

THE WALTER REED ARMY INSTITUTE OF RESEARCH

Entomology

Mission

The Entomology Branch conducts basic and applied research, field testing, and product development activities to reduce the risk of vector-borne diseases to DoD personnel and to support global health. The program is a key component of malaria, dengue, and leishmaniasis vaccine and drug development efforts.

The research, products and knowledge generated by the team directly protect the Warfighter through the use of:

- enhanced vector and pathogen surveillance and detection methods
- risk assessment techniques
- personal protective measures
- vector identification

Major Accomplishments

Providing solutions to military and global health vector-borne disease problems by:

Development of methods to detect relevant vector-borne diseases including:

- Circumsporozoite ELISA for detection of malaria parasites in infected mosquitoes
- Real-time PCR for detection of *Leishmania* spp. in sand flies, achieving for the first time the prediction of an outbreak of vector-borne disease by detecting parasite DNA in infected flies, rather than waiting for the first human cases
- Human cutaneous leishmaniasis human diagnostic PCR assay scheduled for FDA clearance in 2011
- Invention and development of rapid, “dipstick” detection of mosquito borne-viruses, *Plasmodium* spp. and *Leishmania* spp. in infected mosquitoes and sand flies
- Designing the gold standard *in vitro* and *in vivo* assays to evaluate the efficacy of topical insect repellents

World leaders in mosquito identification:

- Described scores of new species of mosquitoes between 1961 and 2011
- Deployed online guides (www.WRBU.org) to enable entomologists to identify medically important mosquito and sand fly species in the field
- Created a web tool (www.VectorMap.org) to help pinpoint areas of high vector-borne disease risk

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Major Accomplishments continued

Maintenance of mosquito and sand fly insectaries of global excellence:

- Produced thousands of *Plasmodium*- or dengue virus-infected mosquitoes and *Leishmania*-infected sand flies in support of the world's most active malaria and leishmaniasis vaccine and drug development programs

Future Challenges and Directions:

We are currently leading a diverse portfolio of efforts aimed at fielding the following products:

New generation repellents:

- New topical repellent formulations to replace or augment the current DEET repellent
- Spatially active insect repellent devices to protect personnel without applying a topical repellent to the skin
- Improved uniform repellent formulation, which are long lasting and effective against permethrin resistant vectors

New generation bed nets:

- 2nd generation, long-lasting, self-supporting pyrethroid-impregnated bed net
- Application of electrospun nanofibers to untreated bed nets and other materials
- Improved technology to treat fabrics with repellent or insecticide

New generation mosquito trapping tools:

- New trap for mosquito collections
- Field-deployable CO₂ generator to attract insect vectors to traps

Vector and pathogen identification tools:

- Passive vector saliva collection and pathogen screening system
- Hand-held detection system for molecular identification of vector species

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