Dengue Public Health Response Guide
(Revised: 3/3/08)

A known vector of dengue in Texas is the mosquito *Aedes aegypti*. Another mosquito, *Aedes albopictus*, should also be considered a vector of dengue as well. Researchers in Texas have demonstrated that *Ae. albopictus* is a very competent vector of dengue in the laboratory, and in some parts of the world *Ae. albopictus* is a known vector of dengue. This plan is directed toward the control of both *Ae. aegypti* and *Ae. albopictus*. Implementation of this plan will also have the added benefit of reducing local populations of other container-breeding mosquitoes such as *Culex quinquefasciatus*. *Cx. quinquefasciatus* is a known vector of St. Louis encephalitis and West Nile viruses in Texas.

The public health response to dengue virus is important in order to:

- minimize human illness through public education, early diagnosis of the disease, and vector control;

- identify locations where the disease poses the greatest threat; and

- identify breeding sites and implement control measures for the mosquito vector species.

Because these particular mosquitoes are container-breeding insects, vector control measures and surveillance should be targeted toward the areas that provide a breeding and shelter environment for the dengue mosquito population. Control efforts will depend largely on the local authority and the public response to eliminate and locate such risk conditions. Local mosquito control and surveillance efforts should be based on the principles of Integrated Mosquito Management (IMM), legal protection measures, and ensuring that prompt, accurate information reaches the public so that they may institute personal protective measures.

Statutory authority to enforce abatement of nuisance conditions that provide mosquito breeding in the county and non-incorporated municipalities is contained in Chapters 341, 342 and 343 of the Texas Health and Safety Code. Statutory authority to conduct mosquito control (including the use of adulticides and larvicides as well as source reduction) is contained in Chapter 81 of the Texas Health and Safety Code.

Texas Department of State Health Services (DSHS) will immediately inform the appropriate Health Service Region and Local Health Departments or county officials at the first discovery of dengue virus activity in their area. Local Health Departments should consult with their Regional offices regarding implementation of local response plans (see Appendix A: State Contacts).

Local health departments should be prepared to reinforce any statewide information campaign with additional public information targeted to specific communities.

State funding is not available to supplement local control efforts.
Risk Level 1
Normal Response

Conditions: Probability of local transmission is low.

Trigger: Normal mosquito activity with little or no evidence of dengue viral activity.

Recommended Response:

Surveillance

Investigate suspected dengue cases and advise Local Health Departments and medical providers of serologic testing requirements for confirmation.

Information/Education

Prior to the main season for vectors and outdoor activities, publicize methods for mosquito reduction and personal protection. Stress the importance of having proper screening (intact and tight fitting) on doors and windows to prevent *Aedes aegypti* and other mosquitoes from entering the residence.

Disseminate educational materials on dengue and mosquito control to schools, day care centers, civic groups, churches, media and residents. Present educational seminars on mosquito biology and the importance of source reduction to civic groups, churches, etc.

Control Measures:

Conduct community block surveys to establish any high-risk areas, i.e. those areas having high percentages of containers. Map findings and establish target areas for clean up.

Collect larvae samples from containers to determine the presence of *Aedes aegypti* and *Ae. albopictus*.

Conduct *Aedes aegypti* and *Ae. albopictus* surveillance using ovitraps following completion of source reduction activities (see Appendix C). If the egg paddles are positive for *Aedes aegypti* and *Ae. albopictus*, conduct intense survey in the area to locate cryptic breeding sites.

Develop and implement an active source reduction or clean-up program to eliminate as many of the containers as possible.

Create citizen participation committees.
- Recruit and train volunteers.
- Acquire vehicles, equipment and supplies.
- Implement a reporting system.
- Establish a system of self-evaluation.

Establish fixed dates for cleanup campaign activities.

Prior to and following any adulticiding activities, conduct adult sampling to assess the effectiveness of the adulticiding. (See Appendix D)

Apply larvicides to those areas that cannot be eliminated or drained.
Risk Level 2
Enhanced Response

Conditions: Probability of local transmission is moderate.

Trigger: Confirmed human cases in bordering Mexican state.

Recommended Response:

Surveillance:
Investigate suspected dengue cases and advise Local Health Departments and medical providers of serologic testing requirements for confirmation.
Alert medical personnel and Infection Control staff of hospitals in adjacent border County to specify dengue testing for patients showing clinical signs of dengue fever, hemorrhagic fever or shock syndrome (see Appendix B).

Information/Education:
Alert Health Service Regions, Local Health Departments, and other agencies.
Inform local medical professionals of clinical signs and symptoms, ecology, and disease control measures.
Inform the public, emphasizing source reduction, personal protection, and disease symptoms.
Utilize mass media.

Control Measures:
Consult with neighboring health departments in Mexico to evaluate risks and control measures.
Conduct community block surveys to establish any high-risk areas i.e. those areas having high percentages of containers. Map findings and establish target area for clean up.
Collect larvae samples from containers to determine the presence of Aedes aegypti.
Conduct Aedes aegypti and Ae. albopictus surveillance using ovitraps following completion of source reduction activities (see Appendix C). If the egg paddles are positive for Aedes aegypti and Ae. albopictus, conduct intense survey in the area to locate cryptic breeding sites Intensify source reduction and clean-up program to eliminate as many of the containers as possible. Involve code enforcement personnel.
Establish fixed dates for cleanup campaign activities.
Collect larvae samples from containers to determine the presence of Aedes aegypti and Ae. albopictus.
Apply larvicides only to those containers that cannot be eliminated or drained.
Prior to and following any adulticiding activities, conduct adult sampling to assess the effectiveness of the adulticiding (see Appendix D). If available, use CDC Wilton or CDC Faye traps to collect adult Aedes aegypti and Ae. albopictus mosquitoes.
Conduct adulticiding during the day preferably in the early morning or early evening hours. Adulticiding should be done at least twice per week for a minimum of a two week period.
Risk Level 3
Public Health Warning

Conditions: Probability of local transmission is high.

Trigger: Imported human case that meets dengue case definition (see Appendix B).

Recommended Response:

Surveillance:
Investigate suspected dengue cases and advise Local Health Departments and medical providers of serologic testing requirements for confirmation.
In conjunction with Local Health Departments, implement active surveillance for hospital(s) serving area where human case resides.

Information/Education Media:
Alert Health Service Regions, Local Health Departments, and other agencies.
Alert local medical professionals of probability of disease and provide instructions for submitting specimens from suspect human cases.
Warn the general public through the news media with emphasis on source reduction, personal protection, and disease symptoms.
Publicize vector control measures within the target communities.
Visit each household within the 200-yard radius of the human case’s residence and provide them educational materials, stressing the importance of source reduction.
Intensify community education with media, schools, churches and civic groups.

Control Measures:
Conduct larval and adult surveys to determine the presence of *Aedes aegypti* and *Ae. albopictus* in the immediate area of the human case’s residence and other outdoor exposure sites.
Intensify source reduction efforts in the entire city. Require households to empty or properly dispose of all containers on their property. Involve code enforcement personnel.
Apply larvicides only to those containers that cannot be eliminated or drained.
Prior to and following any adulticiding activities, conduct adult sampling to assess the effectiveness of the adulticiding. Place oviposition traps in the area (see Appendix C). If available, use CDC Wilton or CDC Faye traps to collect adult *Aedes aegypti* and *Ae. albopictus* mosquitoes.
Conduct adulticiding in a radius of at least 200 yards around the residence. Start the adulticiding operation on the outer edge of the radius and working toward the residence of the human case. Conduct adulticiding during the day preferably in the early morning or early evening hours. Adulticiding should be done at least twice per week for a minimum of two weeks.
Risk Level 4
Public Health Alert

Conditions: Local transmission of dengue virus is confirmed.

Trigger: A locally acquired human case that meets case definition (see Appendix B).

Recommended Response:

Surveillance:
Investigate suspected dengue cases and advise Local Health Departments and medical providers of serologic testing requirements for confirmation.
In conjunction with Local Health Departments, implement active surveillance for hospital(s) serving area where human case resides.

Information/Education:
Alert health professional organizations and area hospitals, clinics, and individual health care providers and provide instructions for submitting specimens from suspect human cases (see case definition in Appendix B).
Inform the public through the news media with emphasis on source reduction, personal protection, and disease symptoms.
Publicize vector control measures within the targeted communities.
Intensify community education with media, schools, churches and civic groups.
Visit each household within a 200-yard radius of the human case’s residence and provide educational materials and a visual inspection for containers.

Control Measures:
Intensify source reduction efforts in the entire city with special emphasis on source reduction within a 200-yard radius around the residence of the human case. Require households to empty or properly dispose of all containers on their property. Involve code enforcement personnel.
Collect larvae samples from containers to determine the presence of Aedes aegypti and Ae. albopictus.
Apply larvicides only to those containers that cannot be eliminated or drained.
Prior to and following any adulticiding activities, conduct adult sampling to assess the effectiveness of the adulticiding. Place oviposition traps in the area (see Appendix C). If available, use CDC Wilton or CDC Faye traps to collect adult Aedes aegypti and Ae. albopictus mosquitoes.
Conduct adulticiding in a radius of at least 200 yards around the residence. Start the adulticiding operation on the outer edge of the radius and working toward the residence of the human case. Conduct adulticiding during the day preferably in the early morning or early evening hours. Adulticiding should be done at least twice per week for a minimum of two weeks.
APPENDIX A

State Contacts

DSHS Regional Zoonosis Control Offices (surveillance activities, suspect human cases):
www.dshs.state.tx.us/idcu/health/zoonosis/

Region 8 – Uvalde: (830) 591-4385
Region 9/10 – El Paso: (915) 834-7780
Region 11 – Harlingen: (956) 444-3224

DSHS Regional Environmental Health Offices (vector control):

Region 8 – Uvalde: (830) 278-7173 ext. 217 or 221
Region 9/10 – El Paso: (915) 834-7675 ext. 7710
Region 9/10 – Alpine: (915) 837-3877
Region 9/10 – Midland: (432) 571-4120
Region 11 – Harlingen: (956) 423-0130 ext. 518

DSHS Regional Border Health Offices:
www.dshs.state.tx.us/borderhealth/default.shtm

Region 8 – Uvalde: 1-800-693-6699 ext. 15
Region 8 – Eagle Pass: 1-800-693-6699 ext. 14
Region 9/10 – El Paso: 1-800-693-6699 ext. 16
Region 9/10 – Presidio: 1-800-693-6699 ext. 17
Region 11 – Harlingen: 1-800-693-6699 ext. 11
Region 11 – Laredo: 1-800-693-6699 ext. 13
Region 11 – McAllen: 1-800-693-6699 ext. 12
APPENDIX B

Dengue Case Definitions

**Dengue Fever**: An acute febrile illness characterized by frontal headache, retro-ocular pain, muscle and joint pain, and maculopapular rash. Other symptoms may include nausea, vomiting, and a change in taste sensation. The acute phase of up to 1 week is followed by a 1- to 2-week period of convalescence characterized by weakness, malaise, and anorexia.

**Dengue Hemorrhagic Fever**: Dengue hemorrhagic fever is defined as an acute febrile illness with minor or major bleeding phenomena, thrombocytopenia (less than or equal to 100,000/mm3), and evidence of plasma leakage documented by hemoconcentration (hematocrit increased by greater than or equal to 20%) or other objective evidence of increased capillary permeability.

**Dengue Shock Syndrome (DSS)**: All of the above criteria for dengue hemorrhagic fever and also includes hypotension or narrow pulse pressure (less than or equal to 20 mm Hg). Advance warning signs of DSS include severe abdominal pain, protracted vomiting, marked change in temperature (from fever to hypothermia), or change in mental status (irritability or obtundation). Early signs of DSS include restlessness, cold clammy skin, rapid weak pulse, and narrowing of pulse pressure and/or hypotension.

**Case Definition**

**Confirmed**: A clinically compatible case with:

- Isolation of dengue virus from serum and/or autopsy tissue samples, or
- Demonstration of a fourfold or greater rise or fall in reciprocal IgG or IgM antibody titers to one or more dengue virus antigens in paired serum samples, or
- Demonstration of dengue virus antigen in autopsy tissue or serum samples by immunohistochemistry or by viral nucleic acid detection.

**Probable**: A clinically compatible case with supportive serologic finds [a reciprocal IgG antibody titer of ≥ 128 or a positive IgM antibody test on a single acute (late)- or convalescent-phase serum specimen to one or more dengue virus antigens].
APPENDIX C

Protocol for *Aedes aegypti* Surveillance using Ovitraps

At least 30 ovitraps should be used. These are to be distributed in three separate areas that are at least one mile from each other and should represent areas most likely to support populations of *Aedes aegypti*. The ten ovitraps in each area should be placed on the same or adjacent blocks. Older residential areas having considerable shade and accumulations of potential breeding containers are ideal.

**Selection of Premises**

1. Use only premises with single dwellings.
2. Trees should shade at least 25% of the yard during the day. (5-75% would be better)
3. There should be adequate fences, shrubs, trees or other shelter to provide protection from the wind.
4. Use only premises where weekly access can be assured.

**Placement of Traps**

1. Use no more than two ovitraps per premise.
2. Ovitraps placed on the same premises should be no closer than 20 feet from each other.
3. Use only rear or side yards.
4. Avoid sites with excessive run-off of rain roofs or broad leaf plants.
5. Place ovitraps in sites where they will be in full or partial shade most of the day. Avoid direct afternoon sunlight and fully exposed areas.
6. Place ovitraps at least 10 feet from any automobile tires that could contain water.
7. Place ovitraps next to a wall, fence, hedge or other barrier (within 12 inches).
8. There should be at least 12 inches of open space directly above the ovitrap.
9. Place ovitraps where they are not highly conspicuous.

**Trap Servicing**

1. Traps should be serviced weekly on the same day of the week.
2. Each week the ovitrap should be cleaned to maintain its smooth shining appearance.
3. Add approximately 2 inches of water to the ovitrap after it has been cleaned.
4. Use red velour paper paddles or strips of seed germination paper. One of these should be clipped to the side of the ovitrap. Tilt the ovitrap so as to wet the entire paddle before putting the ovitrap in place.
5. Each paddle should have identifying information written on its smooth side before placement in the ovitrap. Include the date, site number and city.
6. As paddles are removed from ovitraps after 7 days exposure in the field, they should be placed side by side on bond paper with each paddle facing the same direction. Staple the upper or dry end of the paddle to the edge of the bond paper.
7. Record the condition of the ovitrap on the G-17 Mosquito Submission Form (see Appendix E), count and record the number of eggs on each paddle.
8. During transport from the field to the office, protect the paddles from excessive heat or drying conditions.
APPENDIX D

Vector Control Program Recommendations

Mosquito Control Personnel
Obtain the required DSHS licensure for pesticide applicators in the public health-related category of Vector Control OR

- develop inter-agency agreement with surrounding entities; OR
- contract for mosquito control services with commercial companies.

Conduct an inventory of all available mosquito control equipment that can be used if necessary for immediate response to imported or introduced human cases of dengue.

- Make certain that all insecticide application equipment is properly calibrated and in good working condition.

- If the inventory reveals that no hand-held sprayers (for larviciding) or foggers (for adulticiding), either ULV or thermal, are available, they should be purchased or borrowed from another entity.

Receive DSHS educational training on the biology, bionomics and identification of *Aedes aegypti*; surveillance; source reduction; chemical suppression; community education; legal control and other related components of an Integrated Mosquito Management program. (Refer to the DSHS Vector Fact Sheet No. 3, currently under development.)

Implement an Integrated Mosquito Management program. (Refer to the publication *Integrated Mosquito Management*, which is available from DSHS.)

Adulticiding
Prior to and following any adulticiding activities, conduct adult sampling to assess the effectiveness of the adulticiding.

Place oviposition traps in the area (see Appendix C).

If available, use CDC Wilton or CDS Faye-Prince traps in the area to collect adult mosquitoes.

Conduct all adulticiding during the day, preferably in the early morning or early evening hours when the mosquito is most active. Adulticiding should be done at least twice a week.

Collect mosquitoes and have them tested for insecticide resistance to the insecticide that is to be used in the control program prior to the application of that insecticide.

Adult Sampling
Sampling should be conducted for a 30-minute period by the same person, in the same manner, at the same place, for the same period, and at equal time intervals.

Collect adult mosquitoes with a battery powered aspirator or hand-held aspirator.

Adult collections can also be made in houses, garages, outbuildings, under porches and in similar resting places.

Collections should be made on each of several days before and after the adulticide application and at as many sampling sites as possible.
**Ovitrap Submission Form**

**Texas Department of State Health Services**
Laboratory Services Section
1100 W. 49TH Street
Austin, Texas 78756-3194

**DATE OF COLLECTION**  _____/_____/_____  **DSHS LAB #**

**HSR NUMBER**

**COUNTY**

**LOCATION**

**COLLECTED BY**

**DATE PLACED**

**DATE REMOVED**

**IF OTHER THAN ABOVE:**

**SUBMITTER**

**ADDRESS**

**CITY**

**TELEPHONE NUMBER**

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**TRAP CONDITIONS**

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