Arbovirus - Mosquito Carried Diseases

Mosquitoes are man's worst insect enemy. They are able to transmit a wide range of diseases, including malaria, dengue fever, yellow fever, filariasis, and encephalitis. For example, during the construction of the Panama Canal in Central America, thousands of workers died of yellow fever carried by mosquitoes. During World War II, 500,000 military personnel contracted malaria from mosquito bites, more than were lost to actual enemy fire. There were similar cases during the Korean and Vietnam wars. Throughout Florida's history, there have been repeated large epidemics of serious mosquito-borne disease.

Today, these same diseases are a possible threat to Florida residents because of the available mosquito carriers and our close proximity to the Caribbean. The main mosquito-borne diseases we are concerned about in Charlotte County are St. Louis encephalitis (SLE), eastern equine encephalitis (EEE), and West Nile Virus (WNV), which we test for in our sentinel chicken flocks. Zika is the most recent virus that has become a concern in Florida's history of mosquito-borne illnesses.

Disease Surveillance

St. Louis encephalitis (SLE), Eastern equine encephalitis (EEE), and West Nile virus (WNV) are diseases that are regularly monitored for in Charlotte County through our sentinel chicken program. A small amount of blood is drawn each week during the mosquito season for testing at the Florida Department of Health Tampa Branch Laboratory for the antibodies to these viruses. Other viruses routinely monitored for, through the use of rapid VectorTest® assays, include chikungunya and dengue virus as well as SLE, EEE, and WNV. This is done by dissolving a sample, or pool, of mosquitoes into a solution and testing for the presence of the viruses. The number of vector-potential mosquitoes (“vectors” are the transmitters of an infectious agent), found in our surveillance traps is also taken into account during periods of viral activity.

Surveillance in Charlotte county (and a number of counties) for SLE, EEE, and WNV is done by testing sentinel chickens in established sites throughout the county. A small amount of blood is drawn each week during the mosquito season for testing at the Florida Department of Health Tampa Branch Laboratory for the antibodies to these viruses. The number of vector mosquitoes found in our surveillance traps is also taken into account during periods of viral activity.

Chikungunya

Chikungunya is a mosquito-borne viral disease first described during an outbreak in southern Tanzania in 1952. It is an RNA virus that belongs to the alphavirus genus of the family Togaviridae. The name "chikungunya" derives from a word in the Kimakonde language, meaning "to become contorted," and describes the stooped appearance of sufferers with joint pain (arthralgia).

Chikungunya is characterized by an abrupt onset of fever frequently accompanied by joint pain. Other common signs and symptoms include muscle pain, headache, nausea, fatigue, and rash. The joint pain is

often very debilitating but usually lasts for a few days or maybe prolonged to weeks. Hence the virus can cause acute, subacute, or chronic disease.

Most patients recover fully, but joint pain may persist for several months or even years in some cases. Occasional cases of eye, neurological and heart complications have been reported, as well as gastrointestinal complaints. Serious complications are not common, but in older people, the disease can contribute to the cause of death. Often symptoms in infected individuals are mild, and the infection may go unrecognized or be misdiagnosed in areas where dengue occurs.

Dengue

Dengue is a viral, mosquito-borne disease that is caused by any of 5 distinct dengue viruses. Humans are the only natural vertebrate host for dengue viruses. The vectors are mosquitoes commonly found in Florida, the Caribbean, the Pacific Islands, Africa, and Central and South America. They breed in artificial containers that occur in urban areas in close association with humans. Because the vectors exist in Florida, the threat of dengue becoming reestablished is very real.

The symptoms of dengue include sudden onset, high fever, severe headache, pain behind the eyes, joint and muscle pain, and rash. Nausea and vomiting, loss of appetite, and altered taste sensations are common. Dengue is also known as "break bone fever" because of the severe pain in the muscles and joints it causes. Dengue may also present as a severe and sometimes fatal hemorrhagic disease, called dengue hemorrhagic fever (DHF). There is no specific treatment for dengue. Dengue cannot be transmitted from person to person. A new vaccine for dengue has been developed and shows great promise.

Eastern Equine Encephalitis

Eastern equine encephalitis (EEE) is not as common as SLE in Charlotte County, but the vectors for the disease are found here. EEE is a frequently fatal disease of humans, horses, and exotic bird species (such as pheasants, emus, and ostriches) in areas where the disease is prevalent. Most human cases are isolated and few in number.

EEE virus was first identified in the 1930s and occurred along the eastern seaboard, the Gulf Coast, and some inland Midwestern locations. The virus is maintained in the bird population, and the vectors prefer to feed upon birds. The vectors, which vary widely from area to area, usually do not bite humans or other mammals but occasionally do. There is a commercially available horse vaccine for EEE, but none exists for man.

Symptoms of EEE begin with a sudden onset of fever, general muscle pains, and a headache of increasing severity. It may progress to more severe symptoms such as seizures and coma. About 1/3 of those with clinical encephalitis caused by EEE will die, and those who recover may suffer permanent brain damage.

Heartworm

Heartworm is a chronic disease of dogs and sometimes cats caused by a mosquito-borne filarial worm parasite. Large adult worms live in the heart and release large numbers of microscopic, embryonic worms into the bloodstream. Embryonic worms are ingested by blood-feeding mosquitoes and go

through part of their life cycle in the mosquito before being transmitted to another host. Untreated heartworm is commonly fatal to dogs. Your veterinarian can provide preventive medication for your pet.

Malaria

Human malaria is a disease caused by infection of 4 parasitic protozoan species that have a complex life cycle requiring mosquitoes as one of the hosts. Currently, human malaria kills at least 2 million people annually throughout the world. In Florida, malaria is usually con□ned to imported cases from residents who have returned from international travels. However, the vectors for malaria are still found in Florida, and the possibility for malarial reestablishment exists.

Malaria is now rare in the U.S., but it was once the major scourge of Florida, occurring in all 67 counties. Mosquito control e□orts contributed to a large reduction in malaria for Florida during the 1930s and 1940s.

In humans, the symptoms of malaria will depend on the malaria species. The initial attack may start with lethargy, headache, anorexia, occasional nausea, and vomiting. The fever that occurs is comprised of a cold stage (shivering and a feeling of intense cold), a hot stage (distressing heat, dryness, burning, intense headache, nausea, and vomiting), and a profuse sweating phase. A typical attack often lasts 8 to 12 hours. There is no vaccine.

St. Louis Encephalitis

St. Louis encephalitis (SLE) is the most common mosquito-borne human pathogen in the U.S. The first human outbreak of SLE occurred in St. Louis, Missouri, in 1933. Since then, many SLE epidemics have been documented in North America, with the mosquito vector varying by area. In Florida and Charlotte county, the mosquito vector is *Culex nigripalpus*, a fresh and stagnant water breeder.

SLE virus is maintained in the bird population during the summer. The mosquitoes are primarily feeding on these birds and may pick up the virus. In late summer to early fall, the mosquitoes change hosts from whom they seek blood meals. The focus turns to mammals, especially humans. This is when the disease is able to be passed to people. We cannot pass it on to other people or mosquitoes. We are dead-end hosts, meaning the virus does not replicate in great numbers in our bodies.

Most people who contract the virus survive. Older citizens and infants are at a greater risk of developing severe symptoms. Less than 1% of SLE infections in people are clinically apparent; most go undiagnosed. The symptoms of SLE range from flu-like headaches, fever, and a stiff neck in mild cases to convulsions and coma in severe cases. There is no vaccine.

West Nile Virus

West Nile virus (WNV) is a disease that has been recently introduced to the United States. The first outbreak was in the New York City area in 1999. WNV was first detected in Florida in 2002.

The disease is closely related to St. Louis encephalitis. It can be severe in the elderly, but it is usually mild in healthy adults and children. Humans infected with WNV can experience mild to severe symptoms, including fever that comes on quickly and lasts from 5 to 6 days. Other symptoms include severe headache, rash, swollen lymph nodes, gastrointestinal problems, and pain associated with the eyes, muscles, and back. In serious cases, the symptoms of encephalitis can cause death.

Yellow Fever

Yellow fever is caused by one virus species and typically causes profound hemorrhagic symptoms. It is often fatal. Yellow fever has not been seen in Florida since 1905, but the vectors are still common. Yellow fever has a jungle transmission cycle involving an obscure forest-dwelling mosquito that can transmit the disease to its offspring or forest monkey species bitten by these mosquitoes. The urban transmission cycle involves mosquito vectors found in close association with humans and breed in artificial containers usually found around homes.

Yellow fever is typically recognized by hemorrhagic symptoms. Milder symptoms include those associated with dengue. More severe disease, frequently fatal, includes jaundice, various hemorrhagic symptoms (e.g. black vomit), and abnormally slow heartbeat. Severe forms may conclude in coma or delirium. There is a vaccine, although not widely available or utilized.

Zika Virus

Zika virus is transmitted to people through the bite of an infected mosquito from the Aedes genus, mainly Aedes aegypti in tropical regions. This is the same mosquito that transmits dengue, chikungunya, and yellow fever.

The incubation period (the time from exposure to symptoms) of Zika virus disease is not clear but is likely to be a few days. The symptoms are similar to other arbovirus infections such as dengue, including fever, skin rashes, conjunctivitis, muscle and joint pain, malaise, and headache. These symptoms are usually mild and last for 2-7 days.

Zika virus is diagnosed through PCR (polymerase chain reaction) and virus isolation from blood samples. Diagnosis by serology can be difficult as the virus can cross-react with other flaviviruses such as dengue, West Nile, and yellow fever.

Zika virus disease is usually relatively mild and requires no specific treatment. People sick with the Zika virus should get plenty of rest, drink enough fluids, and treat pain and fever with common medicines. If symptoms worsen, they should seek medical care and advice. There is currently no vaccine available.