

HUMAN CASE SURVEILLANCE

Introduction

Human illness caused by mosquito-borne WNV acquired in Peel occurred for the first time in 2002. In 1999, a Peel resident who had traveled to New York City acquired the infection there and subsequently died upon returning to Peel.

While most human WNV infections are without symptoms, about one in five people infected with WNV develops a mild illness.¹⁷ The incubation period is estimated to be three to 14 days, with symptoms lasting approximately three to six days. The mild form of WNV infection is described as a sudden onset of fever that is often accompanied by malaise, headache, nausea, vomiting, anorexia, eye pain, myalgia, and less commonly, rash and/or swollen lymph nodes.¹⁷

Approximately one case in 150 infections develops severe neurologic disease, with encephalitis being reported more often than meningitis. The greatest risk factor for developing severe WNV disease is increased age.^{17,18} Symptoms among those with severe disease include fever, muscle weakness, gastrointestinal symptoms and a change in mental status. Some cases also experience a rash on their neck, body, arms or legs. A small number of patients experience severe muscle weakness and paralysis. Other symptoms include seizures, optic nerve involvement, cranial nerve abnormalities and ataxia.¹⁷

In 2002, diagnosis was made through the detection of an increase in total antibody to WNV found in two separate samples of blood taken at least one week apart.¹⁹ As there is no cure for WNV, treatment is supportive in nature, and involves hospitalization, administering intravenous fluids, providing respiratory support and preventing secondary infections for patients with severe disease.¹⁷

The 2002 WNV epidemic in North America included the first documented cases of person-to-person WNV transmission through organ transplantation,²⁰ blood and blood product transfusion²⁰ and perhaps breastfeeding,²¹ as well as a case of intrauterine infection.²² A poliomyelitis-like syndrome was recognized among some West Nile patients with onset of acute flaccid paralysis (AFP) during the early stages of infection in the United States.²³ Parkinsonism and Rhabdomyolysis²⁴ were also seen in rare instances.

Modifiable risk factors for WNV include known travel in an area previously identified as having WNV activity, having received blood, blood products or organ transplants from an infected donor, or acquiring the infection through occupational exposure. Two laboratory workers in the United States became infected by suffering occupational injuries, such as lacerations or needle-stick punctures, while working with specimens containing WNV.¹



Methods

Physicians and infectious disease specialists identified patients with suspected WNV infection causing viral encephalitis, viral meningitis or other illnesses consistent with WNV infection, based on their clinical symptoms and patient histories. Blood tests were ordered which would specifically look for antibodies to WNV. Preliminary testing was conducted at the Ontario Central Public Health Laboratory in Toronto, while final confirmatory testing was done at Health Canada's National Microbiology Laboratory in Winnipeg. Once suspected cases were identified, they were immediately reported to public health officials for notification and follow-up.

In the Region of Peel, standardized medical information, including demographics, symptoms, risk factors (such as travel history or having received blood products), and test results were entered into an Access database. Cases were reviewed by an Infection Control Specialist. Later, address information was also entered into a geographic information system so that the incidence of the disease could be mapped.

Test results were delayed due to the volume of tests submitted to the provincial and federal laboratories. In addition, the confirmation process took several weeks since the test required the growth of WNV in culture. This resulted in late information regarding changes in the status of individuals (i.e. identifying whether they were not a case, suspect, probable or confirmed) and delays in reporting the number of known cases. Provincial case definitions used in the Region of Peel are found in Appendix E.

Results

In late August 2002, the Region of Peel and the Ontario Ministry of Health and Long-Term Care jointly announced the identification of the first known human case of WNV encephalitis acquired in Canada in a Region of Peel resident.

As of May 28, 2003, there were 112 residents of Peel who had had laboratory evidence of WNV infection stemming from the 2002 season as follows: 37 confirmed cases, 20 probable cases, and 55 suspect cases. Most of these cases reported onset of symptoms having occurred in August and September. An additional 29 residents were either found to not be cases, or there was not enough information to determine their status at the time this report was prepared.

The remainder of the analyses of human WNV in this report will focus on the 37 confirmed and 20 probable cases in Peel.

By municipality, Mississauga residents accounted for 92% (34) of confirmed human cases of WNV disease in Peel, while Brampton accounted for the remaining 8% (three cases) (Table 4). Mississauga also accounted for 90% of probable cases (18), while



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Brampton had 10% (two cases). There were no confirmed or probable cases among residents of Caledon.

Table 4: Confirmed and Probable Human WNV Cases by Municipality of Residence, Region of Peel, 2002

Municipality	Confirmed		Probable		Total	
	number	percent	number	percent	number	percent
Mississauga	34	91.9	18	90.0	52	91.2
Brampton	3	8.1	2	10.0	5	8.8
Caledon	0	0.0	0	0.0	0	0.0
Peel	37	100.0	20	100.0	57	100.0

Rates of WNV infection per 100,000 population were mapped by Forward Sortation Area (FSA – the first three digits of the postal code) and are depicted in Figure 11. This figure shows that higher incidence rates occurred in the southern parts of Mississauga, along the Lake Ontario shore and Etobicoke creek, somewhat similar to the mapping analyses of dead crows (Figures 2 and 3). The highest rates of WNV infection in humans occurred in the L5G area of Mississauga (35.1 cases per 100,000 population), followed by L5C (18.9 per 100,000) and L5H (17.8 per 100,000). These three postal code areas all border the Credit River basin near Lake Ontario.

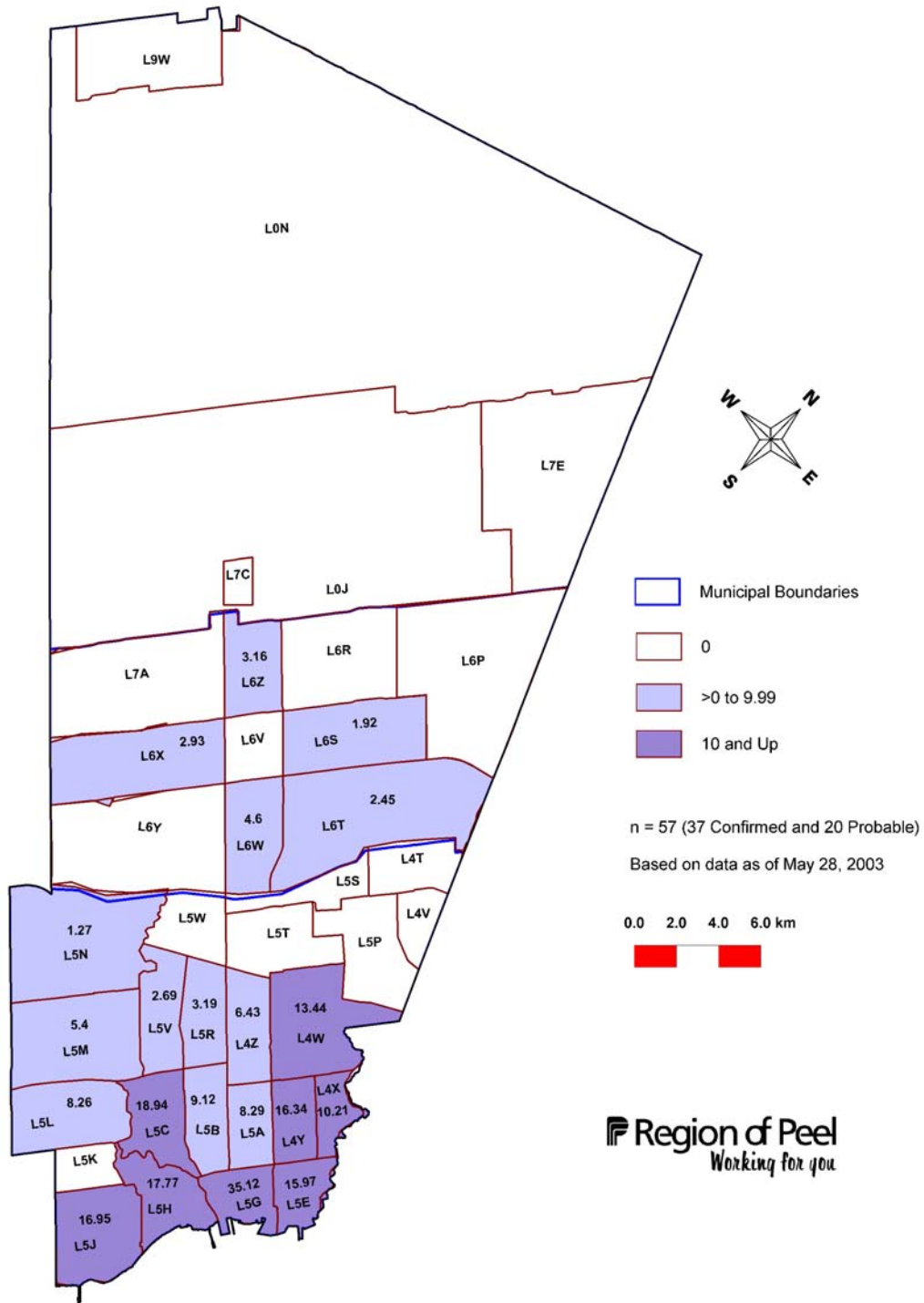
Among confirmed human cases, the median age of infected persons was 60.3 years (range: seven to 82 years); for probable cases, the median age was 50.0 years (range: five to 70 years). There were slightly more females than males among the confirmed and probable cases in Peel (31 females versus 26 males). Among females, the highest proportion of WNV cases occurred in the 60-69 year age group (29%); the highest proportion among males occurred in the 50-59 year age group (35%) (Table 5). The distribution of Peel's WNV cases shows that, regardless of sex, fewer cases occurred among the younger age groups.

Table 5: Confirmed and Probable Human WNV Cases by Age Group and Sex, Region of Peel, 2002

Age Group	Female		Male		Total	
	number	percent	number	percent	number	percent
0 - 9	0	0.0	2	7.7	2	3.5
10 - 19	1	3.2	0	0.0	1	1.8
20 - 29	3	9.7	0	0.0	3	5.3
30 - 39	1	3.2	1	3.8	2	3.5
40 - 49	6	19.4	4	15.4	10	17.5
50 - 59	6	19.4	9	34.6	15	26.3
60 - 69	9	29.0	4	15.4	13	22.8
70 - 79	4	12.9	6	23.1	10	17.5
80 +	1	3.2	0	0.0	1	1.8
Total	31	100.0	26	100.0	57	100.0

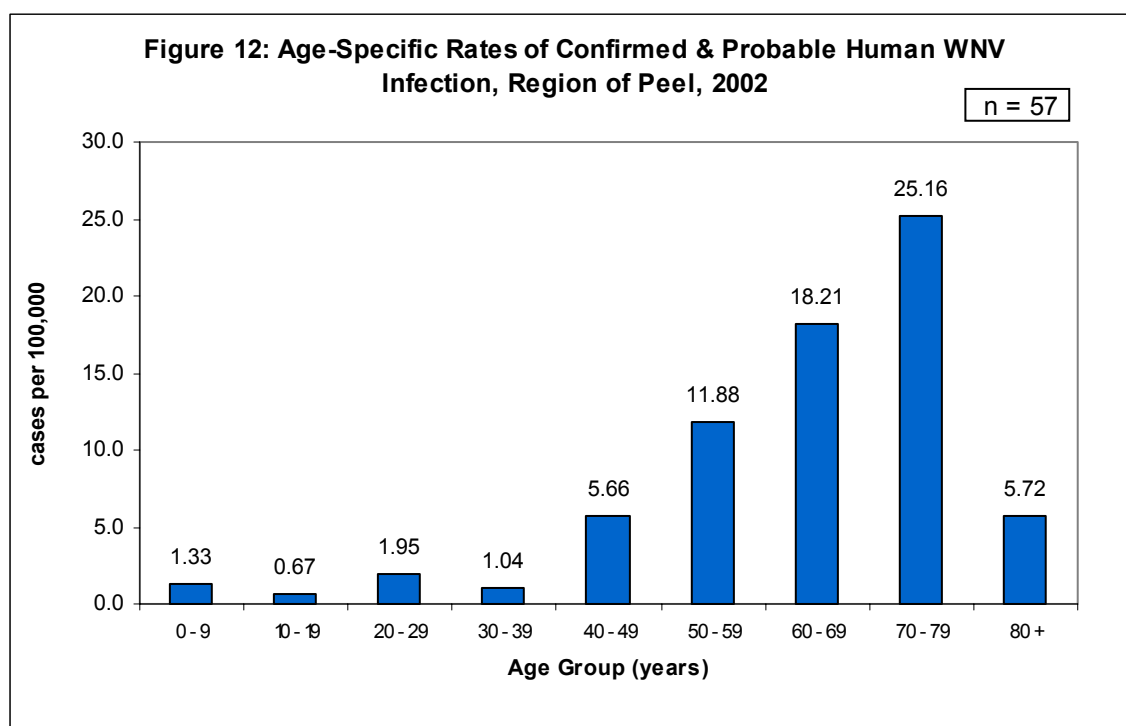


Figure 11: Rates of Confirmed and Probable Human WNV Infection by Forward Sortation Area, Region of Peel, 2002

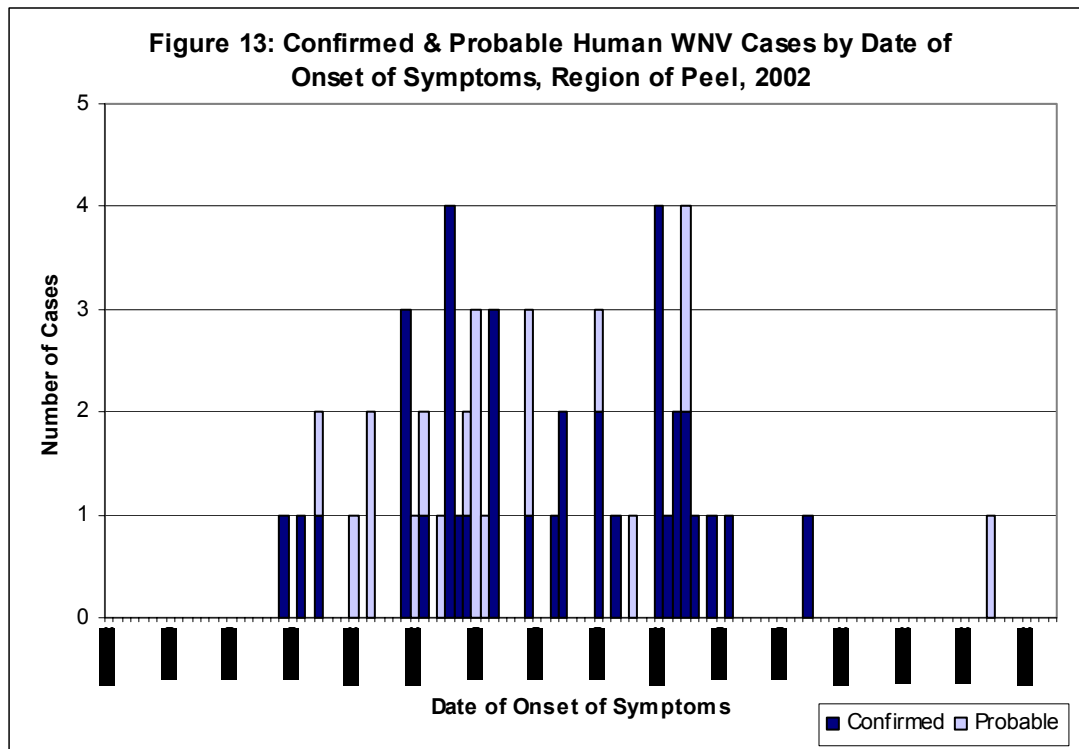


The incidence of confirmed and probable WNV cases among Peel residents generally increased across age groups: older adults were more likely to meet the case definitions for these categories than were younger residents (Figure 12). Rates of WNV were fairly constant among those 0-39 then began to increase at approximately ages 40-49, and continued to increase with advancing age, with the exception of those 80 years and older. The highest rate was observed among 70-79 year-olds where a rate of 25.2 cases per 100,000 population was observed. The rate among residents 80 years and older was lower at 5.7 per 100,000. This may be due, in part, to small numbers of cases. In addition, those 80 years and older may be less likely to be active outdoors than younger age groups. However, contrary to initial expectations, cases of WNV were not limited to older adults or the infirmed, as many of those affected (32% or 18 of 57) were less than 50 years of age.

The first confirmed human case, a 66 year-old male with no history of travel, had onset of symptoms on August 4, 2002. The first reports of human cases were preceded by a sharp increase in the number of crow deaths in late July and early August.⁷ The last confirmed human case had onset of symptoms on October 3, 2002 (Figure 13).



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Proportions of WNV cases with possible risk factors are found in Table 6. Persons with confirmed or probable WNV were asked if they had traveled in the last two weeks prior to the onset of their symptoms. Fifteen of 37 confirmed cases (41%) and six of 20 probable cases (30%) replied that they had traveled, with the most frequent destination mentioned being somewhere in Ontario, followed by the United States and elsewhere in Canada (Table 7). No WNV cases in Peel had been recipients of blood products (Table 6).

Table 6: Confirmed and Probable Human WNV Cases by Possible Risk Factors, Region of Peel, 2002

Possible Risk Factor	Confirmed		Probable		Total	
	number	percent	number	percent	number	Percent
Traveled in last two weeks?	15	40.5	6	30.0	21	36.8
Received Blood?	0	0.0	0	0.0	0	0.0
Total	37	100.0	20	100.0	57	100.0

Table 7: Reported Travel Destinations of Human WNV Confirmed & Probable Cases, Region of Peel, 2002

Destination	Confirmed		Probable		Total	
	number	percent	number	percent	number	Percent
Canada	2	13.3	1	16.7	3	14.3
Europe	0	0.0	1	16.7	1	4.8
Ontario	8	53.3	3	50.0	11	52.4
USA	5	33.3	1	16.7	6	28.6
Total	15	100.0	6	100.0	21	100.0



Symptoms of those with confirmed or probable WNV infection are listed in Table 8. The most common symptom was fever, reported by 76% of confirmed cases and 90% of probable cases. Between 50% and 60% of all cases reported headaches, fatigue and muscle weakness, while rashes were reported by 43% of confirmed cases and 60% of probable cases. One confirmed case in Peel also presented with a poliomyelitis-like syndrome.²⁵

Twenty-one of 37 confirmed cases (57%) and seven of 20 probable cases (35%) required hospitalization for their symptoms (Table 9). Of the 28 confirmed and probable cases admitted to hospital, seven (25%) had encephalitis, five (18%) had meningitis, and six (21%) had sepsis as their primary diagnoses, while the remainder did not have a primary diagnosis identified upon admission (Table 10). One additional confirmed case with meningitis was seen in the Emergency Room, but was not admitted to hospital.

Table 8: Confirmed and Probable Human WNV Cases by Reported Symptoms*, Region of Peel, 2002

Symptom	Confirmed		Probable		Total	
	number	percent	number	percent	number	Percent
Fever	28	75.7	18	90.0	45	78.9
Headache	19	51.4	16	80.0	34	59.6
Fatigue	22	59.5	12	60.0	33	57.9
Muscle Weakness	22	59.5	9	45.0	30	52.6
Rash	16	43.2	12	60.0	27	47.4
Change in Mental Status	16	43.2	5	25.0	21	36.8
Anorexia	10	27.0	2	10.0	12	21.1
Vomiting	7	18.9	4	20.0	11	19.3
Nausea	4	10.8	4	20.0	8	14.0
Lymphadenopathy	0	0.0	2	10.0	2	3.5
Total	37	100.0	20	100.0	57	100.0

* More than one symptom is possible. Numbers do not sum to totals.

Table 9: Confirmed and Probable Human WNV Cases by Admission to Hospital, Region of Peel, 2002

Admitted to Hospital?	Confirmed		Probable		Total	
	number	percent	number	percent	number	Percent
Yes	21	56.8	7	35.0	28	49.1
No	15	40.5	12	60.0	27	47.4
unknown	1	2.7	1	5.0	2	3.5
Total	37	100.0	20	100.0	57	100.0



Table 10: Confirmed and Probable Human WNV Cases by Primary Diagnosis Among Those Admitted to Hospital (n=28), Region of Peel, 2002

Primary Diagnosis	Confirmed		Probable		Total	
	number	percent	number	percent	number	Percent
Encephalitis	5	23.8	2	28.6	7	25.0
Meningitis	2	9.5	3	42.9	5	17.9
Sepsis	6	28.6	0	0.0	6	21.4
None identified	8	38.1	2	28.6	10	35.7
Total	21	100.0	7	100.0	28	100.0

Of the 57 persons with confirmed or probable WNV, two (4%) died, most likely due to infection with WNV. The first death occurred in a 70 year-old male resident of Mississauga. It was not known whether he had traveled within Ontario; however, he had not traveled to a WNV-endemic area. He had not received blood nor had he received vaccines (Yellow Fever, Japanese B Vaccine) that can cause equivocal results in blood tests for WNV.

The second death occurred in a 72 year-old male resident of Brampton. This person did not have a history of travel, nor had he received blood or the vaccines mentioned above.

Neighbouring Halton Region to the west had 56 confirmed and three probable WNV cases for a total of 59, most of which occurred in the southern municipalities of Oakville and Burlington.²⁶ Halton had no deaths associated with WNV among their cases.²⁷

The Halton Region Health Department is participating in a seroprevalence study in conjunction with the McMaster University Institute of Environment and Health, the Ontario Ministry of Health and Long-Term Care and Health Canada. In March 2003, nurses took samples of blood from a random selection of Oakville residents which are being tested to determine the prevalence of WNV antibody in residents' blood. Results will be reported later this year, and will provide invaluable information about the extent of WNV infection in south Oakville.²⁸

Meanwhile in Toronto to the east, there were 127 confirmed and 41 probable cases of WNV among their residents in 2002. None of the 12 deaths among this group were proven to be caused by WNV disease.²⁹ Contrary to initial expectations, serious WNV disease was not confined solely to those who were elderly or had pre-existing medical conditions.^{30,31} Many of those affected were less than 50 years of age, and had been experiencing good health until the time of their infection with WNV.

In all of Ontario, there were 307 confirmed cases of WNV in 2002, with an additional 83 probable cases (Appendix F).³² Seventeen deaths occurred among these individuals;



however, four deaths were not related to WNV. Three deaths were due to WNV infection, four listed WNV as a contributory cause, and six may have been associated with WNV but as of April 23, 2003 were still being investigated.³²

Summary

Mosquito-borne acquisition in Canada of WNV disease in humans, occurred for the first time in 2002. As of May 28, 2003, 112 residents of the Region of Peel had laboratory evidence of WNV infection stemming from the 2002 mosquito season: 37 confirmed cases, 20 probable, and 55 were suspect cases. Numbers of confirmed and probable cases were higher than originally thought due to late reports of test results.

Of the 57 confirmed and probable cases, the majority (91%) was from Mississauga and the remainder (9%) from Brampton. The highest rates of WNV infection among humans occurred in the southern areas of Mississauga (postal code areas L5G, L5H and L5C), all of which border the Credit River basin near Lake Ontario, but are well-populated and contain much human development.

As found in other jurisdictions, and contrary to initial expectations, cases of WNV were not limited to older adults or the infirmed, as many of those affected in Peel (32%) were less than 50 years of age. Few confirmed or probable cases of WNV occurred among the very young, while most occurred among the 50-59 and 60-69 year age groups. The rate of diagnoses of WNV disease increased with increasing age after approximately age 40.

While most of those infected did not suffer very severe disease, there were two deaths, seven cases of encephalitis and five cases of meningitis among the 57 WNV confirmed or probable cases in the Region of Peel, along with fairly high proportions of symptoms such as muscle weakness (53%) and changes in mental status (37%).

Identification of WNV in humans underscores the importance of active, hospital-based human surveillance programs starting in July through to the end of September, as well as the need to consider WNV as a possible diagnosis when clinicians encounter patients with encephalitis, meningitis, AFP or non-specific fevers occurring throughout this time period.^{4,7}

Presently, there is no vaccine available for use in humans.⁹ A human vaccine against WNV is under development by several commercial manufacturers,³³ with availability some years away.



