Surveillance for SARS-CoV-2 in Norway rats (Rattus norvegicus) from southern Ontario

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Abstract

The emergence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) from wildlife origins has raised concerns about spillover from humans to animals, the establishment of novel wildlife reservoirs, and the potential for future outbreaks caused by variants of wildlife origin. Norway rats (Rattus norvegicus) are abundant in urban areas and live in close proximity to humans, providing the opportunity for spillover of SARS-CoV-2. To date, there is no evidence of natural SARS-CoV-2 infection in rats and experimental studies suggest rats are likely not susceptible to ancestral SARS-CoV-2. However, as variants emerge, new species have been identified as competent hosts, as demonstrated by the susceptibility of rats to the SARS-CoV-2 Alpha variant of concern (VOC). We investigated SARS-CoV-2 infection and exposure in Norway rats from southern Ontario, Canada. From October 2019 to June 2021, 224 rats were submitted by collaborating pest control companies. The majority of samples were collected in Windsor (79.9%; n=179), Hamilton (13.8%; n=31), and the Greater Toronto Area (5.8%; n=13). Overall, 50.0% (n=112) were female and most rats were sexually mature (55.8%; n=125). Notably, 202 samples, including the two seropositive samples, were collected prior to the emergence of VOCs, and 22 were collected while the Alpha variant was the predominant circulating VOC in humans. Nasal turbinate (n=164) and small intestinal (n=213) tissue samples were analyzed for SARS-CoV-2 RNA by RT-PCR. Thoracic cavity fluid samples (n=213) were tested for neutralizing antibodies using a surrogate virus neutralization test (sVNT) (GenScript cPass); confirmatory plaque reduction neutralization test (PRNT) testing was conducted on presumptive positive samples. We did not detect SARS-CoV-2 RNA in any samples tested. Two out of eleven samples positive by sVNT had neutralizing antibodies by PRNT (1:40 and 1:320 PRNT70). It is imperative that efforts to control and monitor SARS-CoV-2 include surveillance of rats and other relevant wildlife species as novel variants continue to emerge.

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