

NORTH KOREA - VECTOR RISK ASSESSMENT
PROFILE (VECTRAP)

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1. GEOGRAPHY:

North Korea covers 121,730 sq. km (47,000-sq. mi.), about the size of Mississippi. The population is 21,386,109 (1999). The peninsula that the country lies on is very mountainous. Most of the mountains are forested and hills are separated by deep, narrow valleys and small-cultivated plains. The most rugged areas are the north and east coasts. The climate is temperate. July and August, the warmest months, average 30° C (85° F) and January, the coldest month, averages -20° C (-4° F). Rainfall is generally heaviest in the summer.

2. VECTOR-BORNE DISEASES:

a. JAPANESE ENCEPHALITIS (JE): This is the most important vector-borne disease threat in the country. Cases are reported annually. This disease occurs in both urban and rural areas. The disease is seasonal from July through October, peaking in August and September. The greatest number of cases occurs in the southern coastal provinces. Risk is high to moderate during outbreaks. This disease can severely impair combat readiness.

b. MITE-BORNE TYPHUS (SCRUB TYPHUS): This rickettsial infection is widespread and enzootic in North Korea. Outbreaks are typically sporadic and scattered. The disease is usually limited to rural areas in association with disturbed environments and secondary vegetation as a result of clearings, overgrown terrain and new encampments. The actual incidence of scrub typhus is difficult to ascertain because it is not a reportable disease. This disease can severely impair combat readiness.

c. FILARIASIS: Filarial infections caused by Wuchereria bancrofti are endemic in the southern-most provinces of North Korea, located in the plains near the coast. The period of highest risk is the warm, summer months. For short-term operations (less than 6 months) the risk of

acquiring filariasis is low and if contracted will not normally impair combat effectiveness. For longer operations, the risk and effects on personnel is difficult to assess.

d. MALARIA: Prior to 1964, there was a high incidence of malaria in North Korea. Due to eradication programs, it does not appear to pose a threat to any part of the country. Although risk of contracting the disease is low, if acquired, malaria can severely impair combat readiness.

e. DENGUE FEVER (DF) AND DENGUE HEMORRHAGIC FEVER (DHF): This disease has a very low incidence rate and has only been reported from the coastal plains. Although risk of infection is low, this disease can severely impair combat readiness.

f. LEISHMANIASIS: Visceral leishmaniasis is endemic. The period of highest risk is March-May. If acquired, this disease could impair combat readiness.

g. LOUSE-BORNE TYPHUS (EPIDEMIC TYPHUS): This disease is endemic, and has a major epidemic potential. Outbreaks occur when winters are severe and heavy clothing is worn for extended periods of time. Overcrowded areas with poor sanitation can also give rise to outbreaks. Combat readiness would be seriously impaired in the event of an outbreak.

h. OTHERS: Flea-borne typhus, louse and tick-borne relapsing fevers are all endemic to Korea. Risk is very low. There has not been a reported case in many years.

i. ANIMAL-ASSOCIATED DISEASES: Korean Hemorrhagic Fever (KHF), rabies and leptospirosis are all endemic to Korea. For further information contact NEPMU-6, Box 112 Pearl Harbor, HI 96860-5040.

3. DISEASE VECTOR INFORMATION:

a. JAPANESE ENCEPHALITIS: Culex tritaeniorhynchus is the primary vector of JE virus. It breeds primarily in rice fields, stagnant ground pools and marshes, but can be found in artificial containers. Peak vector populations occur in August and September. This species prefers to feed on large mammals, including domestic pigs and birds, both of which are considered the principal reservoir/amplifying hosts of JE virus. It will feed on man during high population densities or in the absence of preferred hosts. Biting occurs throughout the night beginning one hour after dusk (2000-0400). This species over-winters in the adult stage. Other species, which may be potential JE vectors, include Aedes togoi, Culex pipiens and Ae. vexans nipponii.

b. MITE-BORNE TYPHUS (SCRUB TYPHUS): Larval trombiculid mites (chiggers) of the genus Leptotrombidium are the vectors. L. scutellare and L. pallidum are primary. These minute chiggers are ectoparasites of various small murid rodents. There appears to be little, if any, vector-host specificity. Foci of infection can be very discrete areas where the rickettsia, mites and suitable rodents exist. Feral murine rodents (Apodemus spp.) are the natural reservoirs of this disease. Areas of secondary growth vegetation provide ample food and harborages for these rodents. A painless weal or eschar may develop at the site of the chigger bite before onset of symptoms.

c. FILARIASIS: Anopheles sinensis is the primary vector of bancroftian filariasis in Korea. This species feeds on both man and

animals, and can be found resting out of doors in the daytime. Larvae have been collected from rice paddies, pools, ponds, springs, brackish water swamps and marshes.

d. LEISHMANIASIS: Sand flies, Phlebotomus spp., vector this protozoan disease. Direct person to person contact of abraded skin (wounds, scratches, etc.) can also be a mode of transmission. Adults will rest in the dark areas of human shelters, where humidity remains relatively high. Sand flies are weak fliers, flying close to the ground or moving in short, jerky hops along walls and ceilings. They feed at night and in the early morning hours.

e. PLAGUE AND MURINE TYPHUS: Potential reservoir hosts and vectors are prevalent countrywide. Both diseases are transmitted by fleas, primarily the Oriental rat flea (Xenopsylla cheopis) and the northern rat flea (Nosopsyllus fasciatus). Both species can be found in close association with the two-principle reservoir hosts, Rattus rattus and R. norvegicus.

f. MALARIA: The primary vector, Anopheles sinensis is still very common throughout the country. Vector bionomics is covered under filariasis.

g. DENGUE FEVER (DF) AND DENGUE HEMORRHAGIC FEVER (DHF): Aedes albopictus is present in Korea and is the suspected vector. Artificial containers such as water vases, old tires and discarded bottles or cans are common urban breeding sites. In rural areas, tree holes, or similar natural water holding receptacles are preferred breeding sites.

h. LOUSE-BORNE TYPHUS AND RELAPSING FEVER: Both are transmitted by the body louse (Pediculus humanus humanus), with man serving as the only reservoir and host. Potential transmission increases during winter, especially in human populations heavily infested with body lice and living in unsanitary conditions.

4. DISEASE AND VECTOR CONTROL PROGRAMS:

a. Prevention and Control: The conscientious use of personal protective measures will help to reduce the risk of many vector-borne diseases. Protection from mosquitoes and other biting flies can be accomplished by the use of screened eating and sleeping quarters (insect bar NSN 7210-00-266-9736) and by limiting the amount of outside activity during the evening/night hours whenever possible. If necessary, space spray with d-Phenothrin (NSN 6840-01-412-4634) within quarters.

Personal protective measures should be initiated at sundown in the prevention of malaria, JE and filariasis. Keeping the body covered, such as rolling shirtsleeves down, will deter mosquito biting. The use of DEET 33% lotion (2 oz. tubes: NSN 6840-01-284-3982) or DEET 75% repellent (2 oz. bottles: NSN 6840-00-753-4963) during daylight and evening/night hours is recommended for protection against mosquitoes, sand flies, other biting flies and also against mites and fleas. Additional protection can be achieved through the use of DEET jackets (NSN 8415-01-035-0846 =Sm. 0847 =Med. 0848 =Lrg.) and through the use of 0.5% Permethrin aerosol clothing repellent (NSN 6840-01-278-1336).

Chemical control of vectors may be necessary in areas where avoidance is impractical. The JE vector, Culex tritaeniorhynchus, has shown resistance to a wide variety of insecticides. ULV (ultra low volume) application of suitably registered compounds (Malathion/Chlorpyrifos/Permethrin) will rapidly reduce biting mosquito attacks over wide areas.

This is a temporary measure and will need to be repeated every few days if the problem persists. When using pesticides, be sure to always read and follow the label directions.

Avoid tick-infested areas when feasible. Using a buddy system, search total body area every 3-4 hours for attached ticks. Prompt removal of ticks may prevent potential disease transmission. DEET or Permethrin aerosol spray may be used as a tick and mite repellent when applied to clothing. The blousing of trouser legs will deter tick biting.

For scrub typhus, preventive measures include clearing campsites of non-woody vegetation, spraying with an appropriate acaricide and use of insect repellent. DEET insect repellent should be applied to socks and around openings in the clothing such as near the waist, groin, neck and wrists. Permethrin aerosol clothing spray should also be considered. NOTE: This spray is applied only to trousers and blouse and not to socks, undergarments or covers.

The most important element of a vector control program involving Aedes aegypti and Aedes albopictus is SOURCE REDUCTION. The number of mosquitoes will be greatly reduced by the elimination of all water holding containers in areas close to human habitation. Tin cans, tires, broken pottery, plant vases and similar items must be emptied weekly, be eliminated or stored as to prevent further mosquito breeding. Sand or mortar can be used to fill tree holes and rock holes found near encampments. In areas where it is necessary to store water for drinking, ensure the container has a tight fitting lid or apply Temephos (Abate) larvicide at 1 ppm.

Rodent control should be implemented only after satisfactory flea or mite control has been accomplished.

Controlling body lice best prevents louse-borne typhus. Frequent bathing and laundering of clothing will aid in the prevention and/or control of body lice.

Filth fly control should be considered a priority to prevent outbreaks of enteric infections such as shigellosis. Flytek® and/or Apache® fly baits (NSN 6840-01-183-7244) may be considered for use.

Recommended pesticides, by vector group, can be found in Technical Information Memorandum # 24, Contingency Pest Management Pocket Guide, Armed Forces Pest Management Board, Walter Reed Army Medical Center, Washington, D.C. 20307-5001.

Units should contact NEPMU-6 for current chemoprophylactic, additional preventive measures at:

Navy Environmental and Preventive Medicine Unit Six, 1215 North Road, Pearl Harbor, HI 96860-5040
(PLAD: NAVENPVNTMEDU SIX, PEARL HARBOR HI)
Phone: Comm: (808) 471-9505
DSN: 471-9505
Fax: (808) 474-9361, DSN 474-9361
E-Mail: nepmu6@nepmu6.med.navy.mil

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-Edited by A. S. Benenson. Sixteenth Ed. 1995. 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/~ddbfray/. 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/bq/poison2.html.