
SURVEY RESULTS FOR WEST NILE AND ST. LOUIS ENCEPHALITIS VIRUSES AT LION COUNTRY SAFARI

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Abstract

Overview

The Florida Department of Health (DOH) and the Florida Division of Animal Industry (DAI) documented the presence of West Nile virus (WNV) in 56 Florida counties during 2002.² The DOH tested 3,370 birds that year.¹ Positive WNV samples were obtained from 450 dead birds in 47 counties.² Positive WNV samples were obtained from 499 ill horses in 44 counties.² In addition, 1058 sentinel chickens in 29 counties were WNV seropositive.² Six other animals in three counties also had positive WNV samples.² Statewide, 28 human cases of West Nile meningoencephalitis with two fatalities occurred, including a transfusion recipient and a transplant recipient.² Seven human cases of West Nile fever, a milder form of the disease, were also reported including illness in a transplant recipient.²

In support of nationwide multiple-institution efforts to understand the prevalence and pathogenicity of West Nile virus (WNV), biologic sampling of collection animals and wildlife is an ongoing project at Lion Country Safari (LCS), Loxahatchee, Florida. This zoological park exhibits nearly 1000 animals. Eighty-two percent of LCS collection animals are mammals including over 700 hoofstock. The park also exhibits 56 primates including 33 chimpanzees (*Pan troglodytes*), plus 15 African lions (*Panthera leo*), and 4 African elephants (*Loxodonta africana*). Thirteen percent of LCS collection animals are birds including 44 psittacines, 30 Ciconiiformes, and some 20 ratites. Five percent of LCS collection animals are reptiles including 10 American alligators (*Alligator mississippiensis*), 4 Aldabra tortoises (*Geochelone gigantea*), plus other chelonians, iguanas, and snakes.

At the time of this writing, over 10% of collection animals were sampled for WNV and St. Louis encephalitis virus (SLE) since September 2002. The vast majority of sampling involved serologic tests performed at Cornell University Diagnostic Laboratory. Polymerase chain reaction (PCR) testing of tissues from expired collection animals and wildlife found dead on LCS property were also performed at Cornell. Thirty percent of LCS animals sampled were seropositive for WNV. Seropositive animals were asymptomatic with the exception of a chimpanzee that presented for hemiparesis associated with cerebrovascular thrombosis and severe myocardial disease. No positive WNV samples were obtained from deceased collection animals or wildlife from LCS property.

Wildlife has been tested at LCS since year 2001.

Avian Results

East African crowned cranes (*Balearica gibbericeps*) and Marabou storks (*Leptoptilos crumeniferus*) have some of the highest WNV titers of any LCS animal to date. The WNV titers from two cranes were 1:320 and >1:640. Both of these cranes had negative SLE titers. Two marabou storks had WNV titers of 1:160 and >1:640 and SLE titers in these storks were 1:20 and negative, respectively. Such results are strong evidence that WNV has been present at LCS. East African crowned cranes and Marabou storks at LCS have mounted significant antibody response to WNV without overt signs of illness. These birds are exhibited on a completely open outdoor island during the day and remain there at night.

To date, LCS psittacines tested have not shown serologic evidence of WNV exposure. 18 lorries (*Trichoglossus* sp.) tested negative. These birds are housed outside during the day and indoor at night. Macaws (*Ara* sp.) and Amazon parrots (*Amazona* sp.) tested negative. These parrots are exhibited in a completely open outdoor exhibit during the day and screened welded wire mesh outdoor pens at night.

Since flamingoes (*Phoenicopterus* sp.) have been species of concern regarding sensitivity to WNV, it is of interest to note that two untested Chilean and five untested Caribbean flamingoes have not shown signs of illness throughout 2002. These birds are housed day and night in an outdoor netted aviary located within some 200 yards of the East African crowned cranes and Marabou storks.

Reptile Results

A geriatric iguana (*Iguana iguana*) ill with chronic metastatic mineralization and a juvenile alligator tested negative for WNV. An outbreak of WNV among farmed American alligators at a central Florida location was diagnosed in late 2002.³ Although husbandry, environmental circumstances, and disease susceptibility of farmed alligators may differ from that of LCS alligators, this disease outbreak has prompted serologic testing of the LCS alligator population, results of which are pending.

Mammal Results

Nearly all LCS mammals are housed outdoor day and night. Exotic hoofstock are maintained on large preserves. Petting zoo animals have outdoor enclosures. Other housing arrangements relevant to issues of mosquito exposure are included in species summaries below.

Exotic hoofstock requiring immobilization for sampling were tested when anesthesia was required for procedures such as neutering or lameness evaluation. Among hoofstock, approximately 70 individuals from 12 species have been tested to date. Aoudad (*Ammotragis lervia*), nilgai (*Boselaphus tragocamelus*), and zebra (*Equus burchelli*) had > 50% WNV seropositivity of their

respective sample populations. Two of three aoudad had WNV titers of 1:40 with negative SLE results. Nine of 13 nilgai tested were seropositive for WNV with titers ranging from 1:20 to 1:80. These nilgai were seronegative for SLE with the exception of one nilgai reported with a WNV titer of 1:80 and an SLE titer of 1:160. Zebra had titers to WNV ranging from 1:40 to 1:320. These zebra were seronegative for SLE except for one animal with an SLE titer of 1:320. Other species tested included blackbuck (*Antilope cervicapra*), eland (*Taurotragus oryx*), fallow deer (*Dama dama*), gemsbok (*Oryx gazella*), impala (*Aepyceros melampus*), llama (*Lama glama*), mouflon (*Ovis musimon*), pygmy goat (*Capra hircus*) and waterbuck (*Kobus ellipsiprymnus*).

No positive WNV samples were obtained from six squirrel monkeys (*Saimiri sciureus*) housed day and night in an outdoor welded wire mesh enclosure located some 200 yards from WNV seropositive East African crowned cranes and Marabou storks. Available chimpanzee results show an individual with a WNV titer of 1:80 and an SLE titer of > 1:640. This animal presented with left sided hemiparesis and subsequently died, showing severe myocardial fibrosis with thromboembolic disease on histopathology. Further testing on samples from this individual as well as other members of the chimpanzee population are in progress. LCS chimps are housed day and night on outdoor islands.

Three African elephants have been tested, one of which was WNV seronegative. Another elephant had a WNV titer of 1:40 and was seronegative for SLE. A third elephant had preliminary test results showing a WNV titer of 1:320 and an SLE titer of > 1:640. A fourfold difference in titer between WNV and SLE is necessary to determine which of these arboviruses is responsible for a positive titer. Thus, further titrations must be performed on this sample to determine if exposure to WNV or SLE occurred. Two African lions tested reside entirely outdoors and were seronegative for WNV and SLE.

WNV Vaccination at LCS for Year 2002

White rhinoceros (*Ceratotherium simum*) and Brazilian tapirs (*Tapirus terrestris*) were vaccinated for WNV in 2002 using a product marketed for domestic horses (*Equus caballus*) (West Nile Virus Vaccine, Fort Dodge, Fort Dodge, IA 50501 USA). No adverse reactions to the vaccine occurred. These species were the only LCS collection animals vaccinated for WNV that year. The decision to vaccinate 11 white rhinoceros was made following a sudden fatal illness in a 6-yr-old male white rhinoceros that involved neurologic signs. Results of PCR for WNV from tissues of the deceased rhinoceros returned as negative.

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