New study defines spread of SARS-CoV-2 in white-tailed deer

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North American white-tailed deer—shown in 2021 surveys of five states to have SARS-CoV-2 infection rates of up to 40%—shed and transmit the virus for up to five days once infected, according to a new study.

"It's a relatively short window of time in which the infected animals are shedding and are able to transmit the virus," said Dr. Diego Diel,

associate professor in the Department of Population Medicine and Diagnostic Sciences and director of the Virology Laboratory at the College of Veterinary Medicine's Animal Health Diagnostic Center. "However, the virus is very efficient at transmitting to white-tailed-deer entering contact with infected animals."

The study, "From Deer-to-Deer: SARS-CoV-2 is Efficiently Transmitted and Presents Broad Tissue Tropism and Replication Sites in White-Tailed Deer," which published online on March 21 in *PLOS Pathogens*, also identified that the virus develops and replicates in the deer's respiratory tract, lymphoid tissues—including tonsils and several lymph nodes—and in central nervous system tissues.

"Virus replication in the upper respiratory tract—especially the nasal turbinates [nose structures]—is comparable with what is observed in humans and in other animals that are susceptible to the infection," Diel said, "and I think that's probably one of the reasons why the virus transmits so efficiently." As with humans, the virus spreads between deer through nasal and oral secretions and aerosols.

The findings are critical for guiding epidemiological and immunological studies of SARS-CoV-2 in wildlife to determine if deer can act as reservoirs that maintain the virus in nature independent of humans. Last year, researchers traced multiple introductions of SARS-CoV-2 from people into deer populations in several U.S. states.

Identifying target tissues where the virus replicates during infection could also provide useful information for hunters who harvest deer. While there is currently no evidence that humans have caught COVID-19 from deer, epidemiologists and others are concerned that hunters could become infected while harvesting an infected kill.

"Given the broad practice of deer hunting in the U.S., knowing the sites

of virus replication is important to minimize the risks of exposure and transmission from these wild animals that could be potentially transmit the virus d back to humans," Diel said.

In the study, white-tailed deer were intranasally inoculated with SARS-CoV-2 at a biosafety level-3 facility at the USDA National Animal Disease Center (NADC) in Ames, Iowa. Groups of uninfected deer were then exposed to the infected deer on days three, six and nine. Consistent with tests showing that deer stop shedding infectious virus after five days post-infection, animals exposed on day three became infected but no transmission of the virus was observed in the groups of animals that were added on days six and nine. The new results complement a previous study by Dr. Diel's group and his collaborators at NADC which demonstrated for the first time that white tailed deer are highly susceptible to SARS-COV-2 infection.

If contact tracing for COVID-19 were to continue, a question of whether a person had contact with white-tailed-deer should be added to the contact tracer's questionnaire, Diel said.

More information: Mathias Martins et al, From Deer-to-Deer: SARS-CoV-2 is efficiently transmitted and presents broad tissue tropism and replication sites in white-tailed deer, *PLOS Pathogens* (2022). DOI: 10.1371/journal.ppat.1010197

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