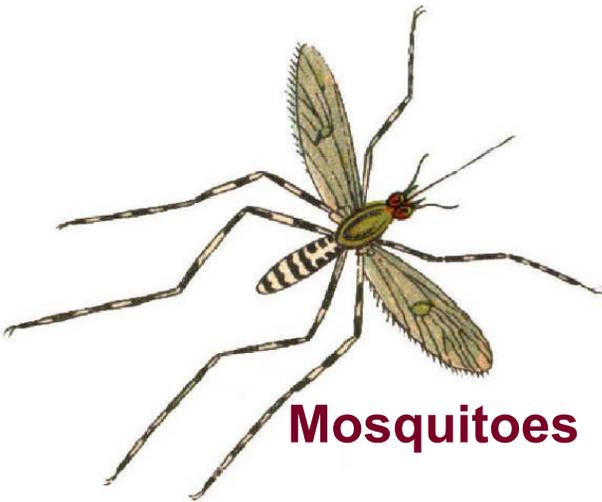


VECTORS AND DISEASE



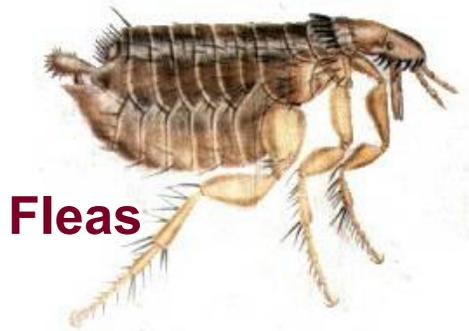
Mosquitoes



Ticks



Sand flies



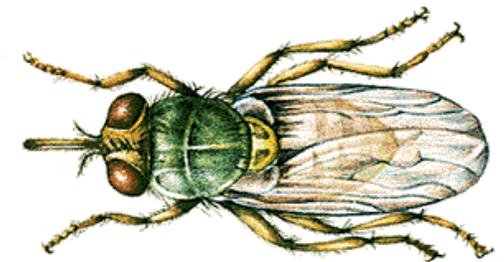
Fleas



Chigger Mites



Lice



Tsetses

LTC Jason H. Richardson
Walter Reed Army Institute of Research

HIT LIST

- **RISK**
 - Predeployment, area specific, risk assessment.
 - What are the threats?
- **RESOURCES**
 - Where can you find answers?
- **ACTION**
 - What can you do to minimize risk?



RISK

What are the **priority threats**?

It depends



REPLY TO
ATTENTION OF

MCHE-MDI

DEPARTMENT OF THE ARMY
BROOKE ARMY MEDICAL CENTER
3851 ROGER BROOKE DRIVE
FORT SAM HOUSTON TX 78234-6200

23 April 2010

MEMORANDUM FOR RECORD

SUBJECT: Infectious Disease Threats to the US Military Prioritization Panel Results

1. A panel was hosted by the Directorate of Combat and Doctrine Development (DCDD) and the Military Infectious Diseases Research Program (MIDRP), US Army Medical Research and Materiel Command (MRMC), under the umbrella of the Medical Force Protection Integrated Capabilities Development Team (ICDT) Charter to prioritize the current infectious disease threats to the US Military (Appendix A).
2. Panel objectives were to identify and operationally prioritize the infectious disease threats to US Forces to assist in the determination of capability requirements.
3. References included "Initial Capabilities Document (ICD) for Infectious Disease Countermeasures (IDCM)," 2006, and "Infectious Diseases Investment Decision Evaluation Algorithm: A Quantitative Algorithm for Prioritization of Naturally Occurring Infectious Disease Threats to the U.S. Military," *Military Medicine* 2008;173:174-181.



Appendix A

Prioritization of Infectious Disease Threats to the US Military

| |
|--|
| 1. Malaria |
| 2. Dengue |
| 3. Diarrhea, bacterial |
| 4. Multidrug-resistant (MDR) wound pathogens |
| 5. Leishmaniasis |
| 6. Q fever (<i>Coxiella burnetti</i>) |
| 7. Norovirus and other viral diarrhea |
| 8. Influenza |
| 9. Adenovirus |
| 10. Leptospirosis |
| 11. Diarrhea, protozoal |
| 12. Tuberculosis (TB) |
| 13. Crimean-Congo hemorrhagic fever |
| 14. Human immunodeficiency virus (HIV/AIDS) |
| 15. Hemorrhagic fever with renal syndrome (HFRS) |
| 16. Chikungunya |
| 17. Meningococcal meningitis |
| 18. Plague |
| 19. Rickettsioses |
| 20. Viral encephalitides |
| 21. Hepatitis E |
| 22. Lassa fever and other arenaviruses |
| 23. Tick-borne encephalitis |
| 24. Rift Valley fever |
| 25. Hepatitis C |
| 26. Brucellosis |
| 27. Other arboviral illnesses |
| 28. Typhoid fever |
| 29. Cholera |
| 30. Schistosomiasis |
| 31. Tularemia |
| 32. Trypanosomiasis |
| 33. Ebola/Marburg hemorrhagic fever |
| 34. Chagas' disease |
| 35. Yellow fever |
| 36. Lyme |
| 37. Bartonellosis (Oroya fever) |
| 38. Soil-transmitted helminths |

PRIORITY THREATS

1. Malaria
2. Dengue
4. Leishmaniasis
13. CCHF
16. Chikungunya
18. Plague
19. Rickettsioses
20. Viral enceph
23. TBE
24. Rift Valley fever
27. Other arboviruses

RISK

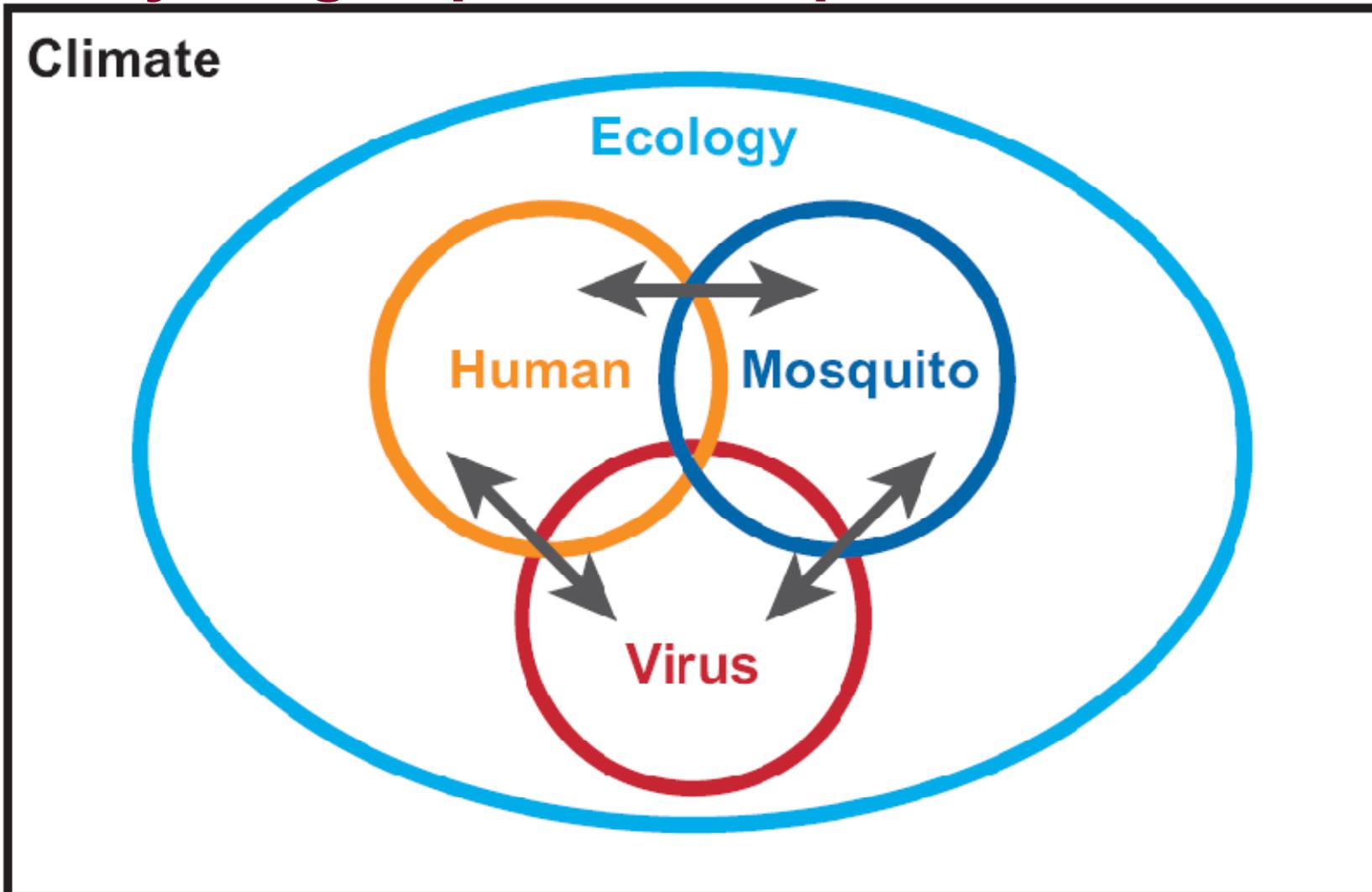
What are the threats in my AO?

Depends on **where** you are and **when** you are there.

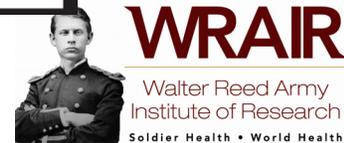


Epidemiology of transmission

Everything depends on space and time

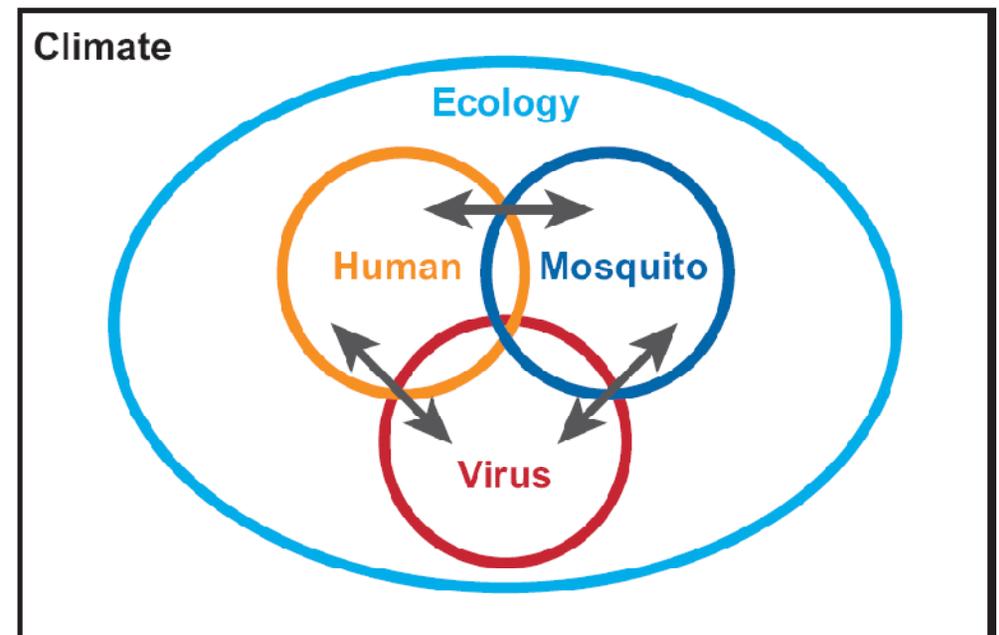


Kyle & Harris, 2008



Complex interaction

- Transmission depends on the complex **interaction** of a given:
 - Vector species
 - Pathogen
 - Host (human)
 - Ecological setting



FACTORS TO HELP ESTIMATE RISK

1. What pathogens and strain/species are present?

(P. falciparum is far more serious than P. vivax)

2. Will the mission put personnel into close contact with vectors?

- VECTOR BEHAVIOR

- *Anopheles* mosquitoes are nighttime biters.
- *Aedes* mosquitoes are daytime biters.
- Sand flies fly close to the ground.

- VECTOR HABITAT...Will personnel operate in areas with vectors?

- BILLETING...in buildings with doors and screened windows?

3. Will conditions support disease transmission?

- SEASONALITY

- RECENT WEATHER (especially rain)

- DENSITY OF VECTOR

- INFECTION RATE

4. What is the Incubation Period?



Air Force

Tent City



Army Tent City

No AC



HELP IN IDENTIFYING PRIORITY THREATS

Entomological Operational Risk Assessments (EORA)

- Provide risk estimates for vector-borne and zoonotic diseases in the country of concern.
- These estimates, prepared by USACHPPM.
- EORAs available for >30 countries.

Infectious Disease Risk Assessment (IDRA)

- AFMIC now NCMI
- Web-based and CD (MEDIC)
- unclassified medical intelligence



ENTOMOLOGICAL OPERATIONAL RISK MANAGEMENT

RISK



How to
Perform an
Entomological
Operational
Risk
Assessment

Entomological risk estimate methodology addressing these factors was developed following the Army's operational risk management process (FM 100-14).

TG 288
September 2003

U.S. Army Center for Health Promotion and Preventive Medicine
5156 Blackhawk Road
Aberdeen Proving Ground, Maryland 2010-5403



WRAIR

Walter Reed Army
Institute of Research
Soldier Health • World Health

REGIONAL RISK

DVEPS

- Provide risk estimates for vector-borne and zoonotic diseases in the regions of concern.
- These estimates, prepared by AFPMB.



Office of the Deputy Under Secretary of Defense for Installations & Environment



Regional Disease Vector Ecology Profile South Central Asia



Defense Pest Management Information Analysis Center
Armed Forces Pest Management Board
Forest Glen Section
Walter Reed Army Medical Center
Washington, DC 20307-5001

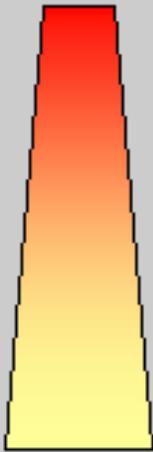
Homepage: <http://www.afpmb.org>

September 2001



ESTIMATING RISK

Hazard Probability Rank: Relationship between force protection measures and exposure to vectors/vector-borne disease. Malaria

| Force Protection Measures | Exposure to Vectors/Vector-borne Disease | | | | |
|---|--|--|------------|------------|------------|
| | High |  | | | Low |
|  <p>Low</p> <p>High</p> | Frequent | Frequent | Likely | Occasional | Occasional |
| | Frequent | Likely | Likely | Occasional | Seldom |
| | Likely | Likely | Occasional | Occasional | Seldom |
| | Occasional | Occasional | Occasional | Seldom | Unlikely |
| | Occasional | Seldom | Seldom | Unlikely | Unlikely |

[Return to Risk Estimate](#)



RESOURCES

Where can you find answers?

- Public Health Command (PHC), Ento Div
<http://chppm-www.apgea.army.mil/ento/default.htm>
- AFPMB
<http://www.afpmb.org>
- NCMi (MEDIC CD)
- Walter Reed Biosystematics Unit (WRBU)
<http://wrbu.si.edu>
- Regional PM assets



AFPMB

<http://www.afpmb.org>



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Board Meeting Information

- [Upcoming Meetings](#)
- [Missed the 190th Board Meeting? Watch the recorded video feed of any committee meeting online](#)

What's New:

- [Updated version of the Contingency Pest Management Guide \(TG #24\) available](#)
- [Distribution and Ecology of Sandflies of the Old World \(Genus Phlebotomus\), by M. M. Artemiev and V. M. Neronov \(in Russian\)](#)
- [Revised CDC rodent control web page, includes fact sheets, images, and other resources](#)
- Congratulations to the current Chair of the AFPMB Council, LTC Sandra Alvey, who has been selected for promotion to O6 (full Colonel) in the Army Reserves. This is a tremendous accomplishment. Well done, LTC Alvey!
- [Rockets and Bugs](#), by Ernie Neff
- [Tick surveillance of small mammals captured in Gyeonggi and Gangwon Provinces, Republic of Korea, 2004–2008](#), by Heung Chul Kim, Sung Tae Chong, William J. Sames, Peter V. Nunn, Stephen P. Wolf, Richard G. Robbins & Terry A. Klein

Snapshots from our Image Library



- Multimedia:
- [Browse our image library](#)
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Resources:

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- [AFPMB Discussion Forum](#)
- [Brown Tree Snake Documents](#)
- [Committee Workspaces](#)
- [DoD Pesticide Use](#) [DoD Pesticide Hotline](#)
- [DoD Standard Pesticides and Pest Control Equipment Lists](#)
- [DoD Pest Management Training and Certification](#)
- [Links](#)
- [Living Hazards Database](#)
- [Publications, Databases, Technical Guides and Media](#)
- [Walter Reed Biosystematics Unit](#)

Military Entomology:



Army



Navy



Air Force



WRAIR

Walter Reed Army
Institute of Research
Soldier Health • World Health

AFPMB



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- [U.S. Army](#)
- [U.S. Navy](#)
- [U.S. Air Force](#)
- [U.S. Government Sites](#)
- [Pesticide News](#)
- [Professional Organizations](#)
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Department of Defense

- [Defense Link](#)
- [Joint Chiefs of Staff](#)
- [Office of the Under Secretary of Defense for Acquisition, Technology & Logistics \(OUSD\(AT&L\)\)](#)
- [Office of the Deputy Under Secretary of Defense for Installations and Environment \(ODUSD\(I&E\)\)](#)
- [DeploymentLINK](#)
- [Defense Environmental Network and Information eXchange \(DENIX\)](#)
- [Deployment Health Clinical Center](#)
- [National Center for Medical Intelligence \(NMIC\)](#)
- [DISDI Portal \(CAC Login Required\)](#)

Combatant Commands

- [U.S. Africa Command \(AFRICOM\)](#)
- [U.S. Joint Forces Command \(USJFCOM\)](#)
- [U.S. Northern Command \(USNORTHCOM\)](#)
- [U.S. Central Command \(USCENTCOM\)](#)



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PROTECTIVE MEASURES

ARMED FORCES PEST MANAGEMENT BOARD

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 - Contingency
 - Contingency Guidance & Policy
 - Contingency Pesticide List
 - DD Form 1532-1 Contingency Form
 - Equipment
 - Humanitarian & Civic Assistance
 - Insect-transmitted Disease Info by Country/Region
 - Personal Protection Measures (PPM) for Deployments
 - Vector Control
 - Vegetation Control
 - Venomous Animals
 - DoD Pest Management List (General Equipment)
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Snapshots from our Image Library

Fauna of Iraq JUN 15 2008

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- Links
- Living Hazards Database
- Publications, Databases, Technical Media
- Walter Reed Biosystematics Unit

Military Entomology:

- Army
- Navy

Tick surveillance of small mammals captured in Gyeonggi and Gangwon Provinces, Republic of Korea, 2004–2008, by Heung Chul Kim, Sung Tae Chong, William J. Sames, Peter V. Nunn, Stephen P. Wolf, Richard G. Robbins & Terry A. Klein



The Walter Reed Biosystematics Unit (WRBU) is a unique national resource. Its mission is to conduct systematics research on medically important arthropods and to maintain the U.S. mosquito collection. The WRBU is just one part of the U.S. Government's entomological research system, which includes the U.S. Department of Agriculture (USDA) and the Smithsonian Institution (SI). Historically, mosquito identification was managed by USDA and the SI, but in 1972 this responsibility was transferred from USDA to the U.S. Army for research on medically important arthropods. Located at the Museum Support Center of the Smithsonian Institution in Suitland, Maryland, the WRBU's physical space is provided by the Smithsonian Institution in return for curation of the collection and specimen identification... [\(more\)](#)

What's New?

Mosquito Classification 2010 

Discussion Forum

New mosquito identification keys

See new WRBU staff publications



MosquitoMap.org
SandflyMap.org
TickMap.org



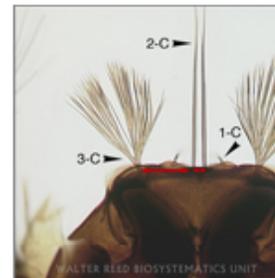
Vector Identification Resources

to medically important arthropods and WRBU's Vector Identification Service

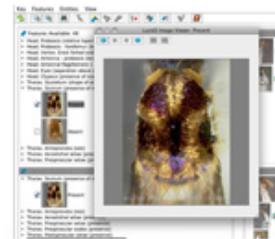
Mosquito Resources



Culicidae Catalog
www.mosquitocatalog.org



Medically Important Mosquitoes



Mosquito Species Identification Keys



Mosquito Genera



Mosquito Literature

Other Vectors



Sand Flies



Ticks



Scorpions



Fleas

<http://wrbu.si.edu/>



MEDICALLY IMPORTANT MOSQUITO SPECIES

[HOME](#)

[VECTOR ID](#)

[MOSQUITO ID](#)

[GENERA](#)

[KEYS](#)

[MED IMP MOSQ](#)

[LIT](#)

Species pages for the medically important mosquitoes. Click on area of responsibility for list of species appropriate to region.

US Department of Defense Unified Command Areas of Responsibility

[AFRICOM](#) | [CENTCOM](#) | [EUCOM](#) | [NORTHCOM](#) | [PACOM](#) | [SOUTHCOM](#)



[HOME](#) | [GENERA](#) | [AORs](#) | [MQ KEYS A—Z](#) | [MQ KEYS Zoogeo](#) | [AFRICOM](#) | [MED IMP MOSQ](#)

AFRICOM Keys:

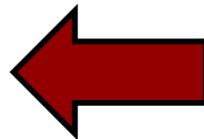
CLICK "ADULTS" or "LARVAE" to launch key, which will open in a separate browser window. Note: Keys are all BETA versions, currently in review process, and as such may contain errors. They will be corrected as reviews are completed and are subject to change without notice.

WORLDWIDE

Mosquito Genera: [ADULTS](#) | [LARVAE](#)

AFRICA

Mosquito Genera, African (AFRICOM): [ADULTS](#) | [LARVAE](#)
Culex Mosquitoes, African (AFRICOM): [ADULTS](#) | [LARVAE](#)



AFROTROPICAL REGION

Aedes Mosquitoes, Afrotropical (AFRICOM): [ADULTS](#) | [LARVAE](#)
Coquillettidia Mosquitoes, Afrotropical (AFRICOM): [ADULTS](#) | [LARVAE](#)
Mansonia Mosquitoes, Afrotropical (AFRICOM): [ADULTS](#) | [LARVAE](#)

AFRICOM Countries:

To search for species by country, see [WRBU's Mosquito Catalog](#). For more information on countries, see [CIA World Factbook](#)

| | | | |
|--------------------------|-------------------|------------|-----------------------|
| ALGERIA | COTE D'IVOIRE | LIBERIA | REPUBLIC OF THE CONGO |
| ANGOLA | DJIBOUTI | LIBYA | RWANDA |
| BENIN | EQUATORIAL GUINEA | MADAGASCAR | SAO TOME AND PRINCIPE |
| BOTSWANA | ERITREA | MALAWI | SENEGAL |
| BURKINA FASO | ETHIOPIA | MALI | SEYCHELLES |
| BURUNDI | GABON | MAURITANIA | SIERRA LEONE |
| CAMEROON | GAMBIA | MAURITIUS | SOMALIA |
| CAPE VERDE | GHANA | MOROCCO | SOUTH AFRICA |
| CENTRAL AFRICAN REPUBLIC | GUINEA | MOZAMBIQUE | SUDAN |
| CHAD | GUINEA-BISSAU | NAMIBIA | SWAZILAND |
| COMOROS | KENYA | NIGER | TANZANIA |
| | LESOTHO | NIGERIA | |

INTERACTIVE WEB MOSQUITO ID

Key Features Entities View

Features Available: 47

- Head. Proboscis (relative tapering at tip)
- Head. Proboscis : forefemur (length)
- Head. Vertex. Erect forked scales (number and distribution)
- Head. Antenna : proboscis (length)
 - Antenna distinctly shorter than proboscis
 - Antenna equal in length or longer than proboscis
- Head. Antennal flagellomere 1 : flagellomere 2 (length)
- Head. Eyes (separation above antennae)
- Head. Clypeus (presence of scales)
- Thorax. Scutellum (shape of scutellar lobe and arrangement of scutellar setae)
- Thorax. Scutum (presence of metallic or iridescent scales)
- Thorax. Antepronota (size)
- Thorax. Acrostichal setae (presence)
- Thorax. Prespiracular setae (presence)
- Thorax. Prespiracular scales (presence)
- Thorax. Postspiracular setae (presence)
- Thorax. Postspiracular scales (presence)
- Thorax. Upper Mesokatepisternal setae (presence)
- Thorax. Lower mesokatepisternal setae (presence on edge of mesepimeron)

Features Chosen: 0

- Head. Antenna : proboscis (length)
 - Antenna distinctly shorter than proboscis

Entities Remaining: 15 Images: 15

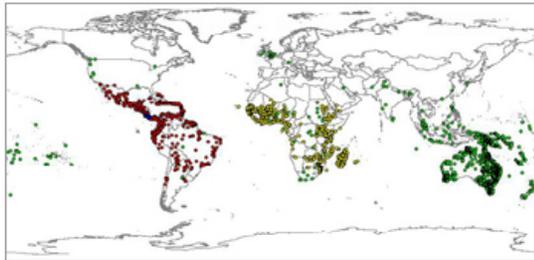
| | | | | |
|--|--|--|--|--|
|  |  |  |  |  |
| Aedeomyia | Aedes | Anopheles | Coquillettidia | Culex |
|  |  |  |  |  |
| Culiseta | Eretmapodites | Ficalbia | Hodgesia | Malaya |
|  |  |  |  |  |
| Mansonia | Mimomyia | Orthopodomyia | Toxorhynchites | Uranotaenia |



MOSQUITOMAP WEBSITE



[Home](#) | [Data Portal](#) | [Dataset History](#) | [Metadata](#) | [Contribute Data](#) | [About](#) | [Contact us](#) | [FORUM](#) | [WRBU](#) | [VectorMap](#)



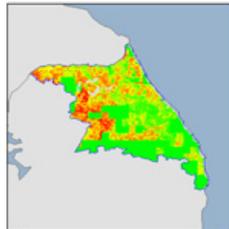
Welcome to MosquitoMap!

MosquitoMap is a component of VectorMap - a geospatially referenced clearinghouse for mosquito species collection records and distribution models. Users can pan and zoom to anywhere in the world to view the locations of past mosquito collections and the results of modeling that predicts the geographic extent of individual species. Collection records are searchable and downloadable, users can map and upload their own georeferenced collection data or distribution models, and all contributions have full attribution. Currently, MosquitoMap has **133,201 records**, for **358,000 individual specimens/observations**, and **1930 unique scientific names**, from **8867 locations**, in **140 countries**.

MosquitoMap is designed to preserve and make available the results of past collecting and distribution modeling activity. The utility of MosquitoMap will increase as more records and models are added. Contributions are encouraged, especially from individuals and organizations with digitized, georeferenced records and those involved in ongoing mosquito surveillance. See a published description of MosquitoMap in the [International Journal of Health Geographics](#).

MosquitoMap is useful for:

- informing decisions about where mosquito collection efforts should be directed
- identifying areas relevant to the study of mosquito biogeography, evolution and biodiversity
- allow predictions about the potential spread of exotic mosquito introductions
- allow predictions about the potential effects of global warming on mosquito distributions
- allow insights into mosquito community structure, and environmental and climatic correlates to species occurrence (ecological niche)
- allow continent-wide rather than just local studies of vector-borne disease
- identifying cryptic evolutionary lineages that differ in geographic or ecological space.



The Mal-area calculator

A novel enhancement of MosquitoMap is the Mal-area calculator (MAC) that quantifies the overlap between vector and pathogen distribution models, and human population. The co-occurrence of vectors, parasites and Humans are required for many vector-borne diseases, and the MAC quantifies this co-occurrence for a given area, thus potentially providing a map and simple index of disease risk for any area of interest. At the moment the MAC is at the 'proof of concept' stage, and only works for South Korea, but we plan to expand its coverage in the near future!

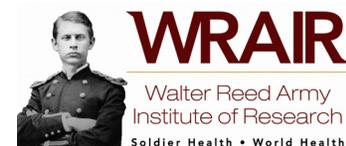
[OPEN DATA PORTAL](#)



MOSQUITOMAP WEBSITE

Welcome to MosquitoMap!

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MOSQUITOMAP WEBSITE

- New tool
- Current version is being beta test
- Feedback from the users in the field requested
- POC is Rick Wilkerson at wilkersonr@si.edu



Public Health Command (CHPPM)

<http://chppm-www.apgea.army.mil/ento/default.htm>

- Provide public health support in support of the Military.
- Entomologists are located at all 6 PHC locations.
- Senior entomologist provide experience and expertise to customers while mentoring the junior entomologists.



Public Health Command (CHPPM)



US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

Entomological Sciences Program

What's Hot?

- [Fact Sheet: Formosan Subterranean Termites](#) (June 2006)
- [Fact Sheet: Pesticides and Child Safety](#) (April 2006)
- [Fact Sheet: West Nile Virus!](#) (March 2006)
- [Fact Sheet: Animal Flea and Tick Collars are NOT for Human Use!](#) (March 2006)
- [Fact Sheet: Hantavirus Pulmonary Syndrome - Protect Yourself and Your Family](#) (March 2006)
- [Fact Sheet: Widow Spiders](#) (March 2006)
- [Fact Sheet: Chikungunya](#) (Feb 2006)
- [Fact Sheet: Brown Recluse Spiders](#) (Nov 2005)
- [Fact Sheet: Protect Yourself from Tick-Borne Diseases](#) (Nov 2005)
- [Human Tick Test Kit Program](#)
- [Tick Borne Disease Education](#)
- [Information on West Nile Virus](#)
- [Deployment Information for Entomologists](#)

CHPPM Entomology

- *Services (All field services listed below are provided to DoD organizations only.)*
 - [Human Tick Test Kit Program](#)
 - [Tick-Borne Disease Education](#)
 - [DoD Pesticide Hotline](#)
 - Monitoring
 - Resistance
 - [Deployment Pest Management](#)
- [Focus on Lyme Disease Newsletters](#)
A periodic newsletter dealing with various Lyme Disease issues
- [Pest Management Bulletins](#)
Quarterly newsletter on a variety of pest management topics
- [Fact Sheets](#)
- [Technical Guides](#)



PM DETACHMENTS



04/23/2003

Prevention



WHAT CAN YOU DO TO MINIMIZE RISK?

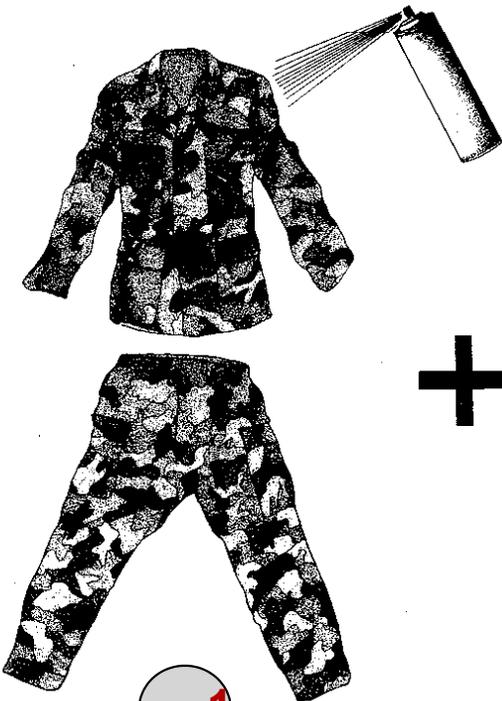
- Find out what the priority risks are in your area before you deploy.
- Understand the vectors so you can avoid them.
- Modify behaviors to minimize contact
 - Use repellents
(Reference for suggested products...<http://www.afpmb.org/coweb/ppm.htm>)
 - Sleep under insecticide treated netting
- Take malaria chemo (if warranted)
- Call for help:
 - AFPMB (CLO) :
 - afpmb-webmaster@osd.mil: subject CLO question
 - PHC, Ento Division



Other Individual Countermeasures

- Wear uniform properly to cover as much skin as possible and to prevent access of insects through openings in the clothing:
- Wash/inspect your body for insects and bites daily; Use the buddy system.
 - Roll sleeves down.
 - Tuck pants into boots.
 - Wear an undershirt; tuck it into the pants at waistline.
 - Wear uniform loosely.
- DO NOT wear aftershave lotion, cologne or perfume in the field.
- Launder uniform routinely to remove insects and their eggs.
- Take malaria prophylaxis pills when directed to do so by your medical authority.
- Use a bed net while sleeping; treat it with permethrin.





1

Permethrin
On
Uniform

+



2

Deet On
Exposed
Skin

+



3

Properly
Worn
Uniform

=

*Maximum
Protection*

**It's critical
for your
health**

DOD Insect Repellent System

**It's a basic
training
task**

**It's DoD
Policy**



Standard Military DEET Skin Repellent



Commercial



Military

33% Controlled-Release DEET Lotion: NSN 6840-01-284-3982

Highest rated skin repellent available (Consumer Reports, May 2003)



WRAIR

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CDC recommended repellents

Q. Which mosquito repellents work best?

A. CDC recommends using products that have been shown to work in scientific trials and that contain active ingredients which have been registered with the EPA for use as insect repellents on skin or clothing.

Of the active ingredients registered with the EPA, CDC believes that two have a higher degree of efficacy in the peer-reviewed, scientific literature (

Products containing these active ingredients typically provide longer-lasting protection than others:

DEET (N,N-diethyl-m-toluamide)

Picaridin (KBR 3023)

- Oil of lemon eucalyptus [active ingredient: p-menthane 3,8-diol (PMD)], a plant-based repellent, is also registered with EPA. In two recent scientific publications, when oil of lemon eucalyptus was tested against mosquitoes found in the US it provided protection similar to repellents with low concentrations of DEET.

http://www.cdc.gov/ncidod/dvbid/westnile/qa/insect_repellent.htm#A1



INSECT REPELLENTS FOR SKIN AND CLOTHING

DEET lotion



NSN 6840-01-284-3982



- Apply a thin coat to **EXPOSED** skin
- One application lasts up to 12 hours

Permethrin

- Individual Dynamic Absorption Kit (IDA)
- Treatment lasts for life of the uniform



NSN 6840-01-345-0237



- Aerosol spray can
- Treatment lasts through 6 washes

NSN 6840-01-278-1336



Light-weight, self-supporting, POP-UP bed net



The pop-up bed net is factory-treated with permethrin and has much finer mesh than the standard military bed net.

- OD Green (Camouflage) NSN 3740-01-516-4415
- Coyote Brown NSN 3740-01-518-7310



Questions?





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