

West Nile Virus Response Plan

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INTRODUCTION

The first reports of West Nile virus in the Western Hemisphere occurred in New York City in 1999. Human, bird, horse and small mammal cases were subsequently reported throughout the Middle Atlantic States and New England. Since that time, the virus has spread throughout the United States, infecting birds and mosquitoes in a natural cycle.

West Nile virus was discovered in St. Louis and St. Louis County through bird testing during late September and early October of 2001. It recurred within the state during the 2002 and 2003 seasons. The St. Louis area was the focus of West Nile virus activity with over 75 percent of the clinically verified cases in the state. It is anticipated that disease will appear in the area again during coming seasons.

In recognition of these facts, the regional task force, formed in 2001, in order to coordinate the arboviral disease response activities of Franklin, Jefferson, St. Charles and St. Louis counties and the City of St. Louis continues to serve as a forum for information exchange and planning. The task force has been expanded by the inclusion of various other governmental and academic entities in order to further the general understanding of West Nile virus disease.

This plan was originally completed through the combined efforts of Mark Ritter (City of St. Louis), Ron Darling (St. Peters, Missouri), Barry McCauley (St. Charles County), Joan Bradford and Michael Williams (St. Louis County). It was reviewed in February 2004 to reflect the experience of 2002 and 2003. Guidelines and written materials from the City of New York, the Federal Centers for Disease Control and Prevention (CDC) and the Missouri Department of Health and Senior Services were used in the preparation of this document.

RESPONSE COORDINATION

Objective

To provide a mechanism for local jurisdictions to coordinate West Nile virus response activities and share information.

Background and Current Activity

Representatives of Franklin, Jefferson, St. Charles and St. Louis counties, the City of St. Louis and the Missouri Department of Health and Senior Services (MDHSS) have developed a coordinated plan to address the likelihood of West Nile virus disease occurring in the St. Louis area. Membership in the work group was expanded by the addition of the Center for the Study of Emerging Infections (CSEI) at St. Louis University during 2002. A comprehensive review of the West Nile virus response plans from other jurisdictions and the Centers for Disease Control and Prevention (CDC) was conducted with the findings used as a guide for the St. Louis area.

Response Plan

Health Department Directors in Franklin, Jefferson, St. Charles and St. Louis counties, the City of St. Louis, the director of the CSEI and other interested jurisdictions or groups may each appoint a representative to serve on the West Nile virus response team. In addition, a member from the MDHSS will be asked to serve in an advisory capacity. This team will meet periodically from May through October to monitor bird, mosquito and human surveillance findings. In the event of an outbreak of human disease, meetings or teleconferences will occur as often as needed in order to coordinate response activities and to provide consistent information to the public, medical community and to the electronic and print media. Should an outbreak occur, the team may expand to include representatives from the medical community, area municipalities and wildlife management agencies.

MOSQUITO SURVEILLANCE

Objective

To monitor the number and type of mosquitoes and detect the presence of viral infection.

Background and Current Activity

The risk of mosquito-borne disease depends on both the number of mosquitoes capable of transmitting the virus and the prevalence of the virus among them. Collecting information on larval and adult mosquitoes is important for guiding appropriate prevention and control activities.

To date, there have been thirty six (36) species of mosquitoes that have tested positive for the presence of West Nile virus in the United States since 1999 according to the Centers for Disease Control and Prevention (CDC). Seven of the “Top Ten” are in the *Culex* genus (representing 93% of the mosquitoes tested). The preponderance of these have been *Culex pipiens*, *Cx. restuans*, or *Cx. quinquefasciatus* (86%). Focusing control efforts on permanent breeding site area habitats conducive to *Culex* breeding, while not totally neglecting floodwater areas producing *Aedes*, *Ochlerotatus* and *Psorophora* mosquitoes, will enable maximum viral containment effectiveness for our programs.

Larval surveillance can provide information on timing of adult emergence and expected adult mosquito density. It can also indicate areas where efforts to eliminate mosquitoes at their source should be targeted. Adult mosquito surveillance and viral testing can provide early predictive information about the potential for a disease outbreak.

Adult mosquitoes are currently collected by four jurisdictions within the area, St. Louis City and Jefferson, St. Charles and St. Louis Counties, from mosquito traps at multiple locations throughout the St. Louis Area. Pools are then submitted to Southeast Missouri State University for testing. Some jurisdictions have also opted to conduct some testing using VecTest procedures and methodology. Their experience thus far has confirmed that *Culex pipiens* mosquitoes were the primary West Nile virus carriers identified in this area.

Response Plan

It is recognized that not all of the members of this consortium can devote equal resource levels to this activity, yet each of the jurisdictions is encouraged to maintain a mosquito surveillance program within its boundaries. During the off-season, training programs can ensure that those jurisdictions in which surveillance is a newly established program will be able to participate effectively as quickly as possible. The samples obtained through any of the established methods of mosquito surveillance (light traps, gravid traps or landing count station operation) should be sent in to Southeast Missouri State University for testing or tested locally utilizing the VecTest process. Ideally, these samples will be sent in on a weekly basis. Each sample or pool will consist of female mosquitoes of the same species, collected at a single collection site in the same type of trap (e.g., *Culex pipiens* mosquitoes from one night's gravid trap collection or *Aedes vexans* species from one evening's light trap collection). The information obtained by means of this

surveillance will be shared at the West Nile Virus Response Team meetings. Summary statistics will be made available to the community. Trapping may be expanded based upon surveillance indicators. The trapping season may be lengthened or shortened depending on the weather. In the event that pesticides are applied for adult mosquito control, trapping may be used more frequently to evaluate the efficacy of control measures. Resource and information sharing is encouraged as a means of maximizing the response capabilities of the region.

BIRD AND MAMMAL SURVEILLANCE

Objective

To detect mosquito-borne diseases in birds and mammals in advance of human disease.

Background and Current Activity

Many species of birds have tested positive for West Nile virus. Crows, blue jays and raptors have been excellent indicators of avian disease. Therefore, these species are most closely monitored by local health agencies and a variety of governmental and community partners. It is the intent of this surveillance to gather sufficient background information on the incidence of dead crows or blue jays. Changes from baseline could then be detected quickly if reports increase.

Horses and small mammals are also susceptible to West Nile virus. Animal surveillance efforts may be assisted by a number of partner organizations, including the Department of Parks and Recreation, the Missouri Department of Agriculture and local veterinarians.

Response Plan

All jurisdictions should ask the public to report the number and location of dead crows, blue jays and raptors by telephone or via Web site. Dead bird reports may be used as markers for West Nile virus activity. Reports of crow roosting sites should also be encouraged.

Dead crows, blue jays or raptors may be retrieved if dead less than 24 hours and forwarded to the University of Missouri Veterinary Laboratory in Columbia. For those birds that are not being retrieved, the public will be advised to discard them safely. Dead birds should be handled using gloves or by covering the hands with a plastic trash bag.

Veterinarians should be asked to enhance surveillance for encephalitis and other mosquito-borne diseases in horses, which have been particularly susceptible to West Nile virus and to report suspected infections to their local health department.

HUMAN SURVEILLANCE

Objective

To quickly detect human arthropod-borne diseases.

Background and Current Activity

Regional arboviral disease surveillance was initiated in 2000 and continued in subsequent years in the form of active surveillance for viral encephalitis (all ages) and viral meningitis (in adults) as well as Guillain-Barré syndrome and flaccid paralysis. Syndromes under surveillance in 2004 may be expanded based on clinical experience derived during the 2002 and 2003 seasons. Emergency departments in hospitals throughout the five jurisdictions in the consortium were called three times per week in order to determine the frequency of these clinical syndromes. When suspect illness was detected, health care providers were consulted to determine if arboviral infection had been considered or ruled out. Instructions for collecting and transporting appropriate laboratory specimens were provided when necessary. Data for individual jurisdictions within the survey area as well as summary data were disseminated weekly in order to facilitate individual case investigations where warranted.

Response Plan

In the event that active surveillance identifies illness compatible with West Nile virus infection, all jurisdictions participating in the surveillance project as well as the Missouri Department of Health will be notified immediately. Physicians will be requested to report immediately all suspected cases of viral encephalitis and to submit appropriate laboratory samples.

After consultation with MDHSS, laboratory-based surveillance may be established at selected hospitals. Laboratory staff may be asked to store all spinal fluid samples that have parameters suggestive of a viral cause of infection. Samples would be collected weekly and screened for mosquito-borne viruses. This laboratory-based system would provide a backup to ensure that viral meningo-encephalitis cases that are not reported by health care providers are screened for mosquito-borne viruses.

Patients presenting with encephalitis of unknown cause should have serological testing performed for arboviruses. If the original blood specimen or cerebrospinal fluid was collected within 8 days of the onset of illness and was negative for West Nile or a related virus, a convalescent blood specimen should also be collected. The convalescent blood specimen should be drawn 2 to 3 weeks after the initial specimen.

PREVENTION OF MOSQUITO BREEDING

Objective

To reduce the quantity of mosquitoes by preventing mosquito breeding.

Background and Current Activity

Culex pipiens mosquitoes, a primary carrier of West Nile virus and one of the most common mosquitoes found in urban areas, breed quickly and lay their eggs in standing or slow-moving water containing decaying organic materials. Prime breeding sites include old tires left outdoors, unwashed bird baths, clogged rain gutters, unused swimming and plastic wading pools, pots and pans with standing water, and puddles that last for a week or more. Eliminating breeding sites is the simplest and most effective way to reduce the number of mosquitoes. Every residential and commercial property owner should regularly inspect their land and buildings to determine if conditions are conducive to mosquito breeding and work to eliminate those conditions. Mosquito breeding can be prevented by either eliminating the standing water (source reduction), or if that is not possible, treating the water with larvicide to prevent mosquitoes from developing. Jurisdictions should share information about neighborhood complaints due to mosquito activity.

Response Plan

The application of larvicide should be expanded based upon arthropod-borne disease activity in humans or animals and accumulated data regarding the density and type of mosquito larvae. Each jurisdiction will attempt, insofar as its budgetary capabilities permit, to search for and locate *Culex pipiens* breeding areas and attempt to either eliminate the breeding site or treat them with registered insecticides according to label recommendations.

Each jurisdiction should work with the Parks Department and other partners to ensure that green and vegetative areas (e.g., parks, cemeteries, creek buffers and golf courses) receive intensified mosquito prevention activity, especially in areas where infected dead birds or mosquitoes or dead bird clusters are reported.

Each jurisdiction should provide occupational safety and health training to all employees involved in mosquito surveillance and control operations. Additionally, they should require that all employees of contracted vendors be provided with such training as well as appropriate personal protective equipment. Licensing through the Missouri Department of Agriculture is necessary for application of Restricted Use Pesticides and must be sought if this type of pesticide is to be used in the program. Regardless of pesticide used, however, all members of the group are encouraged to utilize licensed personnel due to the increased professionalism the training brings to the operation.

ADULT MOSQUITO CONTROL

Objective

To reduce the number of adult female mosquitoes in an area and thereby reduce the risk of human infection with mosquito-borne disease.

Background and Current Activities

National guidelines issued by the CDC recommend that public health officials spray a ½-mile radius around West Nile virus-infected mosquitoes or birds. Spraying is currently conducted within four of the five jurisdictions involved. It should be conducted in accordance with EPA-approved pesticide labels.

Response Plan

Comprehensive vector, bird and human surveillance provide the basis for determining the level of West Nile viral activity in birds and mosquitoes that indicates a significant risk for a human outbreak. These indicators will be monitored to identify areas at risk for human transmission.

CDC has developed guidelines for a phased response to surveillance findings (see Appendix II). West Nile virus findings should trigger more intensive community-specific surveillance, public education, source reduction and larviciding. Close tracking of dead bird reports should further prioritize for enhanced control activity those areas where there is early evidence of the virus. Evidence of dead bird clusters will prompt increased testing of birds and additional mosquito pool collections and testing in conjunction with intensive preventive control measures in nearby green areas (e.g., parks, cemeteries, golf courses, etc.). Adult mosquito control should be considered where amplification of the virus as a result of mosquito/bird transmission is most likely.

Further evidence of increasing West Nile viral activity at a level thought to be of significant human health risk, despite aggressive preventive measures, will trigger the consideration of new or expanded use of adult mosquito control measures in a targeted area. Indicators that will be monitored include the overall number or clustering of dead birds reported, the positivity rates among dead birds and mosquitoes tested for West Nile viral infection, or escalating mammalian cases. Positive viral tests in bridge vectors (mosquitoes that serve as a main transmission of virus between birds and humans) will be of particular concern.

All jurisdictions should work closely with state and federal partners to assess the risk of an outbreak of human disease. The need to apply pesticides in a limited and targeted area to control adult mosquitoes will be determined by each jurisdiction's standard practice and by considering habitat; time of year; weather conditions; the level of documented virus; the distribution, density, age and infection rate of the vector population; and the density and proximity of human population. If an outbreak were in progress with multiple confirmed cases in humans and conditions that favor continued transmission, adult mosquito control for a larger area would be considered and pursued, again based upon the capability and standard practice of each jurisdiction.

If the threat of human illness makes spraying necessary, spraying should commence and should be concentrated in areas most at risk for human disease occurrence.

The participating jurisdictions will only use EPA registered products for mosquito control. All pesticides will be applied in compliance with local, State, and Federal laws and regulations.

Information on the spray schedule and pesticide to be used will be provided upon request to the public, physicians and other health care providers.

PUBLIC EDUCATION

Objective

To increase public awareness of mosquito-borne disease risk and prevention.

Background and Current Activity

Since 1999, news reports through numerous print and electronic media sources have served to inform the public of the appearance and spread of West Nile virus in the United States. Public information campaigns in previously affected areas have advised the elimination of standing water to reduce the opportunity for mosquitoes to breed and suggested the use of insect repellents by adults as a means to limit exposure. A fact sheet has been developed (Appendix I) in order to make information available to elected officials, schools, community-based organizations, and the general public. CDC and the Missouri Department of Health and Senior Services also provide information on West Nile virus through their Web sites (www.CDC.gov and www.dhss.state.mo.us). St. Charles County has established and hosted a regionally based web page to publicize the efforts of this group and to disseminate West Nile virus information of local interest (www.scchealth.org).

Response Plan

The following key messages will be communicated to the public in the event of an arthropod-borne disease outbreak in animals or humans:

The public will be informed about the comprehensive preventive strategies and activities (source reduction, larviciding, community education, surveillance, etc.) to address the threat of West Nile virus and to minimize the necessity of pesticide applications for adult mosquito control.

The public will be advised to eliminate standing water sites where mosquitoes can breed by removing tires, buckets, and other water-holding objects from their property. They will also be urged to change the water and clean bird baths at least once a week; to clean and chlorinate swimming pools or drain and cover if not in use; to prevent water from accumulating in pool covers and to unclog gutters and down spouts.

All jurisdictions should increase public awareness about the nature of mosquito-borne diseases and the signs and symptoms of West Nile virus (headache, high fever, muscle pain, weakness and disorientation).

The public will be informed that persons 50 years of age and over are more likely to experience significant clinical disease from West Nile virus infection. Protective measures that can be taken include ensuring that screens fit tightly in doors and windows, wearing protective clothing (long pants, long-sleeved shirts, and socks) and using insect repellents with strict adherence to manufacturer's directions.

The public will be informed, when appropriate, about the importance of reporting dead birds for surveillance purposes. It will also be made clear that not all birds that are

reported will be picked up. Information about the species being prioritized for testing, how to properly dispose of birds not being retrieved, and the potential association between high density of dead birds (especially crows) and the potential risk for West Nile virus will be disseminated.

If the application of pesticides to control adult mosquitoes becomes necessary in excess of routine jurisdiction activity, the public will be informed in a timely manner. Techniques used to disseminate information may include any of the following:

- Televised public service announcement to air in the early mosquito season through the use of local cable channels.
- Radio public service announcements urging breeding site reduction.
- Posters, brochures and door hangers to be distributed in affected communities.
- Brochures and fact sheets to be distributed to community-based organizations, community boards, elected officials, schools, nursing homes, libraries, outdoor activity sites, and many other organizations community wide.
- West Nile virus web site will be regularly updated and will include enhanced tools that the public can use for reporting dead birds.
- Presentations should be made in all jurisdictions to elected officials, community groups and a wide variety of organizations, to provide information about mosquito breeding reduction and related activities.
- Press releases will be prepared describing all West Nile virus response activities.

MEDICAL PROVIDER EDUCATION

Objective

To provide timely information about West Nile virus to the medical community.

Background and Current Activity

Each jurisdiction and the Missouri Mosquito and Vector Control Association will provide information through a variety of means to health care providers and medical professional groups.

Response Plan

Broadcast facsimile and E-mail alerts should be sent to all area hospitals and infectious disease specialists regarding the appearance of arboviral disease in the community. These should be followed by confirmed findings when available. The importance of reporting suspected encephalitis and meningitis cases should be continuously stressed through regular contact with emergency department staff and infectious disease physicians. Each jurisdiction should provide the criteria for reporting and submission of appropriate laboratory specimens for West Nile virus testing. To maintain physician awareness throughout the mosquito season, these alerts should be sent at least monthly with updated information on West Nile virus activity.

Each jurisdiction should conduct health care provider education to increase knowledge about the proper detection, prevention and clinical management of mosquito-borne diseases and other types of encephalitis and meningitis. A clinical case definition, case reporting protocols, laboratory specimen collection and transport protocols, information on the health effects of pesticides and West Nile virus fact sheets should be widely disseminated to the medical community. Presentations should be made upon request.

Appendix I

West Nile Virus Fact Sheet

What Is West Nile Virus?

West Nile virus (WNV) is a potentially serious illness. Experts believe WNV is established as a seasonal epidemic in North America that flares up in the summer and continues into the fall. This fact sheet contains important information that can help you recognize and prevent West Nile virus.

What Are the Symptoms of WNV?

WNV affects the central nervous system. Symptoms vary.

- **No Symptoms in Most People.** Approximately 80 percent of people who are infected with WNV will not show any symptoms at all.
- **Mild Symptoms in Some People.** Up to 20 percent of the people who become infected will display mild symptoms, including fever, headache, and body aches, nausea, vomiting, and sometimes swollen lymph glands or a skin rash on the chest, stomach and back. Symptoms typically last a few days.
- **Serious Symptoms in a Few People.** About one in 150 people infected with WNV will develop severe illness. The severe symptoms can include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis. These symptoms may last several weeks, and neurological effects may be permanent.

How Does It Spread?

- **Infected Mosquitoes.** Generally, WNV is spread by the bite of an infected mosquito. Mosquitoes are WNV carriers that become infected when they feed on infected birds. Infected mosquitoes can then spread WNV to humans and other animals when they bite.
- **Transfusions, Transplants, and Mother-to-Child.** In a very small number of cases, WNV also has spread through blood transfusions, organ transplants, breastfeeding and even during pregnancy from mother to baby.
- **Not through touching.** WNV is not spread through casual contact such as touching or kissing a person with the virus.

How Soon Do Infected People Get Sick?

People typically develop symptoms between 3 and 14 days after they are bitten by the infected mosquito.

How Is WNV Infection Treated?

There is no specific treatment for WNV infection. In cases with mild symptoms, people experience symptoms such as fever and aches that pass on their own. In more severe cases, people usually need to go to the hospital where they can receive supportive treatment including intravenous fluids, help with breathing and nursing care.

What Should I Do if I Think I Have WNV?

Mild WNV illness improves on its own, and people do not necessarily need to seek medical attention for this infection. If you develop symptoms of severe WNV illness, such as unusually severe headaches or confusion, seek medical attention immediately. Severe WNV illness usually

requires hospitalization. Pregnant women and nursing mothers are encouraged to talk to their doctor if they develop symptoms that could be WNV.

What Is the Risk of Catching WNV?

For most, risk is low. Less than 1 percent of people who are bitten by mosquitoes develop any symptoms of the disease and relatively few mosquitoes actually carry WNV.

Greater risk for those outdoors a lot. People who spend a lot of time outdoors are more likely to be bitten by an infected mosquito. They should take special care to avoid mosquito bites.

People over 50 can get sicker. People over the age of 50 are more likely to develop serious symptoms of WNV if they do get sick and should take special care to avoid mosquito bites.

Risk through medical procedures is low. The risk of getting WNV through blood transfusions and organ transplants is very small, and should not prevent people who need surgery from having it. If you have concerns, talk to your doctor before surgery.

Pregnancy and nursing do not increase risk of becoming infected with WNV.

What Can I Do to Prevent WNV?

The easiest and best way to avoid WNV is to prevent mosquito bites.

- When you are outdoors, use insect repellents containing DEET (N, N-diethyl-methyltoluamide). Follow the directions on the package.
- Many mosquitoes are most active at dusk and dawn. Consider staying indoors during these times or use insect repellent and wear long sleeves and pants. Light-colored clothing can help you see mosquitoes that land on you.
- Make sure you have good screens on your windows and doors to keep mosquitoes out.
- Get rid of mosquito breeding sites by emptying standing water from flower pots, buckets and barrels. Change the water in pet dishes and replace the water in bird baths weekly. Drill drainage holes in tire swings so water drains out. Keep children's wading pools empty and on their sides when they aren't being used.

Appendix II

CDC Suggested Guidelines for Phased Response to West Nile Virus Surveillance Data

Risk category	Probability of human outbreak	Definition	Recommended response*
0	None	Off-season; adult vectors inactive; climate unsuitable.	Develop WNV response plan. Secure surveillance and control resources necessary to enable emergency response. Initiate community outreach and public education programs. Conduct audience research to develop/target education & community involvement. Contact community partners.
1	Remote	Spring, summer, or fall; areas anticipating WNV epizootic based on previous WNV activity in the region; no current surveillance findings indicating WNV epizootic activity in the area.	Response as in category 0, plus: conduct entomologic survey (inventory and map mosquito populations, monitor larval and adult mosquito density), Initiate source reduction; use larvicides at specific sources identified by entomologic survey and targeted at likely amplifying and bridge vector species; Maintain avian mortality, vector and virus surveillance; Expand community outreach and public education programs focused on risk potential and personal protection, and emphasizing residential source reduction; Maintain surveillance (avian mortality, mosquito density/IR, human encephalitis/meningitis and equine illness).
2	Low	Summer, or fall; areas with limited or sporadic WNV epizootic activity in birds and/or mosquitoes. No positives prior to August.	Response as in category 1, plus: increase larval control, source reduction and public education emphasizing personal protection measures, particularly among the elderly. Enhance human surveillance and activities to further quantify epizootic activity (e.g., mosquito trapping and testing). Implement adulticide applications if vector populations exceed locally established threshold levels, emphasizing areas where surveillance indicates potential for human risk to increase.
3	Moderate	Spring, summer, or fall; areas with initial confirmation of epizootic WNV in birds before August; a horse and/or a human case, or sustained WNV activity in birds and/or mosquitoes.	Response as in category 2, plus: intensify adult mosquito control in areas where surveillance indicates human risk, Initiate adult mosquito control if not already in progress, Initiate visible activities in community to increase attention to WNV transmission risk (speaker, social marketing efforts, community mobilization for source reduction, etc.), Work with collaborators to reduce risks to elderly (e.g., screen repair).
4	High	Spring, summer, or fall; quantitative measures indicating WNV epizootic activity at a level suggesting high risk of human infection (e.g., high dead bird densities in early summer, sustained high mosquito infection rates, multiple positive mosquito species horse or mammal cases indicating escalating epizootic transmission, or a human case and high levels of epizootic activity). Areas with early season positive surveillance	Response as in category 3, plus: Expand public information program to include TV, radio, and newspapers (use of repellents, personal protection, continued source reduction, risk communication about adult mosquito control), Increase visibility of public messages, engage key local partners (e.g., government officials, religious leaders) to speak about WNV; intensify and expand active surveillance for human cases; intensify adult mosquito control program, repeating applications

indicators where WN epidemic activity has occurred in the past. in areas of high risk or human cases.

5	Outbreak in progress	Multiple confirmed cases in humans; Conditions favoring continued transmission to humans (<i>e.g.</i> , persistent high infection rate in mosquitoes, continued avian mortality due to WNV)	Response as in category 4, plus: Intensify emergency adult mosquito control program repeating applications as necessary to achieve adequate control. Enhance risk communication about adult mosquito control. Monitor efficacy of spraying on target mosquito populations. If outbreak is widespread and covers multiple jurisdictions, consider a coordinated widespread aerial adulticide application; emphasize urgency or personal protection through community leaders and media, and emphasize use of repellent at visible public events.
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*Local and regional characteristics may alter the risk level at which specific actions must be taken.

Appendix III
Contact Names and Phone Numbers

Missouri Department of Health and Senior Services
Section of Communicable Disease Control and Veterinary Public Health - St. Louis
Doug Dodson [Communicable Disease Coordinator] (314) 877-2830

Missouri Department of Health and Senior Services
Section of Communicable Disease Control and Veterinary Public Health - Jefferson City
Howard Pue, D.V.M. [Chief] (573) 751-6117
Karen Yates [Arboviral Surveillance Coordinator] (573) 751-4749

Southeast Missouri State University
Chris Frasier, Ph.D. (573) 651-2384

St. Louis University – School of Public Health
Center for the Study of Bioterrorism and Emerging Infections
Brooke Shadel, Ph.D. (314) 977-3276

City of St. Louis Department of Health and Hospitals
Larry Kettlehut, [Chief of Environmental Health] 314-612-5309
Mark Ritter [Vector Control](314) 612-5314

St. Louis County Department of Health
Michael P. Williams, Ph.D. [Communicable Disease Control] (314) 615-1636
Joan Bradford [Vector Control] (314) 727-3097

St. Charles County Department of Community Health and the Environment
Gil Copley, [Director] (636) 949-7477
Barry Drucker [Environmental Health Supervisor] (636) 949-7406
Barry McCauley, Ph.D. [Vector Control] (636) 949-7900 x4260

Jefferson County Health Department
Dennis Diehl [Director] (636) 942-3101 x104

Franklin County Health Department
Conn Roden [Director] (636) 583-7300

Centers for Disease Control and Prevention (CDC)
Division of Vector-Borne Infectious Diseases, Fort Collins, CO
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