Pre\\_Deploy.pdf](http://amsa.army.mil/deploy_surv/DD2795_Pre_Deploy.pdf)

### Requirements during Deployment

- Deploy appropriate Preventive Medicine personnel and equipment.
- Consume food, water, and ice only from US-approved sources; **"Boil it, cook it, peel it, or forget it"**.
- Perform environmental hazard assessments as needed.
- Operate messing facilities in accordance with service directives. Ensure hand-washing facilities near messing facilities.
- Operate latrine facilities in accordance with service directives. Ensure hand-washing facilities near latrine facilities.
- Enforce hand washing often with soap and water.
- Ensure proper removal of garbage and solid waste. Eliminate food/waste sources that attract pests to living areas.

8. Continue malaria chemoprophylaxis, if initiated. Command supervision necessary to ensure accountability for anti-malarial medications.
9. Enforce personnel protective measures (DEET, Permethrin treated uniforms and bed nets). 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 and daily “buddy checks” in tick and mite infested areas.
10. Perform vector surveillance and control as needed, particularly during rainy months when mosquito vectors breed.
11. Always use latex condoms to reduce the risk of HIV and other sexually transmitted diseases.
12. Avoid contact with animals and hazardous plants.
13. Avoid contact with lakes, rivers, streams, and other surface water.
14. Conduct DNBI surveillance per NEHC TM 6490.00-1 (<http://www-nehc.med.navy.mil/downloads/prevmed/weeklydnbi.pdf>)
15. Minimize non-battle injuries by ensuring safety measures are followed. Precautions include hearing and eye protection, adequate water consumption, suitable work/rest cycles, stress management and acclimatization to environment.

### **Requirements after Deployment**

1. If malaria chemoprophylaxis initiated then continue chemoprophylaxis as described above.
2. If performing malaria chemoprophylaxis: begin **terminal prophylaxis** (for both chemoprophylaxis regimens): **Primaquine** 15 mg per day for 14 days starting on day of departure from Ecuador. **G6PD status must be determined prior to starting Primaquine.**
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.
6. **Complete post-deployment health assessment (DD Form 2796)\*** per NEHC TM 6490.00-1 (<http://www-nehc.med.navy.mil/prevmed/epi/depsurv.htm>). The form can be downloaded from the website: [http://amsa.army.mil/deploy\\_surv/DD2796\\_Post\\_Deploy.pdf](http://amsa.army.mil/deploy_surv/DD2796_Post_Deploy.pdf)

\* Mail completed original copy of DD 2795 and 2796 to: Army Medical Surveillance Activity, Building T-20, Room 213 (Attn: Deployment Surveillance), 6900 Georgia Ave, N.W., Washington D.C. 20307-5001

## VECTOR RISK ASSESSMENT PROFILE (VECTRAP):

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**1. GEOGRAPHY:** Area - 271,000 sq. km. (109,000 sq. mi.); about the size of Colorado. **Cities - Capital** - Quito (pop. 1.5 million). **Other Cities** - Guayaquil (2 million). **Terrain** - jungle, mountains to coastal plain. **Climate** varied.

**2. VECTOR-BORNE DISEASES:**

a. **MALARIA:** *Plasmodium vivax* and *P. falciparum* are widespread. *Plasmodium vivax* causes approximately 70 to 75 percent of the 50,000 to 80,000 malaria cases reported annually in Ecuador; nearly all remaining cases are caused by *P. falciparum*. Risk may be elevated from February through August. Malaria risk is present throughout the country, including urban areas, except for the Galapagos Islands, Quito, Cuenca, and population centers in the Andean Highlands. During 1993, two-thirds of Ecuador's total malaria cases, and nearly all of its *P. falciparum* cases, occurred in Manabi, Guayas, and Esmeraldas Provinces. Transmission can occur at elevations below 1500 meters, with *P. falciparum* being chloroquine-resistant in all malarious areas. Fansidar-resistant strains occur in neighboring Colombia, but have not been reported from Ecuador. The risk of acquiring malaria is considered high without the proper chemoprophylaxis, and would result in a serious loss of combat effectiveness. In March 2000, the Health Ministry has reported 15,000 cases of malaria. The coastal provinces of El Oro, Los Rios, Esmeraldas and Guayas have been the hardest hit by the outbreaks, although numerous cases of dengue fever and malaria have also been reported in provinces in Amazonia and the mountains.

b. **DENGUE FEVER & YELLOW FEVER:** \*\*\* As of mid-1997, environmental conditions (i.e., much heavier rainfall than usual and high mosquito vector indices) favored an increase in dengue transmission. The overall risk of both dengue and yellow fever is elevated.

DENGUE: Newspaper accounts reported approximately 300 cases of dengue during the first quarter of 1997; more than half were reported from Manabi province. The port city of Guayaquil experienced a major dengue epidemic attributed to dengue virus serotype 1 from Mar-May 1989. Most of the infections occurred in central Guayaquil where some parishes had attack rates up to 55 percent. Reports indicated possible dengue activity in that region in December 1994. A few thousand cases of dengue occurred in southern Ecuador early in 1995. During the last decade, Den-1, Den-2, and Den-4 serotypes have circulated in Ecuador. As of March 2000, the CDC has identified the new presence of dengue virus type 3 (in addition to the previously present serotypes 1,2 and 4) after analyzing 50 blood samples.

YELLOW FEVER: As of late June 1997, an epidemic of **yellow fever** reportedly was ongoing in Esmeraldas Province. Unconfirmed reports listed 130 cases (30 fatal). If confirmed, this number of cases would exceed the combined totals of all cases officially reported from Ecuador during the previous 20 years. Morona-Santiago and Pastaza Departments were added to the list of areas considered "infected" with **yellow fever**. Surrounding areas are known to be infested with the mosquito vector also, and are therefore at risk. Periods of highest risk would be the wet season from December to May. Yellow Fever is present at a low level of endemicity in the Amazon jungles east of the Andes. All cases are sylvatic, and the scarcity of populated centers in this area make the possibility of urban yellow fever slight. As of early 1995, there was increased risk of yellow fever in the southern Ecuador-Peru border area. Ecuador reported a total of 5 cases with 3 deaths in 1999.

c. **PLAGUE:** Sylvatic plague is endemic in Ecuador wherever rodent populations are found, but the incidence in humans is extremely low. If urban rats become infected by the sylvan cycle, the potential for a human epidemic is high. Nevertheless, the risk of acquiring this disease is considered to be very low. If contracted, plague would severely impair combat readiness.

d. **EPIDEMIC TYPHUS (LOUSE-BORNE):** Epidemic typhus is found at low levels throughout the country, but primarily in the cooler areas of the Andes. In the event of a military conflict in endemic areas, the potential for a large scale epidemic would be significantly enhanced. In the absence of any conflict, the risk to U.S. troops is low if they are kept isolated from the indigenous population. The greater the interaction with native groups, the higher the risk. Combat readiness would be severely impaired with an outbreak of this disease.

e. **LEISHMANIASIS** transmission presumably year-round; risk may be higher from June through September. Endemic in the tropical and subtropical Pacific coastal areas, the Andean plains, and the eastern Amazon region. Risk appears to increase at elevations lower than 1,000 meters, and appears minimal (except for an "uta"-like form) at elevations greater than 2,000 meters. ("Uta" is a form of cutaneous leishmaniasis associated with *L. braziliensis peruviana* infection, limited to elevations of 600 to 3,000 meters in the Andean region of Peru.) Reliable incidence data are lacking (officially, approximately 1,000 cases are reported annually), but cutaneous leishmaniasis is considered a major public health problem in tropical and subtropical areas, particularly in Imbabura and Pichincha Provinces. At least 5 "species" of Leishmania (*L. amazonensis*, *L. braziliensis*, *L. guyanensis*, *L. mexicana*, and *L. panamensis*) are capable of infecting humans occur in Ecuador.

**VECTOR RISK ASSESSMENT PROFILE (VECTRAP): (continued)**

*L. panamensis* and *L. guyanensis* account for nearly 75 percent of isolates detected. Strains of *L. mexicana* recently were isolated from "uta"-like lesions among inhabitants of a south-central Andean village at an elevation of 2,300 to 2,500 meters.

**f. OTHER VECTOR-BORNE DISEASES:**

**Chagas' disease** is widely distributed in rural areas with risk elevated in the Pacific coastal provinces of Manabi and Guayas.

**Bartonellosis** is scattered throughout the Andean villages in valleys between 1000 and 3000 meters in elevation.

**Onchocerciasis** is a major problem in the province of Esmeraldas with small isolated foci moving south through the coastal plain.

**Venezuelan Equine Encephalitis (VEE)** and **Eastern Equine Encephalitis (EEE)** outbreaks occur infrequently along the coast and the lowland regions on both sides of the Andes. Human cases of VEE were reported in southern Ecuador early in 1995.

The risk of acquiring any of these diseases is considered low if proper precautions are taken. If contracted, Bartonellosis or encephalitis would cause significant reductions in combat effectiveness.

**g. RABIES:** Ecuador leads Latin America in rabies transmission, reaching the highest mortality rate of 26 deaths per 100,00. The Ecuadoran Health Officials reported 45 deaths from rabies during January through 1 August 1996. During 1990 through 1994, an average of 15 deaths from rabies were reported annually. The increase in rabies is due to a large increase in the canine population.

**h. LEPTOSPIROSIS:** From January to February 1997 there was an outbreak of leptospirosis with 37 suspected cases, 20 confirmed by serology and 7 deaths from the provinces of Guayas, Manabi, Los Rios, Canar and El Oro.

**3. DISEASE VECTOR INFORMATION:**

**a. MALARIA:** Eight of the 24 anopheline mosquitoes present in the country are confirmed vectors of malaria. These include: *Anopheles albimanus*, *A. aquasalis*, *A. darlingi*, *A. pseudopunctipennis*, *A. punctimacula*, *A. oswaldoi*, *A. rangeli*, and *A. trinkae*. Which species is the primary vector depends largely on geographical location and elevation. Transmission occurs year-round, but peaks between April and June. *Anopheles albimanus*, *A. punctimacula*, and *A. pseudopunctipennis* are reportedly resistant to DDT, Dieldrin and Lindane.

**b. DENGUE & YELLOW FEVER:** The mosquito, *Aedes aegypti*, is the principal vector of dengue and urban Yellow Fever. *Aedes aegypti* is a container-breeding mosquito, and thrives around human habitations in practically any container that holds water. This mosquito was thought to have been eradicated from Ecuador, but surveys begun as a result of the recent dengue epidemic indicate that it is now re-established in several provinces.

Sylvatic Yellow Fever is transmitted to man by *Haemagogus* spp. or *Sabethes* spp. mosquitoes. These mosquitoes are forest dwellers with man as an incidental host.

**c. PLAGUE:** The vectors of plague are the fleas, *Xenopsylla cheopis* and *Pulex irritans*. Both are reported to be resistant to the insecticides DDT, Dieldrin, and Lindane.

**d. EPIDEMIC TYPHUS:** The body louse, *Pediculus humanus*, is the vector of louse-borne typhus. High louse densities among the local populace can be expected. Crowded living conditions during times of conflict can further aggravate this situation. Body lice can be transferred from one person to another through the sharing of infested clothing.

**e. LEISHMANIASIS:** Transmitted by the bite of an infective sand fly (*Lutzomyia* spp.). Most sand flies are active between dusk and dawn, and have very limited flight ranges. Species implicated as vectors in Ecuador include *Lu. trapidoi*, *Lu. hartmanni*, and *Lu. gomezi*, but data on vector bionomics in this region are very limited.

**f. OTHER VECTORS:** The primary vectors of Chagas' Disease are the reduviid bugs (also known as cone-nose or kissing bugs), *Triatoma dimidiata* and *Triatoma infestans*.

The sand flies, *Lutzomyia flaviscutellata* and *L. verrucarum* are the vectors of leishmaniasis and Bartonellosis.

The primary vector of Onchocerciasis in Ecuador is *Simulium exiguum*. Other possible vectors are *S. quadrivittatum*, *S. antillarum*, and *S. reveti*. These black flies are strong fliers and will travel some distance for a blood meal. However, they are concentrated around fast moving rivers and streams where they breed.

Several mosquito species are capable of vectoring viral encephalitides, including VEE and EEE, to man; in Ecuador they include *Aedes taeniorhynchus*, *A. scapularis*, *Anopheles aquasalis* and *Culex* spp.

**VECTOR RISK ASSESSMENT PROFILE (VECTRAP): (continued)****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: 804-444-7671; DSN: 564-7671; FAX: 804-444-1191; PLAD: NAVENPVNTMEDU TWO NORFOLK VA) for current chemoprophylaxis recommendations.

b. Yellow Fever immunizations should be current.

c. 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.

d. 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.

e. In plague-endemic areas, rodent control should be implemented only after satisfactory flea control has been accomplished.

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. Frequent bathing and laundering clothing in hot water will aid in the prevention and/or control of body lice. When authorized by medical authorities, Lindane 1% dust can be used in emergencies for individual treatment of clothing only.

h. Expanded Vector Control Recommendations are available upon request.

**5. IMPORTANT REFERENCES:**

Contingency Pest Management Pocket Guide Technical Information Memorandum(TIM)24. Available from the Defense Pest Management Information Analysis Center (DPMIAC) [www.afpmb.org/pubs/tims/](http://www.afpmb.org/pubs/tims/) (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-Edited by James Chin. Seventeenth Ed. 2000. 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). January 2002. 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 <http://www.promedmail.org/>.

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 <http://www.kingsnake.com/toxinology/>. 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).

**USERS OF THIS VECTRAP:** Please notify NDVECC Jacksonville, or the appropriate NEPMU, if you acquire any medical entomology information that can be used to update this VECTRAP.

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ADDITIONAL INFORMATION ON DISEASE VECTOR SURVEYS, CONTROL AND SPECIMEN ID's WILL BE PROVIDED UPON REQUEST.