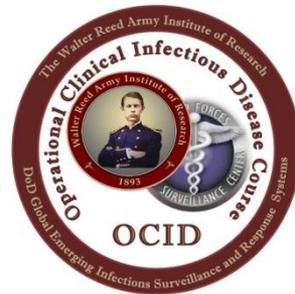




# Entomology LAB



**WRAIR- GEIS 'Operational Clinical Infectious Disease' Course**



UNCLASSIFIED

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# Acknowledgments

Thanks to:

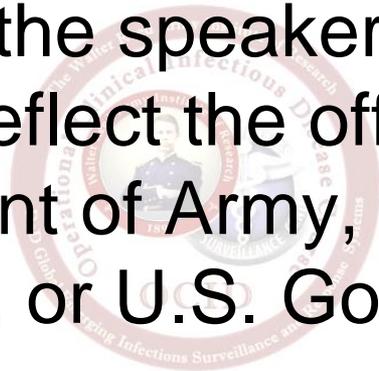
- MAJ Lowen
- CPT Mischler





# Disclaimer

The views expressed in this presentation are those of the speaker and authors, and do not reflect the official policy of the Department of Army, Department of Defense, or U.S. Government





# Deployed Entomological Resources

- **Role 1 – Individual**
  - Personal Protective Measures
- **Role 2 – BCT Preventive Medicine Section (72D. 68S)**
  - Limited surveillance and pesticide application ability
  - Basic laboratory testing (AV-RDDs)
- **Role 3 – Preventive Medicine Medical Detachment (PM MEDDET; 72D, 72B, 68S)**
  - Full entomological services (Surveillance , Identification and Pest Management)
  - Basic laboratory testing (AV-RDDs)
- **Role 4 – 1<sup>st</sup> Area Medical Laboratory**
  - Limited entomological services (Surveillance , Identification and Epidemiology)
  - No pest management services
  - Limited laboratory testing (Availability)
- **Role 5 – USPHC (Main, North, South, West, Europe, Pacific)**
  - Full laboratory testing available (Malaria and Leishmaniasis)

**Ancillary entomological support available at the WRAIR (WRBU) and USAMRIID**





### USAMMDA Mission

The USAMMDA Mission is to develop and manage medical materiel to protect and sustain the Warfighter on point for the Nation.



**Malaria**



**Leishmaniasis**



**Dengue**

### USAMMDA Vision

The USAMMDA Vision is to integrate with USAMRMC, Federal agencies, and the DoD, as part of the joint biomedical research and materiel community, to focus on delivering the best medical solutions for today and tomorrow.

Our products are an integral part of the DoD Force Health Protection Program, to include vaccines, drugs, and medical devices, to prevent, diagnose, and treat infectious diseases, combat-related casualties, and CBRNE threats.

Our products enhance far-forward medical care across the full spectrum of health care missions worldwide.

## For more information about USAMMDA

Visit our website:

[www.usammda.army.mil](http://www.usammda.army.mil)

Or contact us at:

**USAMMDA**

1430 Veterans Drive, Fort Detrick, MD 21702

301.619.7056

# USAMMDA

U.S. Army Medical Materiel Development Activity



*Developing Quality Medical Products  
for U.S. Forces*

## Arthropod Vector Rapid Detection Devices (AVRDD)



Rapid, Hand-Held Detection Assay  
used for qualitative determination of a vector-  
borne pathogen in an infected arthropod



**U.S. Army Medical Research and Materiel Command**  
*Protect the Warrior, Sustain the Force*

Last updated: March 16, 2012





## Arthropod Vector Rapid Detection Devices

The Arthropod Vector Rapid Detection Devices (AVRDD) are hand-held assays that can be used to determine whether arthropods are infected with pathogens capable of infecting deployed personnel.

### What is AVRDD?

The AVRDD is an immunochromatographic membrane assay that uses colloidal gold-labeled antibodies to detect and identify specific parasites or viruses in a target arthropod vector. These antibodies are impregnated on a sample pad and combined with a test strip. The 'Test Line' contains antibodies specific for the pathogen or virus and the 'Control Line' contains control antibody. The AVRDD is packaged as a kit containing all the supplies needed to test 20-50 'pools' of arthropods, which each 'pool' containing between 1-50 individual target arthropods. These kits can be used across the full range of military operations.



### How does AVRDD work?

To perform a test, collected arthropods are placed in the plastic tube along with the proprietary grinding buffer, all included in the kit. A small hand-held pestle is used to grind or homogenize the sample and then the test strip is placed in the tube with the sample. The 'Control Line' will appear to indicate the assay is working, and the 'Test Line' will appear if the target parasite or virus was detected, indicating a positive result. No 'Test Line' indicates a negative result or no parasite or virus detected.

### Procedure Outline

1. Place female Aedes mosquitoes into the conical grinding tube provided in the kit. Place the tube into the tube stand provided.
2. Dispense 250mL of Grinding Solution from GS bottle onto the mosquitoes.
3. Place the pestle provided in the kit into the grinding tube and vigorously rotate it to homogenize the mosquitoes. The pestle can be reused if washed between uses.
4. Place a test strip from the canister into the mosquito suspension in the grinding tube with the arrows pointing down. Replace the desiccant cap on the canister to protect the remaining strips from moisture. Wait for the test to be completed. Results can be read ~20-30 minutes or later.
5. Determine the test results by removing the test strip and comparing it to the pictorial sample provided to the right.



### Collaboration

These assays were developed through collaborative efforts between Walter Reed Army Institute of Research and the Small Business Innovative Research Program and supported by the Military Infectious Diseases Research Program and USAMMDA. Field testing was conducted with the cooperation of U.S. Army Medical Research Institute of Infectious Diseases and U.S. Army Research Unit - Kenya. Manufacturing of these assays is done by Vector Test Systems, Inc.

Each of these assays or kits will be included in the following Medical Equipment Sets (MES):

- MES Entomological Collecting, Field
- MES Endemic Disease, Microbiology;
- MES Entomological, Lab.

They are also available for unit purchase.



### Ordering Information

Malaria AVRDD NSN 6550-01-551-5327

Dengue AVRDD NSN 6550-01-602-7751

Leishmania AVRDD NSN anticipated in June 2012 (waiting on AFPMB approval)





# Why is entomology important?

- Arthropods as disease vectors
- Direct injury or envenomation



# Priority Threats



1. Malaria
2. Dengue
3. Bacterial diarrhea
5. Leishmaniasis
7. Q-fever
13. CCHF
16. Chikungunya
18. Plague
19. Rickettsioses
20. Viral encephalitis
23. Tick-Borne Encephalitis
24. Rift Valley fever
27. Other arboviruses
31. Tularemia
32. Trypanosomiasis
34. Chagas' disease
35. Yellow fever
36. Lyme disease



**Over half of our  
priority diseases have  
arthropod vectors**





# Anopheles

- Malaria
- Filariasis



# Aedes

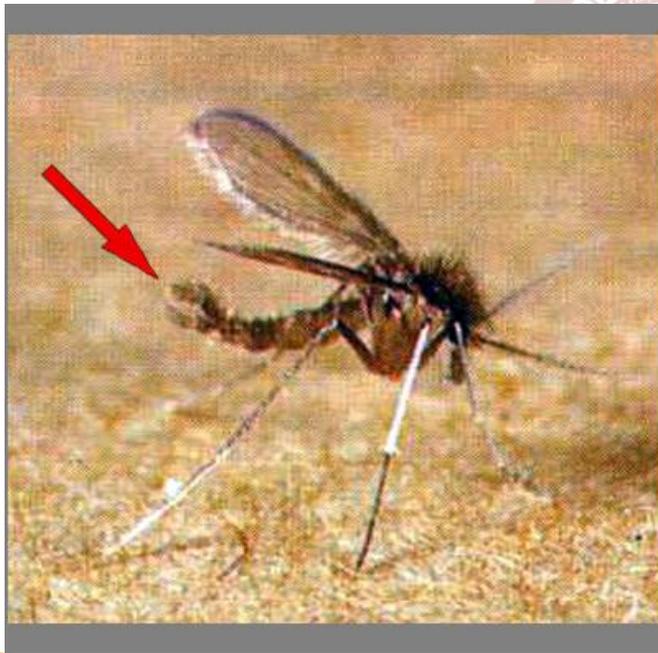
- Dengue
- Chikungunya
- Yellow Fever
- Lymphatic Filariasis
- Encephalitis
  - WNV
  - EEE





# Sand Flies

- Leishmania
- Sandfly Fever
- Bartonellosis





# Ticks

- Crimean Congo Hemorrhagic Fever
- Tick Borne Encephalitis
- Tularemia
- Lyme
- Babesiosis
- Rickettsia Diseases
- Ehrlichosis





# Loa loa

- Transmitted by the Chrysops species of deer flies





# Onchocerciasis River Blindness

- Caused by microfilaria transmitted by the bite of Simulium blackflies

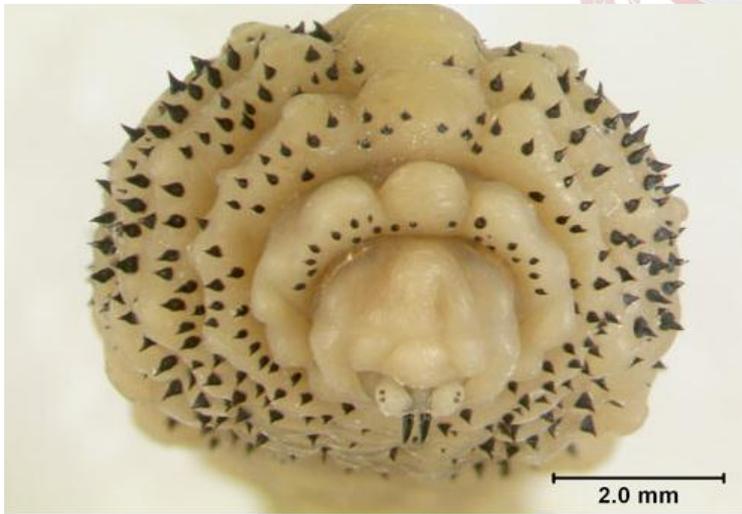
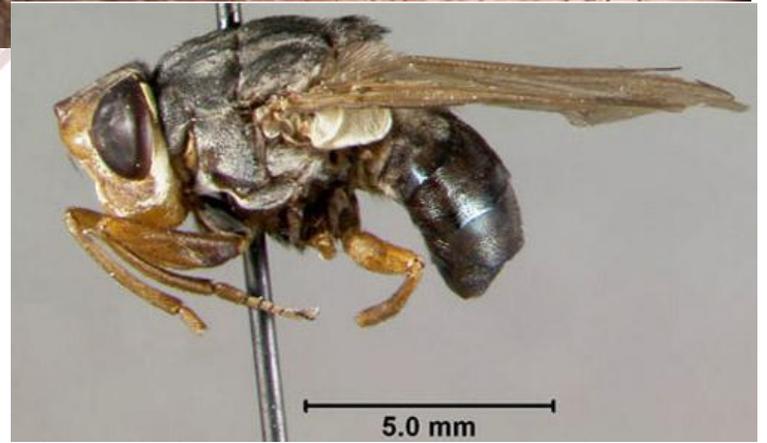




# Injury and Envenomation



# Bot Fly



# Scorpions

- Deathstalker
- Arabian Fat-Tail
- Yellow Fat-Tail
- Spitting Thicktail Black Scorpion
- Striped Bark Scorpion
- Asian Forest scorpion



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# Fire Ants

- Ants will bite to grip and then inject Solenopsin
- Stings can be deadly to sensitive people



# Bullet Ant



# Black Widow Spiders



- 32 recognized species of widow spider worldwide
- Bites are extremely painful but rarely fatal
- Tend to be shy and not aggressive



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# Brown Recluse

- Rarely aggressive
- Carries a hemotoxic venom
- Small number of bites will become necrotic





# The Wandering Spider

- Aggressive spiders
- Has a neurotoxic venom
- Bites cause intense pain and can lead to loss of muscle control and breathing difficulties





# Centipedes

- Very painful bite followed by redness and swelling
- Follow first aid for bites and stings



# Blister Beetles



- Secretes a chemical called cantharidin that causes skin blistering
- Cantharidin is also the principal irritant in Spanish Fly





# Stinging Caterpillars





# Puss Caterpillar

## Megalopyge opercularis

### “Toxic Toupee”



# Saddleback Moth *Acharia stimulea*





# Io Moth Automeris io



Army Institute of Research  
Infectious Di  
Institute



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# Giant Silkworm Moth

## Lononia species

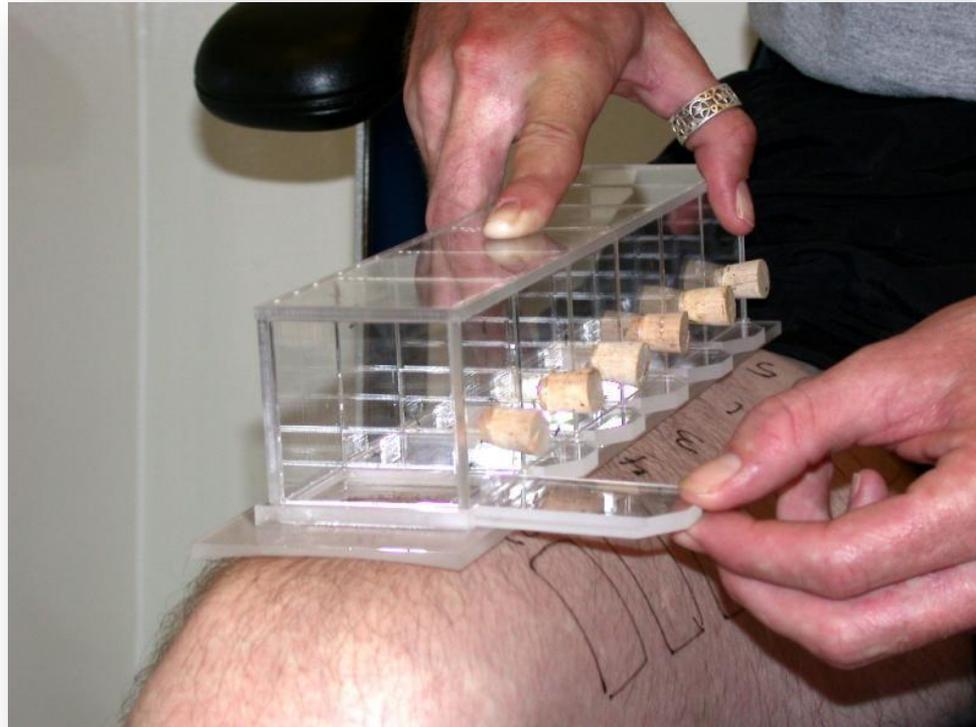
- Responsible for many human deaths especially in Brazil
- Contact with multiple caterpillars can result in massive internal hemorrhaging, renal failure, hemolysis and death



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# Test and Evaluation



# Personal Protection



- Treated uniforms
- Repellents
- Bed nets

- Spatial Repellents



ThermoCELL®  
(allethrin)



## Picaridin

First new repellent a.i. added to military stock system since 1946.



Off!®Clip-On™  
Mosquito Repellent  
(metofluthrin)



Standard Insect  
Net Protector



"Pop-up" Self-Supporting  
Low-Profile Bed Net



Triton Egret Bed Net





# QUESTIONS?

