

Fact Sheet

Format

Project Title: Human-Environmental Interaction and the Effect of Waste Tire Removal on Risk for Dengue Fever Infection in Brownsville, TX and Matamoros, MX.

Impact: (Impact on Public and or Environmental Health)

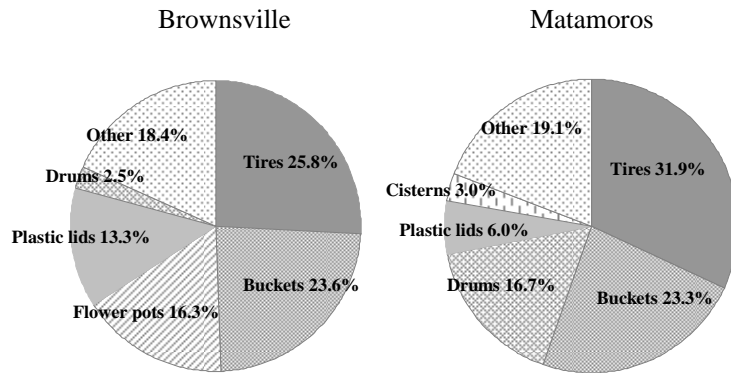
This project focuses on the Lower Rio Grande Valley in Brownsville, Texas and Matamoros, Tamaulipas where waste tires have been identified as a significant public health problem.

Discarded tires provide an ideal breeding site for the *Aedes aegypti* and *Aedes albopictus* mosquitoes which transmit dengue fever, as the tires provide insulation from heat and cold and retain water for long periods of time. The large number of waste tires in this region is thought to be one factor contributing to the sufficient populations of *Ae. aegypti* and *Ae. albopictus* mosquitoes to pose a risk to nearby humans. Significant numbers of tire piles remain both on the US and Mexican sides of the border. Clearly some of the problem—the larger and mid-size tire piles—must be dealt with by local authorities, and the best methods to do so are the subject of a separate facet of this study (e.g. testing resistance to currently used control compounds for example), but the actions of individual householders are also of concern. People often keep used tires for future use, or simply for lack of the means to easily dispose of them. Each tire in a yard, if improperly stored, can become a potential mosquito breeding site, adding to the overall risk in the community.

Background: Dengue is an emerging arboviral disease with worldwide impact.

Increasing case numbers in both the Americas and Asia necessitate an examination of changing human and vector ecology in order to better understand the dynamics of dengue transmission. This is especially important in geographic areas where dengue has more recently emerged in order to develop interventions to slow or halt the further expansion of dengue, and to efficiently focus prevention efforts. An outbreak investigation conducted in Brownsville, TX and Matamoros, MX in late 2005 revealed the highest prevalence of human anti-dengue antibodies in the continental United States in the last 50 years and the first case of classic dengue hemorrhagic fever acquired in the continental U.S. Not surprisingly, the data indicate many more infections in Matamoros than in Brownsville and highlight the need to delineate the various influences on dengue transmission dynamics in this border region.

The outbreak investigation conducted in 2005 identified tires as a significant breeding site for *Ae. aegypti* and *Ae. albopictus* in both Brownsville and Matamoros.



Containers infested with *Aedes* species mosquito immatures, by weighted proportion of container type, Brownsville and Matamoros—December, 2005

Study Description:

Objective 1. Assessment of human health-environmental factors, specifically the effect of waste tire proximity on human-vector contact through measurement of mosquito indices.

- Larval and pupal surveys and adult trapping using BG Sentinel traps to determine whether tires contribute to the presence of disease vectors in the neighborhoods in which they are located. These adult traps are specifically targeted toward *Ae. aegypti* and *Ae. albopictus* and have been recently field tested in Puerto Rico (Hayden, unpublished data)
- Tire piles will be either controls or treated with Altosid (or other chemical larvicide) or with the copepods, *Mesocyclops longisetus*, as an environmental intervention.

Objective 2. Evaluation of *Ae. aegypti* and *Ae. albopictus* resistance to widely used larvicides.

- Oviposition trapping will be undertaken to provide samples of *Aedes aegypti* and *Aedes albopictus* eggs which will be sent to CDC, Ft. Collins for resistance testing. We are proposing to conduct resistance testing across a wider range of larvicides (beyond just temephos).

Objective 3. *Qualitative evaluation of household level perception of risk of dengue transmission from waste tires and options for control.*

- Information will also be gathered through community focus group discussions and in-depth qualitative interviews regarding participants' knowledge of mosquito biology and habitats, participants' perceived ability to control waste tire breeding sites, and participants' views of the roles of government and community in the reduction of waste tire breeding sites in order to inform the development of potential interventions.

Timeline:

February 2007 –

- organizational meeting with partners at Brownsville City Health Department
- site visits in Brownsville, TX and Matamoros, Tamaulipas

June 2007 –

- establishment of field sites
- oviposition trapping
- initial larval and pupal surveys
- focus groups to assist in development of relevant community survey questions
- establishment of copepod colony

August 2007 –

- larval and pupal surveys
- adult baseline trapping;
- field testing of community surveys
- copepod and Altosid treatment of tires

September 2007 –

- adult trapping
- administration of community surveys

October 2007 –

- adult trapping
- begin data analysis

March 2008

- write up

Contact Information:

Stephen Waterman, MD, MPH
San Diego Quarantine and Border Health Services
Division of Global Migration and Quarantine
Centers for Disease Control and Prevention
3851 Rosecrans Street, P.O. Box 85524
San Diego, CA 92138
(619) 692 5659
Shw2@cdc.gov

Mary Hayden Ph.D.
National Center for Atmospheric Research
Advanced Study Program
Institute for the Study of Society and Environment
P.O. Box 3000
Boulder, CO 80307
303.497.8116 (w)
719.237.8199 (c)
mhayden@ucar.edu