Connecticut Epidemiologist

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Eastern Equine Encephalitis Outbreak Connecticut, 2019

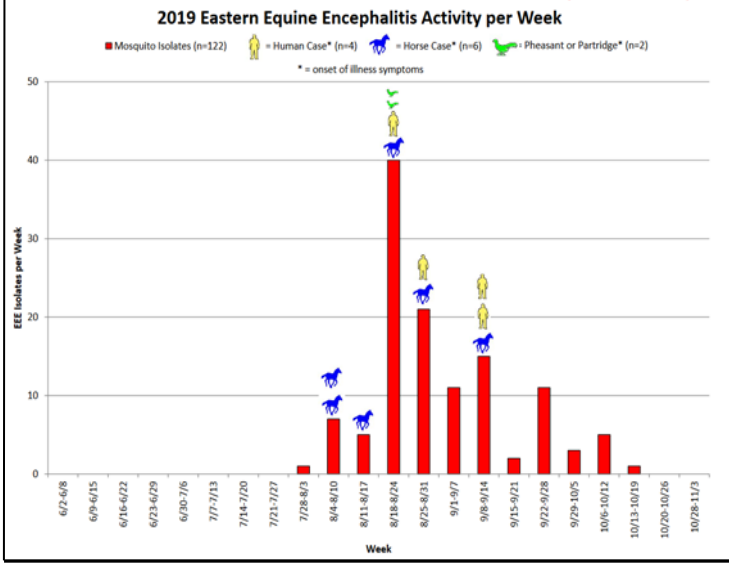
Eastern Equine Encephalitis virus (EEEV) is an arbovirus transmitted through the bite of certain species of infected mosquitoes (*1*). Generally, infection in humans is asymptomatic; disease presentation can range from mild febrile illness to severe neuro-invasive disease or even death. The Connecticut Department of Public Health (DPH) has conducted human encephalitis surveillance, which included EEEV, since 2000. In 2008, "encephalitis" was changed to "arboviral infection" to capture the full spectrum of arboviral disease. A rare disease in Connecticut, only one human case was reported during 2000-2018, that resulted in death (*2*). In 2019, a statewide outbreak emphasized the potential severity of EEEV disease and importance of sustaining combined veterinary, human, and mosquito surveillance for public health response.

Human Surveillance

In 2019, 4 cases of EEEV disease were reported to DPH. All patients were hospitalized with a diagnosis of encephalitis; 3 died. Onset of illness occurred during August 21 – September 12, 2019 (Figure 1). Cases resided in 4 towns: Colchester, East Haddam, East Lyme, and Old Lyme, and the median age was 68.5 years (range = 42-77 years).

Symptoms included fever (4), seizures (4), altered mental status (4), headache (3), myalgia (3), ataxia or incoordination (3), paresis or paralysis (3), stiff neck (2), nausea or vomiting (2), aphasia (1), and rash (1). Each reported peridomestic activities during the 10 days prior to onset. Preliminary and confirmatory testing was conducted at the Centers for Disease Control and Prevention (CDC).

Figure 1. Updated: October 22, 2019



Mosquito Surveillance

The Connecticut Agricultural Experiment Station conducted mosquito surveillance at 92 permanent trapping stations in 72 municipalities throughout the state (*3*). In 2019, mosquito trapping and testing was conducted June 3 - October 29, and resulted in 239,960 specimens for testing. A total of 122 isolates of EEEV were made from 15 mosquito species collected from 25 sites located in 22 towns in 6 counties (*2*). Of the 122 isolates, 102 (84%) were from mosquitoes trapped in 9 towns in south-central and eastern CT, including North Stonington (31), Voluntown (30), Hampton (10), Stonington (8), Plainfield (6), Chester (5), Haddam (4), Killingworth (4) and Madison (4). Only 18% of EEEV mosquito isolates were trapped in towns west of the Connecticut River. Infected mosquitoes were collected July 31 - October 17, with 115 (94%) isolates obtained during August 7 - September 30.

Veterinary Surveillance

During 2019, veterinary surveillance identified equine EEEV cases from 6 towns (Colchester, Columbia, Montville, Salem, Sterling, Voluntown) and EEEV infected farm raised birds from North Stonington.

Reported by

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Editorial

Eastern Equine Encephalitis virus (EEEV) has a complex transmission cycle that includes wild bird hosts and a variety of mosquito vectors (*1*). *Culiseta*

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melanura is the primary mosquito species responsible for EEEV transmission in the northeastern United States. *Cs. melanura* feed predominately on birds and inhabit forested swamps where larvae develop in water-filled crypts at the base of swamp trees. In most years, EEEV is maintained at low levels in an enzootic cycle by *Cs. melanura* and wild birds such as wood thrush, red winged blackbird and American robin. Occasionally, the virus spreads to other mosquito species, such as *Coquillettidia perturbans*, *Ochlerotatus canadensis*, *Aedes vexans*, and *Culex salinarius*, which feed opportunistically on both birds and mammals and can transmit the virus to horses and humans. Many factors including weather, number of infected birds, number of appropriate mosquito vectors and infected mosquitoes, human behavior and environmental changes influence the spread of virus. Precipitation and temperature levels were above normal from July 2018 - May 2019. This provided optimal conditions for *Cs. melanura* larvae to develop, resulting in the emergence of adults 2 to 2.5 times above long-term averages during the summer of 2019.

Annual transmission of EEEV among mosquitoes and animals is highly variable with epizootics occurring every six to seven years. High levels of EEEV infection were detected in a variety of mosquito species during 1996, 2003, 2009, 2013 and 2019.

Human, animal, and mosquito surveillance indicated heightened transmission in towns primarily in the southeastern portion of the state, including areas where EEEV had not been previously identified (Figure 2). The onset of human EEEV cases in 2019 were preceded by an increase in EEEV positive mosquitoes and equine cases, emphasizing the importance of mosquito and veterinary surveillance findings for assessing human EEEV disease risk.

During 2019, the US experienced the largest outbreak of EEEV in more than 50 years, involving 38 human cases (15 fatalities) from 10 states in the eastern US (*4*). Half of these cases clustered in the southern New England states of Massachusetts (12 cases, 3 fatalities), CT (4 cases, 3 fatalities), and Rhode Island (3 cases, 1 fatality).

Symptoms of EEEV infection typically begin 4 to 10 days after a bite from an infected mosquito. Most persons infected with EEEV have no symptoms or mild flu-like illness. A small percentage will develop severe disease and encephalitis, which often begins with sudden onset of headache and high fever and rapidly progresses to disorientation, seizures, and coma. Approximately one-third of severe infections are fatal and most survivors experience life-long neurologic sequelae. Infection is diagnosed through preliminary detection of antibodies followed by secondary confirmatory testing performed by CDC, or through polymerase chain reaction (PCR) in cerebrospinal fluid. Confirmatory testing is performed by the CDC. Because of the time required from specimen collection through confirmatory testing infections may be confirmed several weeks after the infection was acquired. The risk of EEEV transmission is assessed based on the period during which a patient was most likely bitten by an infected mosquito.

When EEEV activity is reported, residents should take precautions to avoid mosquito bites by using EPA approved repellants, wearing protective clothing, and limiting outdoor activities during dusk to dawn when mosquitoes are most active. Additional information about human EEEV, and prevention measures can be found on the DPH website. Information about mosquitoes, mosquito testing, and insect repellant use are available on the Mosquito Management Program website.

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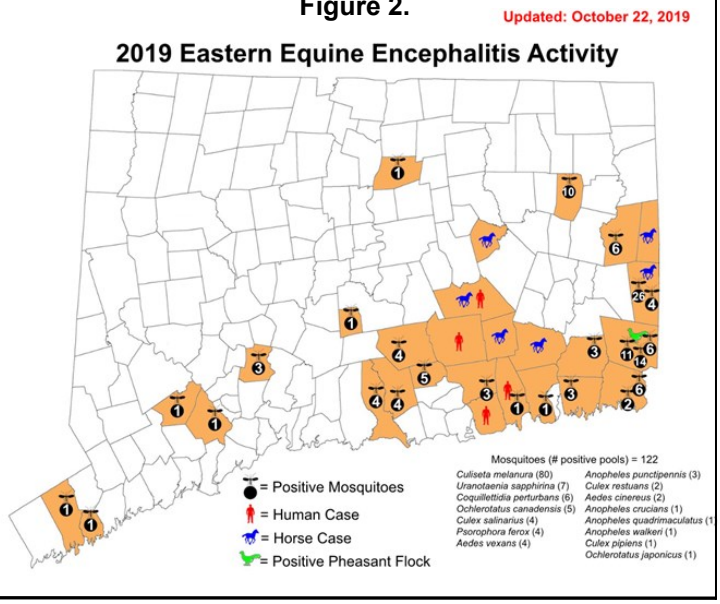
Figure 2.



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Trends in Cyclosporiasis Infection in Connecticut, 1997—2019

Cyclosporiasis is an illness resulting from infection with the parasite, *Cyclospora cayetanensis*. It is transmitted through the fecal-oral route by ingesting contaminated food or water and is characterized by watery diarrhea, loss of appetite, nausea, and cramping. On average, symptoms last 7 days (range 2 days to ≥ 2 weeks), and are often self-limited in immunocompetent individuals (*1*). *C. cayetanensis* is endemic to tropical and sub-tropical areas. Cases in the United States (US) have been associated with international travel and imported fresh produce contaminated with *C. cayetanensis*, most commonly basil, cilantro, raspberries, snow peas, and mesclun lettuce (*1,2*). This report summarizes *C. cayetanesis* surveillance in Connecticut for 1997-2019.

In 1997, the Connecticut Department of Public Health (DPH) began active laboratory surveillance for *Cyclospora* as one of 10 states selected by the Centers for Disease Control and Prevention to participate in the Foodborne Diseases Active Surveillance Network (FoodNet). FoodNet is a program within the Emerging Infections Program, which provides funding to Yale School of Public Health to conduct selected surveillance activities. FoodNet staff attempt to interview every laboratory-confirmed case of cyclosporiasis to obtain demographic, symptom, and exposure information including travel history and food consumption in the 14 days prior to illness onset. Complete ascertainment of laboratory-confirmed cases is assured through periodic audits of Connecticut laboratories.

From 1997 - 2019, a total of 372 domestic and travel-associated laboratory confirmed cases were reported (Table 1). Of those with complete demographic data, 86.0% were non-Hispanic white, 59.0% female; median age was 50 years (range: 0 to 83). Similar characteristics were seen among domestically acquired cases (n = 202). Overall, 2.5% were hospitalized, and there were no deaths reported. Since 1997 there has been an increasing proportion of Hispanic cases and decreasing proportion of cases under 18 years of age.

The annual incidence of cyclosporiasis in Connecticut showed no clear trend during 1997 - 2014; since 2015 there has been an increasing trend with the highest incidence in 2019 (Figure 1, pg 12).

In 2019, symptoms included diarrhea (100%), weight loss (95.2%), loss of appetite (86.2%), fatigue (79.3%), nausea (64.0%), and abdominal cramps (59.5%). Fever and vomiting were experienced by 33.7% and 32.2%, respectively. The median number of days from symptom onset to specimen collection was 14 days.

Travel history has been collected for cases since 2006. The proportion of domestically acquired cases was relatively stable from 2006-2015, with an average 52.9% of cases reporting no international travel in the two weeks before illness. During 2016-2019, the proportion increased to an average 79.0% (Figure 1). Of cases reporting international travel, 89.6% reported travel to Latin America; among these, Mexico (59.7%) was the most frequent destination.

Of domestically acquired cases in 2019 with complete food history, possible (answered "yes" or "maybe") consumption was reported for mesclun lettuce (43.2%), red raspberries (40.5%), cilantro (32.4%), and basil (31.1%); none reported possible snow pea consumption. Overall, 77.0% reported consuming at least one of these items.

Table 1. Descriptive characteristics of cyclosporiasis cases, Connecticut, 1997-2019

CHARACTERISTIC	N* (%**)	INCIDENCE RATE***
RACE/ETHNICITY		
WHITE, NON-HISPANIC	288 (86.0)	0.48
BLACK, NON-HISPANIC	7 (2.1)	0.10
HISPANIC	32 (9.6)	0.33
ASIAN	6 (1.8)	0.23
OTHER	2 (0.6)	0.13
AGE (YEARS)		
< 18	15 (4.0)	0.08
18 – 64	291 (78.2)	0.58
³ 65	66 (17.7)	0.58
SEX		
MALE	152 (41.0)	0.39
FEMALE	219 (59.0)	0.53
COUNTY		
FAIRFIELD	145 (39.1)	0.70
HARTFORD	60 (16.2)	0.30
LITCHFIELD	19 (5.1)	0.44
MIDDLESEX	23 (6.2)	0.62
NEW HAVEN	90 (24.3)	0.46
NEW LONDON	17 (4.6)	0.28
TOLLAND	12 (3.2)	0.36
WINDHAM	5 (1.4)	0.19
HOSPITALIZED	9 (2.5)	--
DEATHS	0	--
TOTAL	372	0.46

*Numbers may not sum to total due to missing values

**Percentages may not sum to 100 due to rounding

***Incidence rate per 100,000 person-years

Cyclosporiasis is a seasonal illness that generally occurs during May 1-August 31, which is considered "in season". Since 2011, surveillance has captured illness onset. From 2011 - 2019, 93.9% of cases had onset of illness in season. Of those, 80.4% had onset during June or July; no cases reported onset during November - January.

Since 2015, cyclosporiasis has been identified via culture independent diagnostic testing (CIDT) in addition to the traditional method of microscopy; CIDT for *C. cayetanensis* is part of a large panel of tests automatically done and does not require a specific diagnostic test request. With the debut of CIDT in 2015, there was a 100% increase in reported cases compared to 2014. Since 2015, however, there has not been a statistically significant change in proportion of all cases that were diagnosed using CIDT (37%).

Reported by

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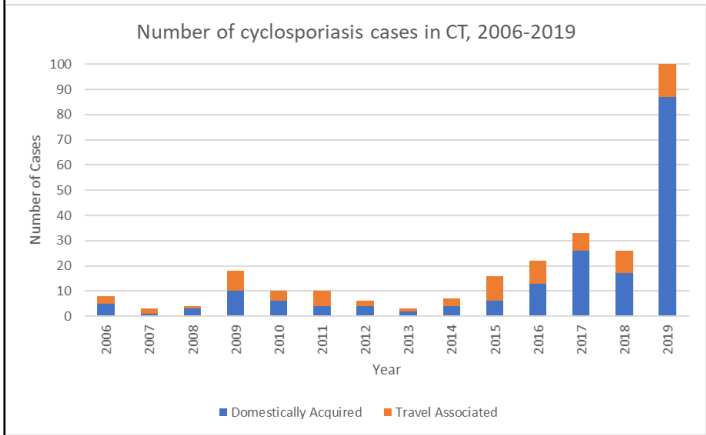
Editorial

Cyclosporiasis cases have been increasing in recent years. Some of the increase during 2015-18 may be in part due to the use of CIDT which may detect cases that otherwise would not have been found as physicians may not order microscopy tests for patients with insufficient evidence of a parasitic infection. In 2019, data show the substantial increase of cases was due to an increase in domestic exposure rather than the use of CIDT.

In 2019, a multi-state cyclosporiasis outbreak was attributed to imported Mexican basil (*3*). One CT case was classified as outbreak-associated, although 31.1% of domestically acquired CT cases reported eating basil during the incubation period. Accurate food history is difficult to obtain especially for fresh herbs, often implicated as vehicles for *C. cayetanensis* transmission, because they are not typically the main component of a dish. Molecular typing, which is available but not frequently utilized, will be crucial for assessing outbreak associated cases in the future.

Connecticut data indicated more females were reported to be infected with *Cyclospora*. In the US, this may be due to females being more likely to consume fresh produce (*4*). Additionally, those <18 years appear to bear much less of the burden of cyclosporiasis; children are less likely to consume fresh produce (*4*).

Figure 1. Cyclosporiasis cases by international travel status, Connecticut, 2004-2019



Key Messages for Providers

Healthcare providers should be aware of increasing incidence of cyclosporiasis in Connecticut and consider testing patients who experience symptoms of prolonged watery diarrhea and weight loss in the summer months, regardless of history of international travel. Comprehensive gastrointestinal panels may be useful in detecting cases that may not otherwise be indicated by travel history.

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