Western Gulf Center of Excellence for Vector-Borne Diseases

Lead Institution: Institute for Human Infections & Immunity, UTMB Health
Program Manager: Caroline Weldon, MPHTM
Partners and Associated Institutions
WGCVBD Goals

A. Applied Research
   1. Insecticide resistance mechanisms, monitoring and strategies to avoid
   2. Development and testing of new mosquito control strategies
   3. Improved surveillance for mosquito- and tick-borne diseases
   4. Nucleic acid detection for dengue, chikungunya, Zika and West Nile viruses
   5. High throughput microneutralization assays for the same three viruses
   6. Ultrasensitive antibody and antigen detection for human ehrlichiosis
   7. Predictive Models for the Spread of Mosquito-Borne Diseases in Temperate Climates
   8. Symbiotic Bacterial Delivery of RNA Interference to Inhibit Arbovirus Transmission
   9. Surveillance for tick- and flea- borne Rickettsiaceae along the Texas-Mexico border

B. Education: ranging from short modular courses designed for public health and vector control personnel to specialized PhD programs

C. Outreach: to share findings and advice with public health agencies ranging from municipal to national levels
Project 1 Aim A Insecticide Resistance Management

Project Leader: Patricia Pietrantonio (Texas A&M AgriLife Research)

- Determine the frequency of pyrethroid resistant mosquitoes (kdr)
- Pie charts areas 708, 55 and 423: number of *Cx. quinquefasciatus* females diagnosed by sequencing or by PCR. SS: susceptible; RR: homozygous resistant; RS: heterozygous resistant. R represents the **L1014F** kdr-like mutation (TTA ->TTT).

Colors in map: number of treatments per area in 2018, 1-7 (cyan), and 8-14 (magenta) with Permanone® (pyrethroid) or Fyfanon® (OP).

Most females carry the *kdr* allele for pyrethroid resistance!
Project 2 Evaluation of Vector Interventions

Project Leader: Gabriel Hamer (Texas A&M AgriLife Research)

Evaluation of the larvicide intervention in Brownsville, Texas:
• Modest reduction in Ae. aegypti abundance in areas receiving the Bti-based intervention using Buffalo Turbine

Understanding the social feasibility and economic cost-benefit of vector control strategies in Texas
• Distribute surveys addressing the perceived impacts of mosquitoes on quality of life, support for or opposition to different control techniques, and willingness to pay for control.
Project 3 Tick and Tick-borne Disease Surveillance in Texas

Project Leader: Donald Bouyer (UTMB)

- Increase in Lyme disease, spotted fever rickettsioses, tularemia, and Ehrlichioses
- Little known in Gulf and Rio-Grande Valley regions
- Collected 2376 ticks from 45 counties with pathogen testing underway
- Partnership with University of OK and intentions to expand this year
Project 4, 5, and 6 Vector-Borne Disease Diagnostics

- **Project 4** Rapid Point of Care Nucleic Acid Amplification Tests for Emerging Arboviruses (Travi)
  - Zika virus, Chikungunya virus, and more recently for viruses transmitted by ticks such as Heartland virus, Powassan virus and Bourbon virus

- **Project 5** Stable Reporter Zika Chimeric Viruses (Shi)
  - Aims to improve the current arbovirus diagnostic

- **Project 6** Ultrasensitive antibody and antigen detection for human ehrlichiosis (Mcbride)
  - Working to develop an antigen detection assay that will provide ultrasensitive methods without expensive equipment
Project 7 Predictive Models for the Spread of Mosquito-borne Disease in Temperate Climates

Project Leaders: Kevin Myles (Texas A&M University)

- Studies suggest that the transmission dynamics of mosquito-borne viruses differ substantially between tropical climates and temperate climates due to large differences in fluctuating diurnal temperature ranges.
- Develop a low-cost wireless network for real-time climate monitoring of mosquito breeding and resting sites.
- Data generated used to develop predictive models for the spread of Zika virus.
Project 9 Surveillance of Tick- and Flea-borne Rickettsiaceae along the Texas-Mexico Border

Project Leaders: Donald Bouyer, Lucas Blanton, David Walker (UTMB)

- Underserved, dense populations near Mexico at risk for spillover of vector-borne infectious diseases
- Highly endemic murine typhus- underreported
- Aim to determine prevalence of typhus group Rickettsia, spotted fever group Rickettsia and Ehrlichia species in collected fleas and ticks collected
Integration of Education and Outreach

Short and long-term training

- Public Health Practitioners
- Government Officials (Municipal, County, State)
- Private Sector Companies
- Future Professionals (Undergraduate/Graduate Students/Post-docs)

In-Service Training
Face-to-Face/Online
5 Topic Areas w/Certification
Master Vector-Borne Disease Management Certification

New Online Courses
- Vector Biology & Ecology
- Vector Colony Establishment & Maintenance
- Vector Surveillance Methods
- Vector-Borne Disease Outbreak Response & Mgmt

Institutional Programs with Concentration
- Disciplinary Degrees
- Undergraduate Transcribed Certificate in Public Health Entomology
- Graduate Transcribed Certificate in Vector Biology
- Student Exchanges for Institutional Cross Training
- Certification in arthropod containment (ACL-2 and ACL-3)
- Student Internships (public and private)
- Student Research in Vector Biology
Education and Training

Project Leader: Pete Teel and Craig Coates, TAMU

Online Courses at Texas A&M University
1. Vector Biology and Ecology
2. Vector Colony Establishment and Maintenance
3. Vector Surveillance and Resistance Monitoring Methods
4. Vector-borne Disease Outbreak Response and Management

Tick and Identification and Foreign Animal Disease Awareness workshops at TAMU Entomology: Training to 48 animal health inspectors and veterinarians

Graduate degree seeking courses:
1. A joint UTRGV, TAMU, and UTMB course “Field Experiences in One Health and Outbreak Investigation”
2. Certificate course in Arbovirology, Rickettsiology and Arthropod Containment at UTMB
3. Certificate course in Medical Entomology at University of Texas Rio Grande Valley
4. Public Health Entomology Certificate at Texas A&M
# Training and Outreach

**Project Leader: Sonja Swiger (TAMU)**

**1 and 3 day workshops:**
- Mosquito Identification & Biology
- Mosquito-Borne Diseases
- Surveillance and control tactics
- Master VBD Management Certification

## One Day Workshops

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<thead>
<tr>
<th>Location</th>
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<th># of attendees</th>
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<tr>
<td>Victoria</td>
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</tr>
<tr>
<td>Tyler</td>
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<tr>
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## Three Day Workshops

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<td>Jackson</td>
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<td>Weslaco</td>
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<td>Houston</td>
<td>Dec 5 - 7</td>
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Outreach Participation

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<tr>
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Satisfaction Survey Results

Average Responses 2016-2018

[Pie chart showing satisfaction levels]

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Acknowledgements

Thank you to WGVBD Center researchers and collaborators!

- University of Texas Medical Branch
- University of Texas Rio Grande Valley
- Texas A&M Agrilife Research
- Harris County Public Health Department