Multiple spillovers and onward transmission of SARS-CoV-2 in free-living and captive white-tailed deer

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Abstract

Many animal species are susceptible to SARS-CoV-2 and could potentially act as reservoirs, yet transmission of the virus in non-human free-living animals has not been documented. White-tailed deer (*Odocoileus virginianus)*, the predominant cervid in North America, are susceptible to SARS-CoV-2 infection, and experimentally infected fawns can transmit the virus. To test the hypothesis that SARS-CoV-2 may be circulating in deer, we tested 283 retropharyngeal lymph node (RPLN) samples collected from 151 free-living and 132 captive deer in Iowa from April 2020 through December of 2020 for the presence of SARS-CoV-2 RNA. Ninety-four of the 283 deer (33.2%; 95% CI: 28, 38.9) samples were positive for SARS-CoV-2 RNA as assessed by RT-PCR. Notably, between November 23, 2020 and January 10, 2021, 80 of 97 (82.5%; 95% CI 73.7, 88.8) RPLN samples had detectable SARS-CoV-2 RNA by RT-PCR. Whole genome sequencing of the 94 positive RPLN samples identified 12 SARS-CoV-2 lineages, with B.1.2 (n = 51; 54.5%), and B.1.311 (*n* = 19; 20%) accounting for ~75% of all samples. The geographic distribution and nesting of clusters of deer and human lineages strongly suggest multiple zooanthroponotic spillover events and deer-to-deer transmission. The discovery of sylvatic and enzootic SARS-CoV-2 transmission in deer has important implications for the ecology and long-term persistence, as well as the potential for spillover to other animals and spillback into humans. These findings highlight an urgent need for a robust and proactive "One Health" approach to obtaining a better understanding of the ecology and evolution of SARS-CoV-2.

One-Sentence Summary: SARS-CoV-2 was detected in one-third of sampled white-tailed deer in Iowa between September 2020 and January of 2021 that likely resulted from multiple human-to-deer spillover and deer-to-deer transmission events.

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the cause of coronavirus disease 2019 (COVID-19) in humans, is a novel coronavirus in the genus *Betacoronavirus* (subgenus *Sarbecovirus*) (1). SARS-CoV-2 was first identified in Wuhan, China, toward the end of 2019 (2), and has caused a pandemic with 247 million COVID-19 cases and over 5 million deaths globally as of November 1st , 2021 (3). The virus continues to evolve, with a growing concern for the emergence of new variants. SARS-CoV-2 uses the host angiotensin-converting enzyme 2 (ACE-2) receptor to enter cells (4). ACE-2 receptors are well conserved across vertebrate species including humans (5), and computational analyses predict high binding affinities of SARS-CoV-2 to the ACE-2 receptor in multiple animal species, indicating potential susceptibility to infection (5). Included amongst these are three species of cervids: the Père David's deer (*Elaphurus davidianus*), reindeer (*Rangifer tarandus*), and white-tailed deer (*Odocoileus virginianus*) (6).

The widespread and global dissemination of SARS-CoV-2 among humans provides opportunities for spillovers into non-human hosts (7). Indeed, SARS-CoV-2 infections have been documented in dogs, cats, zoo animals (e.g. tigers and lions) and farmed mink (8, 9). In principle, SARS-CoV-2 infection of a non-human animal host might result in the establishment of a reservoir that can further drive the emergence of novel variants with potential for spillback to humans. This type of transmission cycle has been described among workers on mink farms (10). However, widespread SARS-CoV-2 transmission in a free-living animal species has not yet been documented.

Our study was prompted by a recent report that 40% of free-living white-tailed deer in the USA had antibodies against SARS-CoV-2 (11). More recent studies have provided evidence of SARS-CoV-2 transmission among experimentally infected deer under controlled conditions (6). To test the hypothesis that infection and subsequent transmission of SARS-CoV-2 of deer occurs in nature, we assayed 283 retropharyngeal lymph node (RPLN) samples collected from free-living and captive deer in Iowa from April 2020 through January 2021. We discovered that one-third of the deer sampled over the course of the study had SARS-CoV-2 nucleic acid in their RPLN. We then sequenced the SARS-CoV-2 genomes present in all positive samples and found that the genomes represented multiple lineages that corresponded to viral genotypes circulating contemporaneously in humans. In the aggregate, our results are consistent with a model of multiple

independent human-to-deer transmission events and deer-to-deer transmission. Our findings raise the possibility of reverse zoonoses, especially in exurban areas with high deer density. The study also highlights the potential risks and considerable knowledge gaps associated with the continued evolution of SARS-CoV-2 in animal hosts, and calls for the implementation of enhanced surveillance programs to identify potential reservoir species at the animal-human interface.

Results and Discussion

SARS-CoV-2 RNA is present in a substantial fraction of free-living and captive deer across Iowa, with strong evidence of temporal clustering

A total of 283 RPLN samples recovered from wild and captive deer in Iowa between April 8, 2020 and January 6, 2021 were analyzed by RT-PCR for the presence of SARS-CoV-2 RNA signatures using the OPTI Medical SARS-CoV-2 RT-PCR assay targeting the N1 and N2 genes in a CLIA-approved laboratory ((12); Supplementary Table 1). The sampling period closely follows the trajectory of the pandemic in Iowa (with the first human case reported on March 8, 2020) through the peak during the second week of November 2020 ((3); Figure 1).

Sources and characteristics associated with the 283 RPLN samples are summarized in Table 1. Overall, 94 of the 283 (33.2%; 95% CI: 28, 38.9) RPLN samples were found to be positive for SARS-CoV-2 RNA. Since a majority (n = 261, 91.9%) of the 283 RPLN samples in our study were harvested from deer from September through December of 2020, a period that coincided with the regular deer hunting season in Iowa that started on September 19, 2020, and ended January 10, 2021, we explored temporal trends in the recovery of SARS-CoV-2 RNA from deer in the sample set. The results show that all 17 RPLNs from deer collected during April through August 2020 were negative for the presence of SARS-CoV-2 RNA (Table 1). The first identification of SARS-CoV-2 in deer was on September 28, 2020, in an animal harvested on a game preserve in South Eastern Iowa (Figure 2; Supplementary Table 1). This was closely followed by a second positive sample identified in a free-living deer killed in a road accident on September 30, 2020, approximately 300 miles away in Woodbury county on the State's Western border (Supplementary Table 1). In total, two of the 39 samples collected in September were positive for SARS-CoV-2 RNA (5.1%: 95% CI: 1.4, 16.9). Similarly, in October 2020, four of 70 (5.7%; 95% CI 2.2, 13.8) RPLNs recovered from deer, one each from Des Moines and Pottawattamie counties, and two from Woodbury, were found to be positive for SARS-CoV-2 RNA. Coinciding with the major peak of

infection in humans in Iowa, the positivity rate in deer rapidly increased with 22 of 77 RPLN samples (27.8%; 95% CI 19.2, 38.6) harboring SARS-CoV-2 RNA in November 2020, and 61 of 75 samples (81.3%; 95% CI: 71.1, 88.5) positive in December of 2020 (Figure 1). During the second week of January 2021, at the end of the regular hunting season, all five deer RPLN samples were positive for SARS-CoV-2 RNA (95% CI: 56.6-100). Notably, during the seven-weeks starting November 23, 2020, through the end of hunting season on January 10, 2021, 80 of 97 (82.5%; 95% CI 73.7, 88.8) deer RPLN samples from across the State were positive for SARS-CoV-2 RNA. Importantly, the results show a high viral copy number in deer RPLN samples (Median 106,000 viral copies per ml; ranging from 268 to 5.4 x 10^8 copies per ml) (Supplementary Figure 1), suggesting that many of the deer likely had a very high viral load.

Ecological associations and risk factors for recovery of SARS-CoV-2 RNA from free-living and captive deer in Iowa

An exploratory analysis of potential risk factors for the identification of SARS-CoV-2 RNA in deer was carried out. We found no statistically significant differences (95% level) in the proportion of positive tests by age or sex within this sample (Table 1, Supplementary Figure 2). However, since this study was not designed or powered to probe this question with rigor, further investigations may be warranted.

The deer included in the study were either "free-living" on public lands or in peri-urban environments (n = 151) or were resident in nature or hunting preserves in "captive" settings (n = 132) (Table 1). Notably, the results suggest that the proportion of free-living deer positive for SARS-CoV-2 (44.4%; 95% CI: 36.4, 52.3) was significantly higher ($z = 4.3$; $p < 0.0001$) than in the deer living within preserves / captive settings (20.4%; 95% CI 13.7, 27.4). However, these results may be confounded in that four times as many RPLN were harvested from free-living deer (n = 52) as were from captive deer (n = 13) during December 2020, when the virus positivity rate was at its peak in Iowa deer herd. Hence, further studies are needed to assess the true significance or reasons for the observed differences in prevalence between free-living deer and that resident in managed environments. For instance, to better assess the risk of spillover and transmission, it is important to understand whether deer in managed settings are less stressed, have different nutritional status, or otherwise exhibit behaviors that influence opportunities for spillover or within-herd transmission of SARS-CoV-2 compared with those that are free-living.

We next explored regional differences in observed SARS-CoV-2 positivity among deer at the county level across the State. Figure 2A shows the widespread distribution of positive samples recovered from deer throughout Iowa and illustrates a strong temporal trend in SARS-CoV-2 positivity as the year progressed. The study identified 10 counties with at least one positive sample (Table 1). The largest number of RPLN samples represented in the collection were from a single game preserve (Preserve 2; Fig 2B) in Southeastern Iowa. Overall, 23 of the 112 deer RPLN samples from this preserve were found to be positive for SARS-CoV-2 RNA, with the first positive in September and the second in October 2020, and 11 of 38 deer sampled in November and all 10 deer sampled in December 2020, suggesting a rapidly increasing herd-level prevalence.

Seven counties had at least 10 samples collected, with all 11 specimens from Allamakee county being found to be SARS-CoV-2 positive, as were 21 of the 28 samples collected from Appanoose county (Table 1; Supplementary Table 1). In contrast, none of the 9 samples collected from Black Hawk county were positive, nor were the 6 RPLN samples from Henry county. While the exact reasons for this heterogeneity in PCR positive response rates are unknown, the timing of collection in relation to the SARS-CoV-2 spread in deer may play a role. For instance, the samples from Henry county were collected during April and May of 2020 during the early of the pandemic and well before the first positive sample was identified in deer. Similarly, all 9 RPLN samples tested from Black Hawk county were collected prior to the mid-November peak of reported SARS-CoV-2 cases in humans in Iowa. Together, these results suggest the widespread presence of SARS-CoV-2 RNA in deer across the State of Iowa, with strong evidence of temporal clustering.

Whole genome based phylogeographic and phylogenomic analyses provide evidence of multiple likely reverse zoonotic spillover events of SARS-CoV-2 to deer and deer-to-deer transmission

To begin to understand the genomic diversity of SARS-CoV-2 associated with free-living and captive deer, we characterized the complete SARS-CoV-2 genomes from all 94 deer RPLN positive for the presence of viral RNA. A high-level of sequencing coverage was obtained, and Pangolin version 3.1.11 (*https://github.com/cov-lineages/pangoLEARN*, last accessed October 27, 2021) was used to identify SARS-CoV-2 lineages using previously described genome sequence analysis pipelines (13-15). Next, we used an automated vSNP pipeline (https://github.com/USDA-VS/vSNP) to identify SNPs and construct phylogenetic trees in the context of 84 additional

publicly available animal origin SARS-CoV-2 isolates as well as from 372 SARS-CoV-2 isolates identified from humans in Iowa during this same period (Supplementary Table 2). All newly sequenced SARS-CoV-2 consensus genomes from deer RPLN are deposited in GISAID, and raw reads submitted to NCBI's Short Read Archive (BioProject Number PRJNA776532).

The analysis identified a total of 12 SARS-CoV-2 lineages amongst the 94 samples from deer, with two lineages, B.1.2 (n = 51; 54.5%), and B.1.311 (n = 19; 20%) representing ~75% of all samples. Together with the next two most abundant lineages, B.1 (n = 7) and B.1.234 (n = 6), these four lineages represented ~ 88% of SARS-CoV-2 circulating amongst geographically widely distributed deer in the State (Table 2). While the number of SARS-CoV-2 sequences from Iowa is not very high (only 372 sequences are available) during this period in publicly available data, it is noteworthy that the B.1.2 was also the most abundant (~ 43.5%) SARS-CoV-2 lineage circulating in humans in Iowa (Supplementary Table 2). In contrast, the B.1.311 lineage accounting for about one fifth of the isolates in deer was relatively poorly represented (~1.6%) amongst the publicly available SARS-CoV-2 from humans in Iowa (Supplementary Table 2). Conversely, the second most abundant SARS-CoV-2 lineage in humans, B.1.565, accounting for ~ 8.1% of available sequences, was not identified amongst the sampled deer. However, given the lack of representativeness of the sampling from both humans and deer, we urge caution in overinterpreting these findings of apparent differences in prevalence of SARS-CoV-2 lineages between deer and sympatric human hosts.

The temporal and geographic patterns of clustering of SARS-CoV-2 lineages, together with phylogenetic analyses, provide strong evidence of multiple likely zooanthroponotic spillovers from humans to deer. This is evidenced by the near simultaneous recovery of multiple SARS-CoV-2 lineages within temporally and geographically restricted deer herds at various locations throughout the State. For instance, the results show that a vast majority (22 of 23) of samples recovered from deer in a game preserve in Southeastern Iowa was represented by the B.1.2 lineage. The single outlier isolate was represented by lineage B.1.311 and was recovered from a deer at this preserve on November 24, 2020, in synchrony with 12 additional specimens harboring the B.1.2 lineage. Similarly, in the Yellow River State Forest area in Allamakee county, during the 5 days between December 5 and December 9, all 11 hunter-killed deer were positive for the presence of SARS-CoV-2 RNA in their RPLNs. Nine of these samples were represented by the B.1.2

lineage. The two outliers, represented by B.1.311 and B.1.459 lineages were recovered from another hunter-killed deer on the same date, December 8, 2020, as was another deer harboring the B.1.2 lineage. All these deer were hunted within a few miles of each other. A third example of near synchronous recovery of genetically distinctive SARS-CoV-2 lineages from infected deer is from the Volga River State Recreation Area in Fayette county, where 4 lineages were recovered from the RPLN of hunter-killed deer within a two-mile radius in the three days spanning December 7 through 9, 2020. A final example is from the Lake Rathbun area of Appanoose county, where on December 5, 2020, of 10 positive RPLNs harvested from hunter-killed deer, there were 5 distinctive lineages represented within a 5 mile radius – lineage B.1.311 was recovered from 6 deer RPLNs, and one each of lineages B.1.362, B.1.240, B.1.400, and B.1. Together, these findings strongly suggest multiple point sources of spillover of distinct SARS-CoV-2 lineages to captive and free-living deer.

Recent evidence suggests that experimentally infected deer readily transmit the virus to other susceptible deer between 3-5 days post infection, and the virus can be recovered from the palatine tonsils and RPLNs of infected animals for up to 21 days post-exposure (6). However, evidence of deer-to-deer transmission of the virus in free-living deer has not yet been documented. To explore evidence for potential sylvatic transmission in free-living deer, we applied a molecular epidemiologic approach to explore the temporal patterns of recovery of SARS-CoV-2 lineages from free-living deer to identify possible evidence of deer-to-deer transmission. One example is evident from the Lake Rathbun area of Appanoose county, where lineage B.1.311 was predominant amongst deer representing 14 of 21 positive samples. The first RPLN sample harboring a B.1.311 lineage was recovered on December 5, 2020 from a hunter-killed deer from this area. This was followed by additional recoveries of B.1.311 on December 8 and then again on January 2, 2021, and January 9, 2021 – more than a month apart – and with high viral loads in the lymph nodes suggestive of active infection. Together with the observation that the B.1.311 lineage was less frequently reported (based on available sequences) from humans in Iowa as well as in deer in other IA counties, the results suggest the continued circulation of this lineage amongst deer in free-living settings. However, it is important to note that in the absence of a comprehensive longitudinal study of circulating lineages, it is not possible to formally exclude the possibility that B.1.311 was circulating within humans or other hosts in this area, and the deer were repeatedly exposed to the same point source(s) of infection.

Finally, to better visualize phylogenetic relationships amongst circulating SARS-CoV-2 originating in free-living and captive deer, we generated an SNP-based maximum likelihood tree including available human and animal lineage isolates (Fig. 3). As evident from the branching patterns of the phylogram, the results highlight the presence of multiple independent but closely related SARS-CoV-2 lineages circulating amongst deer in Iowa, as well as provide strong evidence for transmission within deer as many of the genomes from individual deer shared complete genomic identity (no SNPs) or differed by between 1 and 5 SNPs. The results also highlight several branches with shared human and deer origin SARS-CoV-2 isolates circulating in Iowa that are related to but distinct from isolates previously identified from outbreaks from animals such as farmed mink or otters or other domesticated animal species. Hence, taken together, the results provide strong evidence of multiple spillover events of SARS-CoV-2 and the subsequent circulation of these strains within free-living and captive deer.

Broader implications for the ecology of SARS-CoV-2

Most viruses causing disease in humans have originated in animals and many are capable of transmitting between multiple host species (16, 17). The ability to infect a range of host species is a risk factor for disease emergence (18, 19). Despite this knowledge, reservoir host(s) are rarely identified and studied. Indeed, the wild animal reservoir(s) of SARS-1, SARS-CoV-2 and MERS-CoV are still not known. There have been numerous cases of isolated human-to-animal transmission of SARS-CoV-2 involving companion, farmed, and zoo animals since the COVID-19 pandemic began (8, 9, 20, 21). Our study is the first to provide evidence of widespread dissemination of SARS-CoV-2 into any free-living species, in this instance, the white-tailed deer. While the precise route(s) of transmission of SARS-Cov-2 from humans to deer are unknown, there are several ways in which deer may be exposed to the virus from humans, including through feeding in backyards or even when a susceptible deer may come in contact with potentially infectious material saliva, urine, etc.) from an infected human in forested areas or exurban environments. Deer may also become exposed to SARS-CoV-2 through contact with wastewater discharges, infected fomites, or other infected animals. Regardless of the route of transmission from humans, our results suggest that deer have the potential to emerge as a major reservoir host for SARS-CoV-2, a finding that has important implications for the future trajectory of the pandemic.

So what might be the implications of deer emerging as reservoirs of SARS-CoV-2? When pathogens infect a single host species, the population dynamics are intrinsically unstable, and an outbreak spreads rapidly through a population and then fades out as hosts either develop immunity or die from the infection. The outbreak's trajectory depends on the basic reproductive number (R_0) and the generation time of the infection, but this changes when a pathogen is a generalist and infects multiple host species. In this instance, the dynamics are dominated by what occurs within reservoir hosts, defined as species which can maintain the infection and from which infection is transmitted to other hosts (22).

A reservoir host can facilitate viral evolution and the emergence of lineages with increased virulence for the original host. Since many animal species already harbor an extensive array of endemic endogenous CoVs, the presence of a free-living reservoir host for SARS-CoV-2 may provide an opportunity for the virus to recombine and acquire or evolve increased fitness traits such as increased virulence, transmissibility, pathogenicity, and immune evasion (23). Evidence of some of these exists in the Denmark mink spillover event where the Y435F substitution (which conferred increased affinity of the spike protein to human ACE2) evolved after human to mink transmission (24-26). Animal reservoirs can also provide a refuge outside of a largely immune/vaccinated human population and thus increase the threat of subsequent re-emergence of ancestral genotypes into immunologically naïve or susceptible human hosts (23). An example of this is a scenario observed in the 2009 A-H1N1 (swine flu) pandemic where the virus was related both to the pandemic 1918 strain and strains circulating in the early 20th century (23, 27).

Predicting how the utilization of a new host species by a virus can affect virulence in the primary host is not simple. In theory, pathogen evolution to an optimum in a single-host system is determined by a trade off with transmission, but this becomes more complicated in multiple-host systems (28). With the infection spreading so quickly through the deer population, as seen in our study, this could potentially result in fade out with insufficient susceptible deer recruits to sustain the infection within the deer population alone. Alternatively, with sizeable annual birth cohorts or invasion into areas where deer have not previously been infected, the virus may continue to spread among susceptible deer or circulate with the deer population. However, even while the dynamics in these multi-host systems can be complex, they often result in more stable dynamics with

multiple reservoir hosts. The pathogens that utilize many hosts can be at a selective advantage since they are not lost during periods soon after the fade out.

Finally, the white-tailed deer is the most abundant wild cervid species in the United States, with an estimated 25 million individuals. Deer hunting is the most popular form of hunting in the United States, contributing over $20 billion to the US GDP and supporting more than 300,000 jobs in 2016 (29). Given the social relevance and economic importance of deer to the US economy, even though experimental evidence suggests that SARS-CoV-2 infected deer remain largely asymptomatic, the clinical outcomes and health implications of SARS-CoV-2 infection in free-living deer are unknown, and warrant further investigation. For these reasons, the discovery of sylvatic and enzootic transmission in a substantial fraction of free-living deer has important implications for the natural ecology and long-term persistence of the SARS-CoV-2, including through spillover to other free-living or captive animals and potential for spillback to humans.

Study limitations

The study has several limitations: The RPLN samples tested were from only one State in the USA, and the sampling was not uniform within the State. However, while the generalizability of our findings remains to be tested, we see no reason why this scenario has also not already played out in other regions with large deer populations with opportunities for contact with humans. Another limitation of our study was that RPLN samples tested were all from 2020 and early 2021, representing the early part of the pandemic before the global dissemination of the highly successful Alpha and Delta variants. Hence, surveillance efforts with robust longitudinal sampling approaches are urgently needed to determine whether deer will become long-term reservoirs for SARS-CoV-2 and potentially assume a role as generators of novel variant viruses that may repeatedly re-emerge in humans or spillover to other animal hosts.

Concluding comments

To help predict or prevent the emergence of the next pandemic and control infectious diseases with pandemic and panzootic potential, a better understanding of the human–animal molecular and ecological interface and its relevance to infection transmission dynamics is essential (9). Thus, we call for an urgent need to implement a more proactive and robust “One Health” approach to better understand the ecology and evolution of SARS-CoV-2 in deer and other free-living species.

Materials and Methods

Samples:

The Iowa Department of Natural Resources (DNR) routinely collects medial retropharyngeal lymph nodes (RPLNs) from white-tailed deer across Iowa for its statewide Chronic Wasting Disease (CWD) surveillance program. Tissue samples were collected by trained field staff. Paired RPLNs were then removed and placed into separate Whirl-Paks with corresponding sample identification numbers and frozen at -20°F in a standard chest or standing freezer. A total of 283 RPLN samples collected between April 2020 to January 2021 were studied (Supplementary Table 1). An additional 60 RPLN archived samples from the 2019 deer hunting season were included as process negative control samples (Supplementary Table 1).

RNA extraction

RPLN tissues were processed by adding 3ml UTM (Copan) to a whirl-pak bag containing the tissue and placing the bag in the stomacher on a high setting for 120 seconds. Liquid volume was recovered and centrifuged at 3,000 rpm for 5 minutes to pellet cellular debris. 400 µL of the RPLN tissue homogenate supernatant was used for viral RNA extraction with a KingFisher Flex machine (ThermoFisher Scientific) with the MagMAX Viral/Pathogen extraction kit (ThermoFisher Scientific) following the manufacturer's instructions.

Detection of SARS-CoV-2 viral RNA by RT-PCR

The presence of SARS-CoV-2 nucleic acid was assessed by a real-time reverse transcription-polymerase chain reaction (RT-PCR) assay using the OPTI Medical SARS-CoV-2 RT-PCR kit following the manufacturer's instructions on an ABI 7500 Fast instrument (ThermoFisher Scientific). The OPTI Medical SARS-CoV-2 RT-PCR assay detects two different targets in the gene encoding viral nucleocapsid (N) protein coding region(12, 30). The assay is highly sensitive with a limit of detection of 0.36 copies/µl. The internal control RNase P (RP) was used to rule out human contamination. We generated a standard curve using SARS-CoV-2 RNA with a known copy number. Using the standard curve, viral RNA copies per milliliter of tissue homogenate were calculated.

To ensure assay specificity, a subset of 25 positive and 25 negative samples were additionally tested with the TaqPath kit (ThermoFisher Scientific) targeting the SARS-CoV-2 ORF1ab, N gene, and S gene (30, 31) . The results were concordant with both assays. Further, to ensure samples were not inadvertently contaminated with human origin tissue or fluids during harvesting or processing, all samples were tested and found negative for the presence of human RNaseP. As a final check of assay specificity, none of the 60 RPLN samples collected in 2019 prior to the first reported case in humans in the United States were found positive for the presence of SARS-CoV-2 RNA.

SARS-CoV-2 Genome Sequencing

Total RNAs extracted from RPLN samples was used for sequencing the whole genomes of SARS-CoV-2 as previously described (13-15). Briefly, libraries were prepared according to version 4 of the ARTIC nCoV-2019 sequencing protocol (https://artic.network/ncov-2019, last accessed October 27, 2021). We used a semi-automated workflow that employed BioMek i7 liquid handling workstations (Beckman Coulter Life Sciences, Indianapolis, IN) and MANTIS automated liquid handlers (FORMULATRIX, Bedford, MA). Short sequence reads were generated with a NovaSeq 6000 instrument (Illumina, San Diego, CA). To ensure a very high depth of coverage, the RPLN sequencing libraries were prepared in duplicate and sequenced with a SP 300 cycle reagent kit.

SARS-CoV-2 Genome Sequence Analysis and Identification of Variants

Viral genomes were assembled with the BV-BRC SARS-Cov2 assembly service (The Bacterial and Viral Bioinformatics Resource Center, *https://www.bv-brc.org/app/comprehensivesars2analysis*, last accessed October 27, 2021, requires registration)(32). The One Codex SARS-CoV-2 variant calling and consensus assembly pipeline was used to assemble all sequences (GitHub, *https://github.com/onecodex/sars-cov-2.git*, last accessed October 27, 2021) using default parameters and a minimum read depth of three. Briefly, the pipeline uses seqtk version 1.3-r116 for sequence trimming (GitHub, *https://github.com/lh3/seqtk.git*, last accessed October 27, 2021); minimap version 2.1 (*https://github.com/lh3/minimap2*, last accessed October 27, 2021) for aligning reads against reference genome Wuhan-Hu-1 (*https://www.ncbi.nlm.nih.gov/nuccore/1798174254*; NC_045512.2)(33); samtools version 1.11 (*http://www.htslib.org*, last accessed October 27, 2021)

for sequence and file manipulation(34); and iVar version 1.2.2 (*https://github.com/andersen-lab/ivar/releases*, last accessed October 29, 2021) for primer trimming and variant calling(35). Genetic lineages, VOCs, and VOIs were identified on the basis of genome sequence data and designated by Pangolin version 3.1.11 (*https://github.com/cov-lineages/pangoLEARN*, last accessed October 27, 2021) with pangoLEARN module 2021-08-024 (SARS-CoV-2 lineages, *https://cov-lineages.org/pangolin.html*, last accessed October 27, 2021). SNPs identified using vSNP (https://github.com/USDA-VS/vSNP,) SNP analysis program.

QGIS mapping software version 3.16.10 was used to portray/visualize the geographic distribution of the RPLN samples.

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Author contributions

S.V.K conceptualized the study; S.V.K, V.K and R.M.R designed the project; M.S.N, M.Y, R.H.N, R.K.N, L.L, B.M.J, K.J.V, C.D.M, N.L, , K.W, A.J.K.C, R.J.O, J.J.D, J.M.M and P.J.H performed research and or analysis. All authors contributed to writing the manuscript.

Competing interests

Authors declare that they have no competing interests.

Data and materials availability

All SARS-CoV-2 consensus genomes are deposited in GISAID and raw reads submitted to NCBI's Short Read Archive (BioProject Number: PRJNA776532)

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Table 1: Characteristics and demographics of white-tailed deer screened for presence of SAR-CoV-2 in Iowa.

Month	Negative	Positive	Total Samples (N)	Proportion/Prevalence (%) (95% CI)
April 2020	7		7	
May 2020	4		4	
June 2020	4		4	
August 2020	2		2	
September 2020	37	2	39	5.13 (1.42-16.9)
October 2020	66	4	70	5.71 (2.24-13.8)
November 2020	55	22	77	28.6 (19.7-39.5)
December 2020	14	61	75	81.3 (71.1-88.5)
January 201	0	5	5	100 (56.6-100)
Total	189	94	283	33.2 (28.0-38.9)
		Total Samples (N)	**Positive Samples (N)**	**Proportion/Prevalence (%) (95% CI)**
Sex	Male (M)	179	59	33.0 (26.1 - 39.9)[a]
	Female (F)	103	35	34.0 (24.8- 43.1)[a]
	Unknown	1		
	Total	283	94	33.2 (28.0-38.9)
Age	Adult (A)	250	82	32.8 (26.9 - 38.6)[b]
	Yearling (Y)	32	12	37.5 (20.7 - 54.3)[b]
	Fawn	1		
	Total	283	94	33.2 (28.0-38.9)
Status	Captive*	131	27	20.6 (13.7 - 27.5)[c]
	Free living*	152	67	44.1 (36.1 - 51.8)[c]
	Total	283	94	33.2 (28.0-38.9)
		Total Samples (N)	**Positive Samples (N)**	**Proportion/Prevalence (%) (95% CI)**
County	Allamakee	11	11	100 (74.1 - 100)
	Jasper	4	4	100 (51.0 - 100)
	Polk	7	6	85.7 (48.7 - 97.4)
	Appanoose	28	21	75 (56.6 - 87.3)
	Fayette	10	6	60 (31.3 -83.2)
	Jefferson	8	4	50 (21.5 - 78.5)
	Woodbury	46	13	28.3 (17.3 - 42.6)
	Pottawattamie	22	5	22.8 (10.1 - 43.4)

	Des Moines	112	23	20.5 (1.5 - 28.9)
	Dubuque	12	1	8.3 (1.5 - 35.4)
	Black Hawk	9		0
	Dickinson	1		0
	Henry	6		0
	Jackson	3		0
	Keokuk	1		0
	Van Buren	1		0
	Washington	1		0
	Webster	1		0
	Total	283	94	33.2 (28.0-38.9)

[a]p= 0.86 [M, F] [b]p= 0.59 [A, Y] [c]p<0.0001 [C, FL]

Table 2. Recovery of SARS-CoV-2 lineages from white-tailed deer in Iowa.

Lineage	Number of Samples	Proportion (95% CI)
B.1	7	7.5 (3.7-14.6)
B.1.1	1	
B.1.119	2	
B.1.2	51	54.2 (44.2-64.0)
B.1.234	6	6.4 (3.0-13.2)
B.1.240	1	
B.1.264	1	
B.1.311	19	20.2 (13.3-29.4)
B.1.362	2	
B.1.400	2	
B.1.459	1	
B.1.596	1	
Total	94	

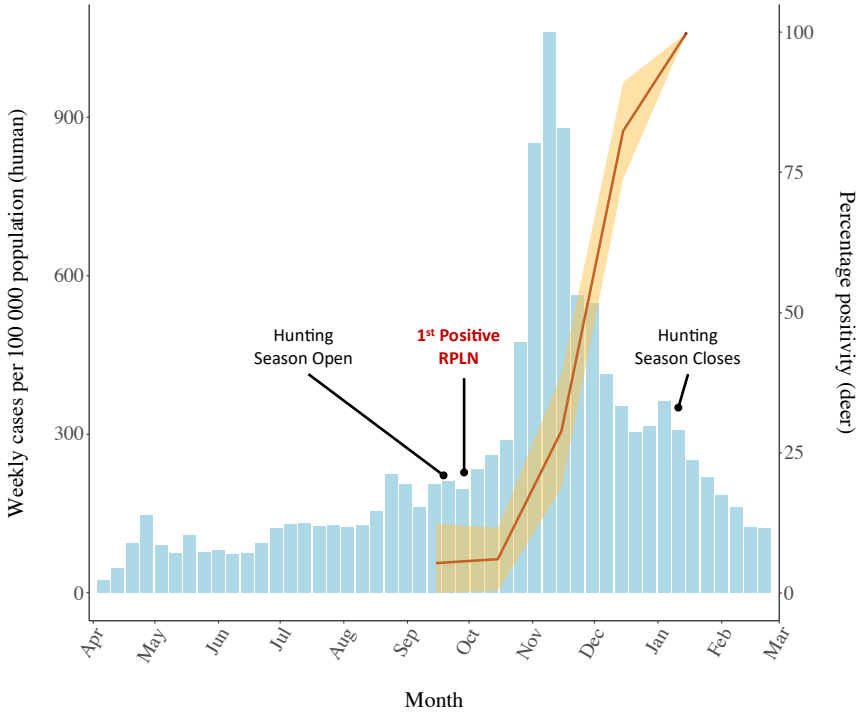


Figure 1: Epidemic curve showing SARS-CoV-2 weekly cases (per 100,000) in humans and the monthly change in SARS-CoV-2 positivity in white-tailed deer in Iowa. The histogram represents the progression in weekly reported cases (per 100,000 individuals; left axis). The percentage (and 95%) CI of white-tailed deer found positive for the presence of SARS-CoV-2 RNA (red line; right axis) appears to closely follow the trajectory of the human pandemic. The first identified positive sample on September 28, 2020 is marked, as is the start of the regular hunting season on September 19, 2020 and its end on January 10, 2021.

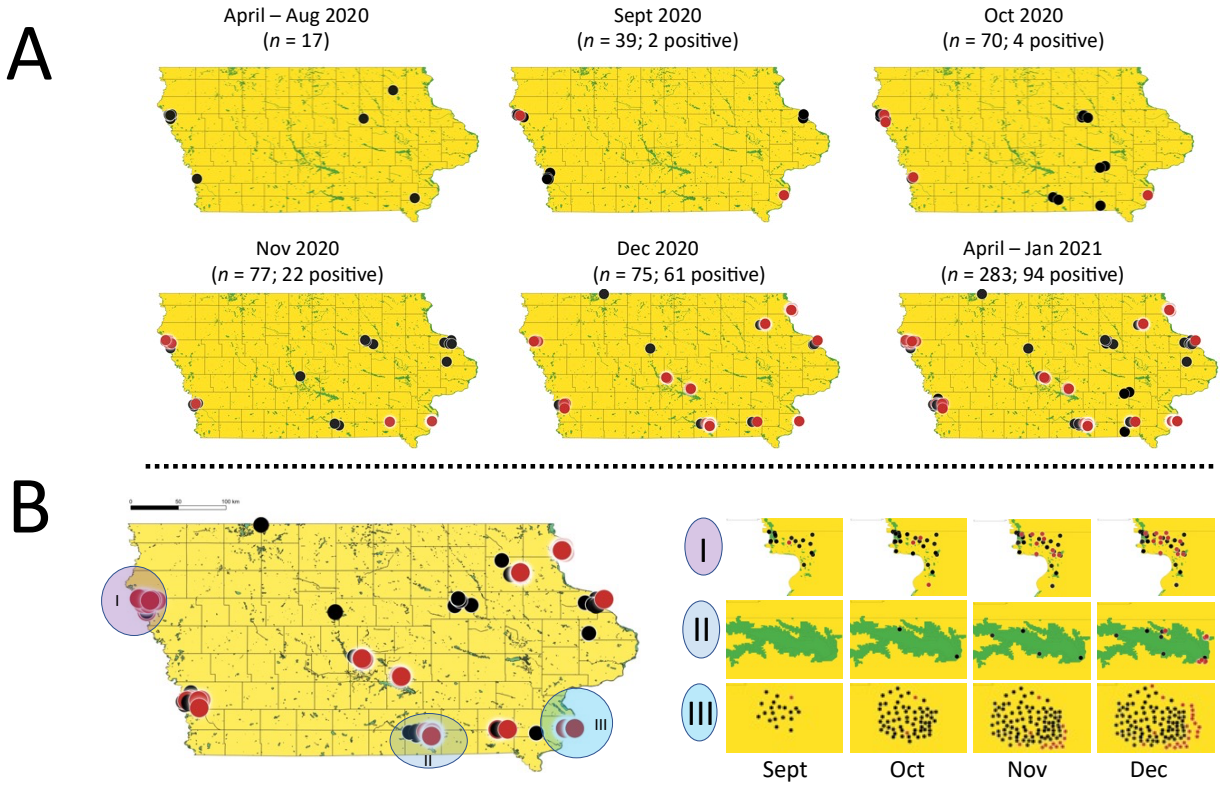


Figure 2: Temporal and spatial distribution of SARSCoV-2 positive samples from white-tailed deer in IA. The 94 SARS-CoV-2 positive deer RPLN samples from geographically dispersed sites were mapped and show strong temporal clustering in frequency of detection of positive samples starting with the first positive case identified in September. **A.** Monthly snapshots showing number and location of SARS-CoV-2 positive cases identified in deer in Iowa. **B.** Progression in number of positive cases in deer from September through December 2020 in three exemplar regions with different sampling intensities and sizes of sampling area. Each filled black circle represents a negative test result, and each filled red circle represents a positive test result for presence of SARS-CoV-2 RNA in deer RPLN.

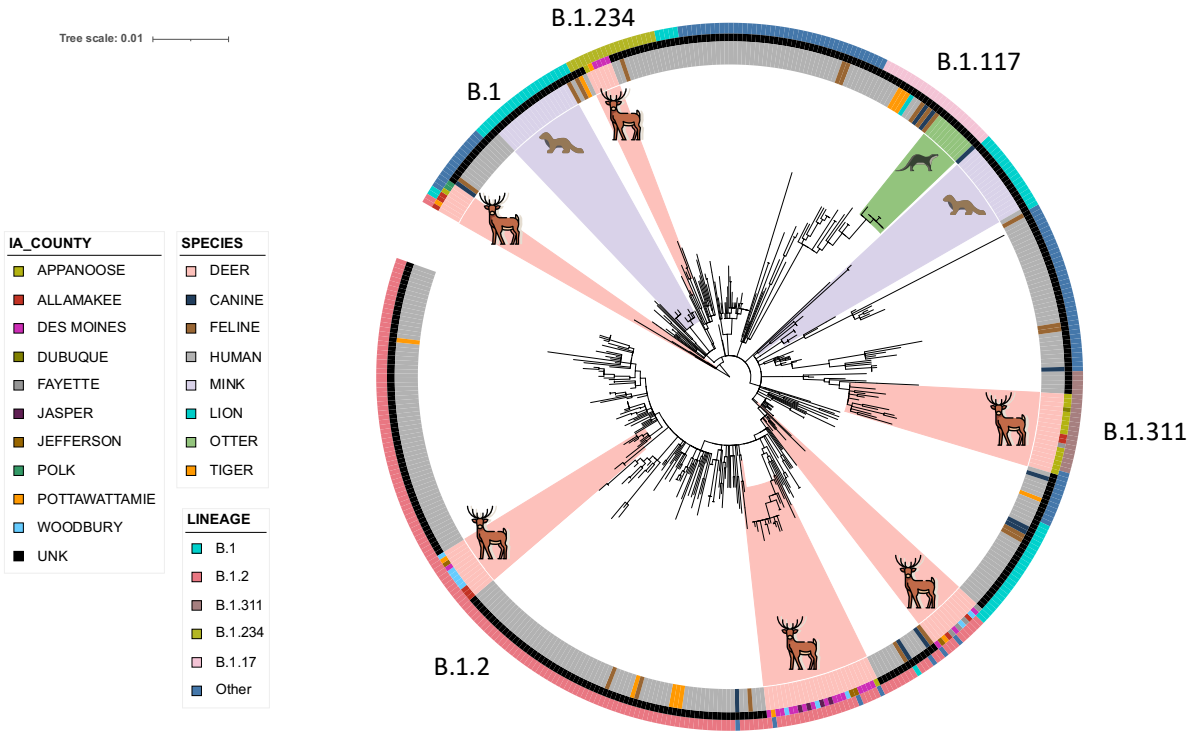
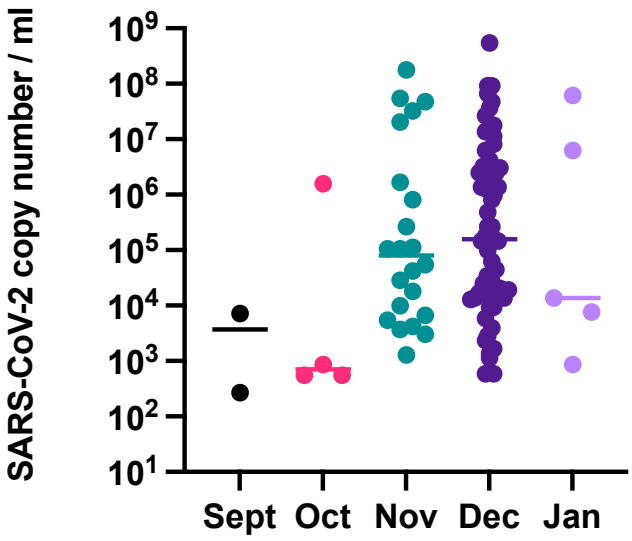
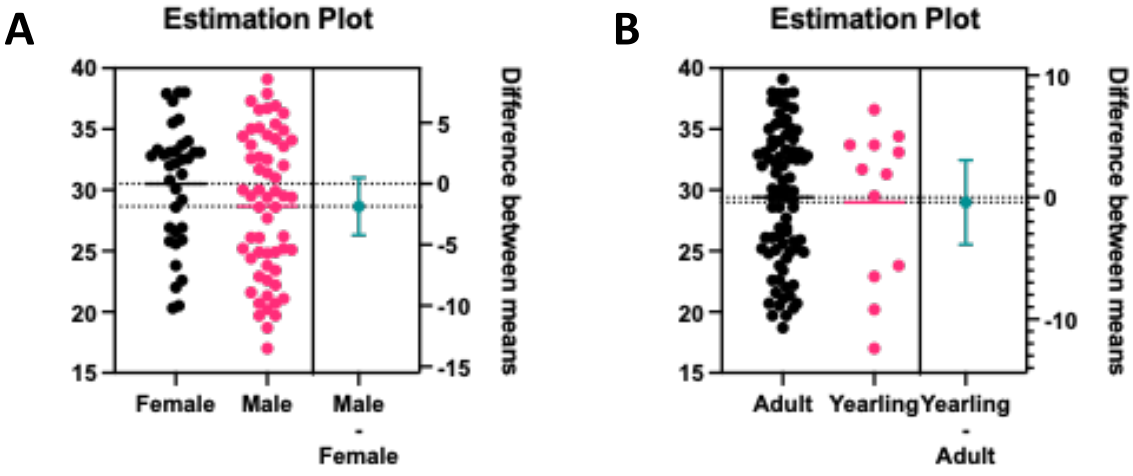


Figure 3: Whole genome SNP-based phylogenies of 94 SARS-CoV-2 recovered from free-living and captive white-tailed deer in Iowa. Whole genome sequences of the 94 SARS-COV-2 positive samples from deer RPLN were analyzed in the context of 92 additional publicly available animal origin SARS-CoV-2 isolates and 312 human SARS-CoV-2 isolates circulating in Iowa during this same period (Supplementary Table 2). The sequences were screened for quality thresholds, and SNP positions called against the SARS-CoV-2 reference were determined together with SNP alignments and used to assemble a maximum-likelihood phylogenetic trees using RAxML. The results show several genetically distinct clusters of animal and human SARS-CoV-2 lineages circulating within the Iowa deer herd, suggesting multiple likely spillover events from humans to deer. Several branches with shared human and deer origin SARS-CoV-2 isolates circulating in Iowa were observed. The sequences from deer were genetically distinct from isolates from previous outbreaks in farmed mink and otters but showed close clustering with SASRS-CoV-2 genomes recovered humans in Iowa.



Supplementary Figure 1: Temporal changes in distribution of SARS-CoV-2 viral genome copy numbers in white-tailed deer RPLNs. As the positivity proportion among the collected samples increased over the months of collection depicted on X axis, the viral copy numbers (y-axis) increased in a range of 268 to 5.4 x 10^8 copies/ml with a median of 106,000 viral copies/ml.



Supplementary Figure 2: Estimation plots of gender and age associated effects on the distribution of Ct values from RPLN SARS-CoV-2 positive samples. The results show no significant difference based on Sex (**A**) or Age (**B**) in proportion of SARS-CoV-2 positive samples.

Supplementary Table 1

SAMPLES INCLUDED

Sample_ID	Date Collected	Type	Age	Sex	County	Type2	Rt-PCR Ct value	SARSCoV-2 Line
207162	4/8/20	Roadkill	Yearling	Female	Woodbury	Free living	NEG	
207159	4/13/20	Roadkill	Adult	Female	Woodbury	Free living	NEG	
207160	4/13/20	Roadkill	Adult	Female	Woodbury	Free living	NEG	
208000	4/28/20	Preserve	Yearling	Female	SE Iowa	Captive	NEG	
208001	4/28/20	Preserve	Fawn	Male	SE Iowa	Captive	NEG	
208002	4/28/20	Preserve	Yearling	Female	SE Iowa	Captive	NEG	
208003	4/28/20	Preserve	Adult	Female	SE Iowa	Captive	NEG	
207143	5/12/20	Roadkill	Adult	Female	Woodbury	Free living	NEG	
208004	5/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208005	5/13/20	Preserve	Adult	Female	SE Iowa	Captive	NEG	
203001	5/21/20	Roadkill	Yearling	Male	Black Hawk	Free living	NEG	
207177	6/19/20	Roadkill	Adult	Male	Woodbury	Free living	NEG	
207183	6/19/20	Roadkill	Yearling	Female	Woodbury	Free living	NEG	
207185	6/19/20	Roadkill	Adult	Female	Woodbury	Free living	NEG	
207186	6/19/20	Roadkill	Adult	Female	Woodbury	Free living	NEG	
206518	8/19/20	Roadkill	Adult	Female	Pottawattamie	Free living	NEG	
208300	8/21/20	Preserve	Adult	Male	NE Iowa	Captive	NEG	
206519	9/10/20	Roadkill	Adult	Male	Pottawattamie	Free living	NEG	
208006	9/18/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208007	9/18/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208008	9/18/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208009	9/18/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208010	9/18/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208011	9/18/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208012	9/18/20	Preserve	Adult	Female	SE Iowa	Captive	NEG	
206520	9/20/20	Target/Sick	Adult	Male	Pottawattamie	Free living	NEG	
207144	9/20/20	Target/Sick	Adult	Female	Woodbury	Free living	NEG	
207233	9/21/20	Hunter Killed	Adult	Female	Woodbury	Free living	NEG	
207234	9/22/20	Hunter Killed	Adult	Female	Woodbury	Free living	NEG	
207235	9/22/20	Hunter Killed	Yearling	Female	Woodbury	Free living	NEG	
207236	9/22/20	Hunter Killed	Adult	Female	Woodbury	Free living	NEG	
207237	9/22/20	Hunter Killed	Adult	Female	Woodbury	Free living	NEG	
207238	9/22/20	Hunter Killed	Adult	Female	Woodbury	Free living	NEG	
206521	9/23/20	Roadkill	Adult	Female	Pottawattamie	Free living	NEG	
206522	9/24/20	Roadkill	Adult	Female	Pottawattamie	Free living	NEG	
206523	9/24/20	Roadkill	Adult	Male	Pottawattamie	Free living	NEG	
203033	9/25/20	Hunter Killed	Adult	Female	Dubuque	Free living	NEG	
203034	9/25/20	Hunter Killed	Yearling	Female	Dubuque	Free living	NEG	

SAMPLES INCLUDED

Sample_ID	Date Collected	Type	Age	Sex	County	Type2	Rt-PCR Ct value	SARSCoV-2 Line
207239	9/26/20	Hunter Killed	Adult	Female	Woodbury	Free living	NEG	
207240	9/26/20	Hunter Killed	Adult	Female	Woodbury	Free living	NEG	
208013	9/28/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208014	9/28/20	Preserve	Adult	Female	SE Iowa	Captive	NEG	
208015	9/28/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208016	9/28/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208017	9/28/20	Preserve	Adult	Male	SE Iowa	Captive	39.1	B.1.2
208018	9/28/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208019	9/28/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208020	9/28/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208021	9/28/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208022	9/28/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208023	9/28/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208024	9/28/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208025	9/28/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
207241	9/29/20	Hunter Killed	Adult	Female	Woodbury	Free living	NEG	
207242	9/29/20	Hunter Killed	Adult	Female	Woodbury	Free living	NEG	
207337	9/30/20	Roadkill	Adult	Male	Woodbury	Free living	34.1	B.1.2
207243	10/5/20	Hunter Killed	Adult	Female	Woodbury	Free living	NEG	
207244	10/5/20	Hunter Killed	Adult	Female	Woodbury	Free living	NEG	
208026	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208027	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208028	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208029	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208030	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208031	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208032	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208033	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208034	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208035	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208036	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208037	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208038	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208039	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208040	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208041	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208042	10/8/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208043	10/8/20	Preserve	Adult	Female	SE Iowa	Captive	38	B.1.2
207245	10/9/20	Hunter Killed	Adult	Female	Woodbury	Free living	NEG	

SAMPLES INCLUDED

Sample_ID	Date Collected	Type	Age	Sex	County	Type2	Rt-PCR Ct value	SARSCoV-2 Line
207349	10/11/20	Roadkill	Adult	Female	Woodbury	Free living	NEG	
206524	10/12/20	Roadkill	Adult	Female	Pottawattamie	Free living	NEG	
202276	10/13/20	Hunter Killed	Adult	Female	Black Hawk	Free living	NEG	
208044	10/13/20	Preserve	Adult	Female	SE Iowa	Captive	NEG	
208045	10/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208046	10/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208047	10/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208048	10/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208049	10/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208050	10/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208051	10/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208052	10/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
206525	10/13/20	Roadkill	Adult	Male	Pottawattamie	Free living	NEG	
207246	10/13/20	Target/Sick	Adult	Female	Woodbury	Free living	NEG	
202277	10/14/20	Hunter Killed	Yearling	Female	Black Hawk	Free living	NEG	
206526	10/14/20	Target/Sick	Adult	Female	Pottawattamie	Free living	NEG	
206527	10/15/20	Roadkill	Adult	Female	Pottawattamie	Free living	38	B.1.2
207385	10/15/20	Roadkill	Adult	Female	Woodbury	Free living	NEG	
202278	10/16/20	Hunter Killed	Yearling	Female	Black Hawk	Free living	NEG	
202275	10/17/20	Hunter Killed	Yearling	Female	Black Hawk	Free living	NEG	
208325	10/17/20	Target/Escape	Adult	Male	Washington	Captive	NEG	
208383	10/19/20	Target/Escape	Adult	Male	Keokuk	Captive	NEG	
207247	10/21/20	Hunter Killed	Adult	Female	Woodbury	Free living	NEG	
207248	10/21/20	Roadkill	Adult	Female	Woodbury	Free living	NEG	
208053	10/22/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208054	10/22/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208055	10/22/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208056	10/22/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208057	10/22/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208058	10/22/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208059	10/22/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208060	10/22/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208061	10/22/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208062	10/22/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208063	10/22/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208064	10/22/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208065	10/22/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208066	10/22/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208068	10/22/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
200334	10/27/20	Hunter Killed	Adult	Male	Appanoose	Free living	NEG	

SAMPLES INCLUDED

Sample_ID	Date Collected	Type	Age	Sex	County	Type2	Rt-PCR Ct value	SARSCoV-2 Line
206528	10/27/20	Roadkill	Adult	Female	Pottawattamie	Free living	NEG	
208326	10/27/20	Target/Escape	Adult	Female	Van Buren	Captive	NEG	
207219	10/27/20	Roadkill	Yearling	Female	Woodbury	Free living	NEG	
207249	10/27/20	Hunter Killed	Adult	Female	Woodbury	Free living	NEG	
207431	10/28/20	Roadkill	Adult	Female	Woodbury	Free living	25.9	B.1.2
206529	10/29/20	Roadkill	Adult	Male	Pottawattamie	Free living	NEG	
207149	10/29/20	Hunter Killed	Adult	Male	Woodbury	Free living	NEG	
200284	10/30/20	Hunter Killed	Yearling	Female	Appanoose	Free living	NEG	
207437	10/31/20	Roadkill	Adult	Male	Woodbury	Free living	37.3	B.1.2
200340	11/2/20 November	Hunter Killed	Adult	Male	Appanoose	Free living	NEG	
207250	11/2/20 November	Hunter Killed	Adult	Female	Woodbury	Free living	NEG	
208069	11/3/20 November	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208070	11/3/20 November	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208071	11/3/20 November	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208072	11/3/20 November	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208073	11/3/20 November	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208074	11/3/20 November	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208075	11/3/20 November	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208076	11/3/20 November	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208077	11/3/20 November	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208078	11/3/20 November	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208079	11/3/20 November	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208080	11/3/20 November	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208081	11/3/20 November	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208082	11/3/20 November	Preserve	Adult	Female	SE Iowa	Captive	NEG	
208083	11/3/20 November	Preserve	Adult	Female	SE Iowa	Captive	NEG	
208084	11/3/20 November	Preserve	Adult	Male	SE Iowa	Captive	NEG	
206530	11/3/20 November	Hunter Killed	Adult	Male	Pottawattamie	Free living	NEG	
207471	11/3/20 November	Roadkill	Yearling	Male	Woodbury	Free living	NEG	
203062	11/4/20 November	Hunter Killed	Adult	Female	Jackson	Free living	NEG	
203063	11/4/20 November	Hunter Killed	Adult	Female	Jackson	Free living	NEG	
203064	11/4/20 November	Hunter Killed	Adult	Female	Jackson	Free living	NEG	
206531	11/4/20 November	Hunter Killed	Adult	Female	Pottawattamie	Free living	NEG	
203132	11/5/20 November	Hunter Killed	Yearling	Female	Dubuque	Free living	NEG	
203134	11/5/20 November	Hunter Killed	Yearling	Female	Dubuque	Free living	NEG	
203136	11/5/20 November	Roadkill	Adult	Male	Dubuque	Free living	NEG	
203140	11/5/20 November	Hunter Killed	Adult	Female	Dubuque	Free living	NEG	
206532	11/5/20 November	Roadkill	Adult	Female	Pottawattamie	Free living	NEG	
200349	11/6/20 November	Roadkill	Yearling	Male	Appanoose	Free living	NEG	
206407	11/6/20 November	Hunter Killed	Adult	Male	Pottawattamie	Free living	18.7	B.1.2

SAMPLES INCLUDED

Sample_ID	Date Collected	Type	Age	Sex	County	Type2	Rt-PCR Ct value	SARSCoV-2 Line
207524	11/6/20 November	Roadkill	Adult	Female	Woodbury	Free living	NEG	
207530	11/7/20 November	Roadkill	Adult	Female	Woodbury	Free living	22	B.1.2
207531	11/8/20 November	Roadkill	Adult	Female	Woodbury	Free living	25.8	B.1.2
203193	11/10/20	Hunter Killed	Adult	Male	Dubuque	Free living	NEG	
203189	11/12/20	Hunter Killed	Adult	Male	Dubuque	Free living	NEG	
206670	11/12/20	Roadkill	Yearling	Male	Pottawattamie	Free living	NEG	
202282	11/13/20	Hunter Killed	Adult	Female	Black Hawk	Free living	NEG	
202283	11/13/20	Hunter Killed	Adult	Female	Black Hawk	Free living	NEG	
202284	11/13/20	Roadkill	Adult	Female	Black Hawk	Free living	NEG	
202985	11/13/20	Hunter Killed	Adult	Male	Black Hawk	Free living	NEG	
208085	11/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208086	11/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208087	11/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208088	11/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208089	11/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208090	11/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208091	11/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208092	11/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208093	11/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208094	11/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208327	11/13/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
207150	11/15/20	Roadkill	Adult	Male	Woodbury	Free living	31	B.1.2
208328	11/17/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208329	11/17/20	Preserve	Adult	Male	SE Iowa	Captive	34.5	B.1.2
208330	11/17/20	Preserve	Adult	Male	SE Iowa	Captive	35.1	B.1.2
207579	11/17/20	Roadkill	Adult	Female	Woodbury	Free living	28.6	B.1
208331	11/18/20	Preserve	Adult	Male	SE Iowa	Captive	36.7	B.1.1
200030	11/19/20	Target/Escape	Adult	Male	Polk	Captive	NEG	
208067	11/20/20	Preserve	Adult	Male	Des Moines	Captive	NEG	
203253	11/22/20	Target/Sick	Adult	Male	Dubuque	Free living	NEG	
208095	11/24/20	Preserve	Adult	Male	SE Iowa	Captive	34.9	B.1.2
208096	11/24/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208097	11/24/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208098	11/24/20	Preserve	Adult	Male	SE Iowa	Captive	34.2	B.1.2
208099	11/24/20	Preserve	Adult	Male	SE Iowa	Captive	32.7	B.1.2
208100	11/24/20	Preserve	Adult	Male	SE Iowa	Captive	33.6	B.1.2
208101	11/24/20	Preserve	Adult	Male	SE Iowa	Captive	35.4	B.1.2
208102	11/24/20	Preserve	Adult	Male	SE Iowa	Captive	20.7	B.1.2
208103	11/24/20	Preserve	Adult	Male	SE Iowa	Captive	31.4	B.1.2
208104	11/24/20	Preserve	Adult	Male	SE Iowa	Captive	29.9	B.1.2

SAMPLES INCLUDED

Sample_ID	Date Collected	Type	Age	Sex	County	Type2	Rt-PCR Ct value	SARSCoV-2 Line
208105	11/24/20	Preserve	Adult	Male	SE Iowa	Captive	32	B.1.311
208106	11/24/20	Preserve	Adult	Male	SE Iowa	Captive	30	B.1.2
208107	11/24/20	Preserve	Adult	Male	SE Iowa	Captive	21.3	B.1.2
207589	11/24/20	Hunter Killed	Adult	Female	Woodbury	Free living	20.5	B.1.2
207391	11/29/20	Target/Sick	Adult	Male	Woodbury	Free living	30	B.1.2
207253	11/30/20	Hunter Killed	Adult	Female	Woodbury	Free living	26.9	B.1.311
207770	12/2/20 December	Roadkill	Adult	Female	Woodbury	Free living	32.8	B.1.311
203164	12/3/20 December	Hunter Killed	Adult	Male	Dubuque	Free living	NEG	
203229	12/4/20 December	Hunter Killed	Adult	Male	Dubuque	Free living	NEG	
204472	12/5/20 December	Hunter Killed	Adult	Male	Allamakee	Free living	28.6	B.1.2
204473	12/5/20 December	Hunter Killed	Adult	Female	Allamakee	Free living	29.2	B.1.2
204478	12/5/20 December	Hunter Killed	Adult	Female	Allamakee	Free living	33.1	B.1.2
200276	12/5/20 December	Hunter Killed	Adult	Female	Appanoose	Free living	NEG	
200277	12/5/20 December	Hunter Killed	Adult	Female	Appanoose	Free living	NEG	
200566	12/5/20 December	Hunter Killed	Adult	Male	Appanoose	Free living	19.7	B.1.311
200567	12/5/20 December	Hunter Killed	Adult	Female	Appanoose	Free living	32.6	B.1.311
200568	12/5/20 December	Hunter Killed	Adult	Male	Appanoose	Free living	26.1	B.1.311
200569	12/5/20 December	Hunter Killed	Adult	Female	Appanoose	Free living	30.8	B.1.311
200570	12/5/20 December	Hunter Killed	Adult	Male	Appanoose	Free living	19.7	B.1.311
200571	12/5/20 December	Hunter Killed	Adult	Male	Appanoose	Free living	22.2	B.1.362
200572	12/5/20 December	Hunter Killed	Adult	Male	Appanoose	Free living	25.1	B.1.240
200573	12/5/20 December	Hunter Killed	Adult	Female	Appanoose	Free living	32	B.1.311
200574	12/5/20 December	Hunter Killed	Adult	Male	Appanoose	Free living	29.4	B.1.400
200772	12/5/20 December	Hunter Killed	Adult	Male	Appanoose	Free living	26.1	B.1
203239	12/5/20 December	Hunter Killed	Adult	Male	Dubuque	Free living	32.6	B.1.2
207649	12/5/20 December	Hunter Killed	Adult	Male	Woodbury	Free living	28.6	B.1.596
201788	12/6/20 December	Hunter Killed	Yearling	Male	Polk	Free living	33.7	B.1.234
201793	12/6/20 December	Hunter Killed	Adult	Female	Polk	Free living	30.1	B.1.119
201794	12/6/20 December	Hunter Killed	Yearling	Male	Polk	Free living	36.6	B.1.234
201795	12/6/20 December	Hunter Killed	Adult	Female	Polk	Free living	33.2	B.1.234
201796	12/6/20 December	Hunter Killed	Yearling	Female	Polk	Free living	33.7	B.1.264
201797	12/6/20 December	Hunter Killed	Yearling	Male	Polk	Free living	34.4	B.1.400
205795	12/7/20 December	Hunter Killed	Adult	Female	Allamakee	Free living	33.3	B.1.2
204363	12/7/20 December	Hunter Killed	Adult	Male	Fayette	Free living	37.9	B.1
204364	12/7/20 December	Hunter Killed	Adult	Male	Fayette	Free living	36.9	B.1.2
204374	12/7/20 December	Hunter Killed	Yearling	Female	Fayette	Free living	NEG	
205750	12/7/20 December	Hunter Killed	Adult	Female	Fayette	Free living	37.9	B.1.234
205751	12/7/20 December	Hunter Killed	Yearling	Male	Fayette	Free living	NEG	
205752	12/7/20 December	Hunter Killed	Yearling	Male	Fayette	Free living	NEG	
203522	12/8/20 December	Hunter Killed	Adult	Female	Allamakee	Free living	35.8	B.1.2

SAMPLES INCLUDED

Sample_ID	Date Collected	Type	Age	Sex	County	Type2	Rt-PCR Ct value	SARSCoV-2 Line
203525	12/8/20 December	Hunter Killed	Yearling	Male	Allamakee	Free living	20.2	B.1.311
203526	12/8/20 December	Hunter Killed	Adult	Female	Allamakee	Free living	26.6	B.1.459
200191	12/8/20 December	Hunter Killed	Adult	Male	Appanoose	Free living	25.2	B.1.311
200192	12/8/20 December	Hunter Killed	Adult	Male	Appanoose	Free living	35	B.1.311
200193	12/8/20 December	Hunter Killed	Adult	Male	Appanoose	Free living	24.9	B.1.311
200194	12/8/20 December	Hunter Killed	Adult	Female	Appanoose	Free living	25.6	B.1.311
200195	12/8/20 December	Hunter Killed	Adult	Female	Appanoose	Free living	33.1	B.1.311
200459	12/8/20 December	Hunter Killed	Adult	Male	Appanoose	Free living	NEG	
205769	12/8/20 December	Hunter Killed	Adult	Male	Fayette	Free living	29.4	B.1.2
203700	12/9/20 December	Hunter Killed	Adult	Male	Allamakee	Free living	23.4	B.1.2
203701	12/9/20 December	Hunter Killed	Adult	Male	Allamakee	Free living	20.7	B.1.2
203704	12/9/20 December	Hunter Killed	Yearling	Male	Allamakee	Free living	29.5	B.1.2
203705	12/9/20 December	Hunter Killed	Yearling	Female	Allamakee	Free living	31.3	B.1.2
201020	12/9/20 December	Hunter Killed	Adult	Male	Dickinson	Free living	NEG	
204668	12/9/20 December	Hunter Killed	Adult	Female	Fayette	Free living	32.5	B.1.311
204669	12/9/20 December	Hunter Killed	Adult	Female	Fayette	Free living	32.2	B.1.234
208108	12/10/20	Preserve	Adult	Male	SE Iowa	Captive	32.5	B.1.2
208109	12/10/20	Preserve	Adult	Male	SE Iowa	Captive	26.2	B.1.2
208110	12/10/20	Preserve	Adult	Male	SE Iowa	Captive	24.9	B.1.2
208111	12/10/20	Preserve	Adult	Male	SE Iowa	Captive	24.4	B.1.2
208112	12/10/20	Preserve	Adult	Male	SE Iowa	Captive	27.7	B.1.2
208113	12/10/20	Preserve	Adult	Male	SE Iowa	Captive	25.2	B.1.2
208114	12/10/20	Preserve	Adult	Male	SE Iowa	Captive	21.1	B.1.2
208115	12/10/20	Preserve	Adult	Male	SE Iowa	Captive	24.8	B.1.2
208116	12/10/20	Preserve	Adult	Male	SE Iowa	Captive	22.6	B.1.2
201820	12/10/20	Hunter Killed	Yearling	Male	Jasper	Free living	17	B.1
201821	12/10/20	Hunter Killed	Adult	Female	Jasper	Free living	22.6	B.1
201833	12/10/20	Hunter Killed	Yearling	Male	Jasper	Free living	23.8	B.1
201835	12/10/20	Hunter Killed	Adult	Female	Jasper	Free living	26.9	B.1
201741	12/10/20	Roadkill	Adult	Male	Webster	Free living	NEG	
207707	12/10/20	Roadkill	Yearling	Male	Woodbury	Free living	31.7	B.1.2
200069	12/15/20	Hunter Killed	Adult	Female	Appanoose	Free living	32.9	B.1.119
206739	12/15/20	Roadkill	Yearling	Male	Pottawattamie	Free living	22.9	B.1.2
208334	12/17/20	Preserve	Adult	Male	SE Iowa	Captive	36.3	B.1.2
208335	12/17/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
208336	12/17/20	Preserve	Adult	Male	SE Iowa	Captive	NEG	
206533	12/18/20	Roadkill	Adult	Female	Pottawattamie	Free living	NEG	
206534	12/18/20	Roadkill	Adult	Unknown	Pottawattamie	Free living	NEG	
206535	12/22/20	Roadkill	Adult	Male	Pottawattamie	Free living	21.6	B.1.2
208117	12/23/20	Preserve	Adult	Male	SE Iowa	Captive	29.5	B.1.2

SAMPLES INCLUDED

Sample_ID	Date Collected	Type	Age	Sex	County	Type2	Rt-PCR Ct value	SARSCoV-2 Line
206978	12/28/20	Roadkill	Adult	Female	Pottawattamie	Free living	35.5	B.1.2
200442	1/9/21	Hunter Killed	Adult	Female	Appanoose	Free living	37.3	B.1.311
200443	1/9/21	Hunter Killed	Adult	Female	Appanoose	Free living	23.8	B.1.311
200444	1/9/21	Hunter Killed	Yearling	Female	Appanoose	Free living	33.1	B.1.311
200862	1/9/21	Hunter Killed	Adult	Female	Appanoose	Free living	20.3	B.1.362
200866	1/9/21	Hunter Killed	Adult	Female	Appanoose	Free living	34	B.1.234

SAMPLES EXCLUDED

Sample_ID	Date_Collected	Sample	Age	Sex	County	Location	Location2	Comment
208332	11/19/20	Preserve	Adult	Female	SE Iowa	Captive_ELK	Preserve 3	Wrong Species
208333	11/19/20	Preserve	Adult	Female	SE Iowa	Captive_ELK	Preserve 3	Wrong Species
200934	2/2/21	Target/Escape	Adult	Male	Monroe	Captive	Found_dead	?? Date / Location
208301	Not specified	Preserve	Adult	Unknown	NE Iowa	Captive	Preserve 1	Missing Date
208302	Not specified	Preserve	Adult	Unknown	NE Iowa	Captive	Preserve 1	Missing Date
208303	Not specified	Preserve	Adult	Unknown	NE Iowa	Captive	Preserve 1	Missing Date

PRE-PANDEMIC SAMPLES INCLUDED

Sample_ID	Date_Collected	Sample	Age	Sex	County	Location	RT-PCR results	Column1
193076	43562	Roadkill	Yearling	Male	Clinton	Rural	NEG	
193057	43726	Roadkill	Yearling	Male	Black Hawk	Rural	NEG	
197229	43752	Hunter Killed	Adult	Male	Crawford	Rural	NEG	
193146	43754	Target/Sick	Adult	Female	Clinton	Rural	NEG	
193148	43754	Hunter Killed	Adult	F	Clinton	Public_land	NEG	
193218	43781	Hunter Killed	Adult	Male	Clinton	Public_land	NEG	
193293	43783	Hunter Killed	Adult	Female	Scott	Rural	NEG	
193298	43784	Hunter Killed	Adult	Male	Johnson	Rural	NEG	
193304	43784	Target/Sick	Yearling	Male	Scott	Public_land	NEG	
194231	43784	Target/Sick	Adult	Male	Black Hawk	Public_land	NEG	
198715	43785	Hunter Killed	Adult	Male	Warren	Rural	NEG	
193305	43787	Hunter Killed	Adult	Female	Scott	Public_land	NEG	
193306	43787	Hunter Killed	Adult	Female	Scott	Public_land	NEG	
194229	43787	Roadkill	Yearling	Female	Black Hawk	Rural	NEG	
197347	43789	Roadkill	Adult	Female	Crawford	Rural	NEG	
193224	43796	Roadkill	Adult	Male	Scott	Public_land	NEG	
193355	43801	Roadkill	Adult	Male	Clinton	Rural	NEG	
193356	43801	Roadkill	Adult	Male	Clinton	Rural	NEG	
193363	43803	Roadkill	Adult	Female	Scott	Rural	NEG	

SAMPLES INCLUDED

Sample_ID	Date Collected	Type	Age	Sex	County	Type2	Rt-PCR Ct value	SARSCoV-2 Line
197200	43806	Hunter Killed	Adult	Male	Crawford	Rural	NEG	
193625	43808	Hunter Killed	Adult	Male	Clinton	Rural	NEG	
193628	43808	Hunter Killed	Adult	Male	Clinton	Rural	NEG	
193670	43808	Hunter Killed	Yearling	Female	Clinton	Rural	NEG	
193671	43808	Hunter Killed	Yearling	Male	Clinton	Rural	NEG	
193672	43808	Hunter Killed	Adult	Female	Clinton	Rural	NEG	
193673	43808	Hunter Killed	Yearling	Female	Clinton	Rural	NEG	
193674	43808	Hunter Killed	Adult	Female	Clinton	Rural	NEG	
193648	43809	Hunter Killed	Adult	Female	Clinton	Rural	NEG	
193725	43809	Hunter Killed	Adult	Male	Clinton	Rural	NEG	
193726	43809	Hunter Killed	Adult	Female	Clinton	Rural	NEG	
193727	43809	Hunter Killed	Adult	Female	Clinton	Rural	NEG	
193728	43809	Hunter Killed	Adult	Female	Clinton	Rural	NEG	
194509	43809	Hunter Killed	Adult	Female	Taylor	Rural	NEG	
193724	43810	Hunter Killed	Adult	Male	Clinton	Rural	NEG	
193733	43810	Hunter Killed	Adult	Male	Clinton	Rural	NEG	
193734	43810	Hunter Killed	Adult	Male	Clinton	Rural	NEG	
193735	43810	Hunter Killed	Adult	Male	Clinton	Rural	NEG	
193736	43810	Hunter Killed	Adult	Female	Clinton	Rural	NEG	
193826	43810	Hunter Killed	Yearling	Female	Clinton	Rural	NEG	
193828	43810	Hunter Killed	Yearling	Male	Clinton	Rural	NEG	
193829	43810	Hunter Killed	Adult	Female	Clinton	Rural	NEG	
197592	43810	Hunter Killed	Adult	Female	Ida	Public_land	NEG	
194853	43811	Hunter Killed	Adult	Male	Black Hawk	Public_land	NEG	
198536	43811	Roadkill	Adult	Female	Adair	Rural	NEG	
194473	43812	Roadkill	Adult	Male	Hardin	Rural	NEG	
191696	43813	Taxidermy	Yearling	Female	Taylor	Rural	NEG	
194527	43813	Roadkill	Yearling	Male	Grundy	Rural	NEG	
198527	43813	Hunter Killed	Adult	Male	Taylor	Rural	NEG	
197519	43814	Locker	Adult	Female	Cherokee	Public_land	NEG	
197520	43814	Locker	Yearling	Male	Cherokee	Public_land	NEG	
197696	43814	Locker	Adult	Male	Cherokee	Public_land	NEG	
198747	43815	Hunter Killed	Yearling	Female	Crawford	City_bounds	NEG	
198765	43815	Hunter Killed	Adult	Male	Cherokee	Public_land	NEG	
198534	43816	Hunter Killed	Adult	Male	Madison	Rural	NEG	
198549	43816	Hunter Killed	Adult	Female	Adair	Rural	NEG	
198749	43818	Hunter Killed	Adult	Male	Ida	Rural	NEG	

SAMPLES INCLUDED

Sample_ID	Date Collected	Type	Age	Sex	County	Type2	Rt-PCR Ct value	SARSCoV-2 Line
198770	43825	Hunter Killed	Adult	Male	Crawford	Rural	NEG	
190133	43829	Hunter Killed	Adult	Male	Marion	Rural	NEG	
190138	43832	Hunter Killed	Adult	Male	Warren	Rural	NEG	
196660	43844	Hunter Killed	Adult	Female	Louisa	Rural	NEG	

Supplementary Table 2

Tree node ID	Host	Collection date	Lineage	Location
200069	Deer	12/15/20	B.1.119	Appanoose
200191	Deer	12/8/20	B.1.311	Appanoose
200192	Deer	12/8/20	B.1.311	Appanoose
200193	Deer	12/8/20	B.1.311	Appanoose
200194	Deer	12/8/20	B.1.311	Appanoose
200195	Deer	12/8/20	B.1.311	Appanoose
200442	Deer	1/9/21	B.1.311	Appanoose
200443	Deer	1/9/21	B.1.311	Appanoose
200444	Deer	1/9/21	B.1.311	Appanoose
200566	Deer	12/5/20	B.1.311	Appanoose
200567	Deer	12/5/20	B.1.311	Appanoose
200568	Deer	12/5/20	B.1.311	Appanoose
200569	Deer	12/5/20	B.1.311	Appanoose
200570	Deer	12/5/20	B.1.311	Appanoose
200571	Deer	12/5/20	B.1.362	Appanoose
200572	Deer	12/5/20	B.1.240	Appanoose
200573	Deer	12/5/20	B.1.311	Appanoose
200574	Deer	12/5/20	B.1.400	Appanoose
200772	Deer	12/5/20	B.1	Appanoose
200862	Deer	1/9/21	B.1.362	Appanoose
200866	Deer	1/9/21	B.1.234	Appanoose
201788	Deer	12/6/20	B.1.234	Polk
201793	Deer	12/6/20	B.1.119	Polk
201794	Deer	12/6/20	B.1.234	Polk
201795	Deer	12/6/20	B.1.234	Polk
201796	Deer	12/6/20	B.1.264	Polk
201797	Deer	12/6/20	B.1.400	Polk
201820	Deer	12/10/20	B.1	Jasper
201821	Deer	12/10/20	B.1	Jasper
201833	Deer	12/10/20	B.1	Jasper
201835	Deer	12/10/20	B.1	Jasper
203239	Deer	12/5/20	B.1.2	Dubuque
203522	Deer	12/8/20	B.1.2	Allamakee
203525	Deer	12/8/20	B.1.311	Allamakee
203526	Deer	12/8/20	B.1.459	Allamakee
203700	Deer	12/9/20	B.1.2	Allamakee
203701	Deer	12/9/20	B.1.2	Allamakee
203704	Deer	12/9/20	B.1.2	Allamakee
203705	Deer	12/9/20	B.1.2	Allamakee
204363	Deer	12/7/20	B.1	Fayette
204364	Deer	12/7/20	B.1.2	Fayette
204472	Deer	12/5/20	B.1.2	Allamakee
204473	Deer	12/5/20	B.1.2	Allamakee
204478	Deer	12/5/20	B.1.2	Allamakee
204668	Deer	12/9/20	B.1.311	Fayette
204669	Deer	12/9/20	B.1.234	Fayette

Tree node ID	Host	Collection date	Lineage	Location
205750	Deer	12/7/20	B.1.234	Fayette
205769	Deer	12/8/20	B.1.2	Fayette
206527	Deer	12/7/20	B.1.2	Allamakee
206535	Deer	11/6/20	B.1.2	Pottawattamie
206739	Deer	10/15/20	B.1.2	Pottawattamie
206978	Deer	12/22/20	B.1.2	Pottawattamie
207150	Deer	12/15/20	B.1.2	Pottawattamie
207253	Deer	12/28/20	B.1.2	Pottawattamie
207337	Deer	11/15/20	B.1.2	Woodbury
207391	Deer	11/30/20	B.1.311	Woodbury
205795	Deer	9/30/20	B.1.2	Woodbury
207431	Deer	11/29/20	B.1.2	Woodbury
206407	Deer	10/28/20	B.1.2	Woodbury
207437	Deer	10/31/20	B.1.2	Woodbury
207530	Deer	11/7/20	B.1.2	Woodbury
207531	Deer	11/8/20	B.1.2	Woodbury
207579	Deer	11/17/20	B.1	Woodbury
207589	Deer	11/24/20	B.1.2	Woodbury
207649	Deer	12/5/20	B.1.596	Woodbury
207707	Deer	12/10/20	B.1.2	Woodbury
207770	Deer	12/2/20	B.1.311	Woodbury
208017	Deer	9/28/20	B.1.2	SE Iowa
208043	Deer	10/8/20	B.1.2	SE Iowa
208095	Deer	11/24/20	B.1.2	SE Iowa
208098	Deer	11/24/20	B.1.2	SE Iowa
208099	Deer	11/24/20	B.1.2	SE Iowa
208100	Deer	11/24/20	B.1.2	SE Iowa
208101	Deer	11/24/20	B.1.2	SE Iowa
208102	Deer	11/24/20	B.1.2	SE Iowa
208103	Deer	11/24/20	B.1.2	SE Iowa
208104	Deer	11/24/20	B.1.2	SE Iowa
208105	Deer	11/24/20	B.1.311	SE Iowa
208106	Deer	11/24/20	B.1.2	SE Iowa
208107	Deer	11/24/20	B.1.2	SE Iowa
208108	Deer	12/10/20	B.1.2	SE Iowa
208109	Deer	12/10/20	B.1.2	SE Iowa
208110	Deer	12/10/20	B.1.2	SE Iowa
208111	Deer	12/10/20	B.1.2	SE Iowa
208112	Deer	12/10/20	B.1.2	SE Iowa
208113	Deer	12/10/20	B.1.2	SE Iowa
208114	Deer	12/10/20	B.1.2	SE Iowa
208115	Deer	12/10/20	B.1.2	SE Iowa
208116	Deer	12/10/20	B.1.2	SE Iowa
208117	Deer	12/23/20	B.1.2	SE Iowa
208329	Deer	11/17/20	B.1.2	SE Iowa
208330	Deer	11/17/20	B.1.2	SE Iowa
208331	Deer	11/18/20	B.1.1	SE Iowa

Tree node ID	Host	Collection date	Lineage	Location
208334	Deer	12/17/20	B.1.2	SE Iowa
20-024606-001_dog_08-11/2020_TX_np_TAMU-096	Dog	8/11/21	B.1	North America / USA / Texas
20-024799-001_dog_8-12-20_TX_op_TAMU-104	Dog	missing	missing	missing
20-024801-002_feline_8-13/2020_TX_np_TAMU-122	Cat	8/13/20	B.1.2	North America / USA / Texas
20-024806-001_feline_8-21/2020_TX_op_TAMU-146	Cat	8/21/20	B.1	North America / USA / Texas
20-024807-001_dog_10-2-20_TX_np_TAMU-149	Dog	8/21/20	B.1.576	North America / USA / Texas
20-028046-004_dog_9-14-20_TX_TAMU-173	Dog	9/14/20	B.1.2	North America / USA / Texas
20-035363-001_dog_12-7-20_KS	Dog	2020-12	B.1.2	North America / USA / Kansas
20-037287-001v_dog_12-14-20_PA	Dog	12/14/20	B.1.509	North America / USA / Pennsylvania
21-002342-001s_dog_01-15-21_FL_na	Dog	1/15/21	B.1.526	North America / USA / Florida
21-005988-002s_dog_02-12-12_TX_op_TAMU-466	Dog	2/12/21	B.1.1.7	North America / USA / Texas / Brazos County
21-007025-001s_zc	Dog	3/3/21	B.1.526	North America / USA / Connecticut
21-012417-001v_zc	Feline	4/16/21	B.1.1.7	North America / USA / Mississippi
20-026484-001_feline_8-8-20_KY	Feline	9/8/20	B.1.1.186	North America / USA / Kentucky
20-028488-001_feline_9-25-20_AL	Feline	9/25/20	B.1.234	North America / USA / Alabama
20-028752-001_feline_9-22-20_TX_TAMU-197	Feline	9/22/20	B.1.234	North America / USA / Texas
20-028754-002_feline_9-24-20_TX_TAMU-201	Feline	unknown	unknown	unknown
20-029571-001_feline_10-2-20_PA	Feline	10/2/20	B.1.369	North America / USA / Pennsylvania
20-029604-001_feline_10-6-20_TX_TAMU-212	Feline	10/6/20	B.1.2	North America / USA / Texas
20-032807-002_feline_10-22-20_TAMU-269	Feline	10/22/20	B.1	North America / USA / Texas
20-032807-007_feline_10-22-20_TAMU-270	Feline	10/22/20	B.1	North America / USA / Texas
20-035363-001v_dog_12-7-20_KS	Feline	unknown	unknown	unknown
20-037760-004_feline_12-18-20_VA_tw	Feline	12/18/20	B.1.240	North America / USA / Virginia
21-000218-001s_feline_01-04-21_KS_np_original_RNA_repeat	Feline	1/4/21	B.1.2	North America / USA / Kansas
21-000296-001s_feline_12-28-20_CA_na	Feline	12/28/20	B.1	North America / USA / California
21-001379-001s_feline_01-07-21_AR_na	Feline	1/7/21	B.1.2	North America / USA / Arkansas
21-002490-001s_feline_01-23-21_CT_na	Feline	1/23/21	B.1.1.486	North America / USA / Connecticut
21-003328-001s_feline_01-26-21_FL_na	Feline	1/26/21	B.1.2	North America / USA / Florida
21-003696-001s_feline_01-30-21_CA_na	Feline	1/30/21	B.1.429	North America / USA / California
21-004025-001s_feline_01-29-21_AZ_na	Feline	1/29/21	B.1.429	North America / USA / Arizona
21-005988-005s_feline_02-12-12_TX_np_TAMU-467	Feline	2/12/21	B.1.1.7	North America / USA / Texas / Brazos County
21-007630-001s_feline_03-06-21_NJ_na	Feline	3/6/21	B.1.526	North America / USA / New Jersey
21-012714-001v_zc	Feline	4/15/21	B.1.1.7	North America / USA / Texas
21-012903-001v_zc	Feline	4/15/21	B.1.1.7	North America / USA / Texas
hCoV-19-USA-IL-UW-627/2020-EPI_zc	Human	6/26/20	B.1.139	North America / USA / Iowa / Jackson County
hCoV-19-USA-WI-GMF-00707/2020-EPI_zc	Human	4/6/20	B.1.308	North America / USA / Iowa / Allamakee County
hCoV-19-USA-WI-GMF-00744/2020-EPI_zc	Human	4/3/20	B.1.308	North America / USA / Iowa / Winneshiek County
hCoV-19-USA-WI-GMF-00857/2020-EPI_zc	Human	4/9/20	B.1	North America / USA / Iowa / Allamakee County
hCoV-19-USA-WI-GMF-00921/2020-EPI_zc	Human	4/3/20	B.1.308	North America / USA / Iowa / Allamakee County
hCoV-19-USA-WI-GMF-00928/2020-EPI_zc	Human	4/6/20	B.1.308	North America / USA / Iowa / Allamakee County
hCoV-19-USA-WI-GMF-01047/2020-EPI_zc	Human	4/14/20	B.1.308	North America / USA / Iowa / Allamakee County
hCoV-19-USA-WI-GMF-01158/2020-EPI_zc	Human	4/16/20	B.1.308	North America / USA / Iowa / Allamakee County
hCoV-19-USA-WI-GMF-01159/2020-EPI_zc	Human	4/16/20	B.1.308	North America / USA / Iowa / Allamakee County
hCoV-19-USA-WI-GMF-01316/2020-EPI_zc	Human	4/6/20	B.1.308	North America / USA / Iowa / Winneshiek County
hCoV-19-USA-WI-GMF-01455/2020-EPI_zc	Human	4/21/20	B.1.308	North America / USA / Iowa / Winneshiek County
hCoV-19-USA-WI-GMF-01534/2020-EPI_zc	Human	4/22/20	B.1.308	North America / USA / Iowa / Allamakee County
hCoV-19-USA-WI-GMF-01535/2020-EPI_zc	Human	4/21/20	B.1.308	North America / USA / Iowa / Allamakee County

Tree node ID	Host	Collection date	Lineage	Location
hCoV-19-USA-WI-GMF-01551/2020-EPI_zc	Human	4/22/20	B.1.308	North America / USA / Iowa / Allamakee County
hCoV-19-USA-WI-GMF-01591/2020-EPI_zc	Human	4/23/20	B.1.308	North America / USA / Iowa / Allamakee County
hCoV-19-USA-WI-GMF-01828/2020-EPI_zc	Human	4/26/20	B.1.308	North America / USA / Iowa / Allamakee County
hCoV-19-USA-WI-GMF-01901/2020-EPI_zc	Human	4/27/20	B.1.308	North America / USA / Iowa / Allamakee County
hCoV-19-USA-WI-GMF-02381/2020-EPI_zc	Human	5/4/20	B.1	North America / USA / Iowa / Fayette County
hCoV-19-USA-WI-UW-1029/2020-EPI_zc	Human	unknown	unknown	unknown
hCoV-19-USA-WI-UW-1246/2020-EPI_zc	Human	unknown	unknown	unknown
hCoV-19-USA-WI-UW-1250/2020-EPI_zc	Human	unknown	unknown	unknown
hCoV-19-USA-WI-UW-1269/2020-EPI_zc	Human	unknown	unknown	unknown
hCoV-19-USA-WI-UW-1299/2020-EPI_zc	Human	unknown	unknown	unknown
hCoV-19-USA-WI-UW-1505/2020-EPI_zc	Human	unknown	unknown	unknown
hCoV-19-USA-WI-UW-1614/2020-EPI_zc	Human	unknown	unknown	unknown
hCoV-19-USA-WI-UW-2090/2020-EPI_zc	Human	unknown	unknown	unknown
hCoV-19-USA-WI-UW-3041/2021-EPI_zc	Human	unknown	unknown	unknown
hCoV-19-USA-WI-UW-3100/2021-EPI_zc	Human	unknown	unknown	unknown
hCoV-19-USA-WI-UW-3348/2021-EPI_zc	Human	unknown	unknown	unknown
hCoV-19-USA-WI-WSLH-210137/2021-EPI_zc	Human	unknown	unknown	unknown
hCoV-19/USA/IA-10859/2020-EPI_zc	Human	5/4/20	B.1	North America / USA / Iowa
hCoV-19/USA/IA-9200028611/2020-EPI_zc	Human	8/14/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-9200056027/2020-EPI_zc	Human	9/16/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-9200064935/2020-EPI_zc	Human	9/24/20	B.1.240	North America / USA / Iowa
hCoV-19/USA/IA-9200064941/2020-EPI_zc	Human	9/24/20	B.1.240	North America / USA / Iowa
hCoV-19/USA/IA-9200086442/2020-EPI_zc	Human	10/13/20	B.1.587	North America / USA / Iowa
hCoV-19/USA/IA-9200130213/2020-EPI_zc	Human	11/23/20	B.1.595	North America / USA / Iowa
hCoV-19/USA/IA-9200156533/2020-EPI_zc	Human	12/23/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-9210074255/2020-EPI_zc	Human	12/9/20	B.1.565	North America / USA / Iowa
hCoV-19/USA/IA-9210074329/2020-EPI_zc	Human	10/28/20	B.1.243	North America / USA / Iowa
hCoV-19/USA/IA-9210074347/2020-EPI_zc	Human	10/28/20	B.1.240	North America / USA / Iowa
hCoV-19/USA/IA-9210074375/2020-EPI_zc	Human	9/28/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-9210074559/2020-EPI_zc	Human	9/8/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-9210074567/2020-EPI_zc	Human	10/16/20	B.1.565	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3714295/2020-EPI_zc	Human	11/29/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3714359/2020-EPI_zc	Human	11/28/20	B.1.311	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3714367/2020-EPI_zc	Human	11/28/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3714371/2020-EPI_zc	Human	11/29/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3714376/2020-EPI_zc	Human	11/28/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3714396/2020-EPI_zc	Human	11/29/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3714458/2020-EPI_zc	Human	11/28/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3714477/2020-EPI_zc	Human	11/27/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3769189/2020-EPI_zc	Human	12/25/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3769260/2020-EPI_zc	Human	12/24/20	B.1.565	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3769271/2020-EPI_zc	Human	12/25/20	B.1.311	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3769291/2020-EPI_zc	Human	12/26/20	B.1.396	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3769295/2020-EPI_zc	Human	12/26/20	B.1.565	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3845832/2021-EPI_zc	Human	1/27/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3845834/2021-EPI_zc	Human	1/27/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3845835/2021-EPI_zc	Human	1/27/21	B.1.2	North America / USA / Iowa

Tree node ID	Host	Collection date	Lineage	Location
hCoV-19/USA/IA-CDC-2-3845912/2021-EPI_zc	Human	1/28/21	B.1.234	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3845917/2021-EPI_zc	Human	1/28/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3845921/2021-EPI_zc	Human	1/26/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3845922/2021-EPI_zc	Human	1/27/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3845930/2021-EPI_zc	Human	1/26/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3846010/2021-EPI_zc	Human	1/27/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3881101/2021-EPI_zc	Human	2/1/21	B.1.234	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3881114/2021-EPI_zc	Human	2/1/21	B.1.427	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3881213/2021-EPI_zc	Human	2/2/21	B.1.311	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3881220/2021-EPI_zc	Human	2/2/21	B.1.1.519	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3972992/2021-EPI_zc	Human	2/17/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3972996/2021-EPI_zc	Human	2/18/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3973074/2021-EPI_zc	Human	2/19/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3973077/2021-EPI_zc	Human	2/17/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3973078/2021-EPI_zc	Human	2/19/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3973092/2021-EPI_zc	Human	2/18/21	B.1.429	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3979370/2021-EPI_zc	Human	2/24/21	B.1.311	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3979374/2021-EPI_zc	Human	2/23/21	B.1	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3979452/2021-EPI_zc	Human	2/23/21	B.1.429	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3979455/2021-EPI_zc	Human	2/24/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3979456/2021-EPI_zc	Human	2/23/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3979461/2021-EPI_zc	Human	2/24/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3979470/2021-EPI_zc	Human	2/22/21	B.1.575	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3979472/2021-EPI_zc	Human	2/25/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-3979499/2021-EPI_zc	Human	2/25/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4014855/2021-EPI_zc	Human	2/27/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4044425/2020-EPI_zc	Human	12/14/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4044433/2020-EPI_zc	Human	12/14/20	B.1.565	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4044443/2020-EPI_zc	Human	12/18/20	B.1.234	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4044501/2020-EPI_zc	Human	12/12/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4044533/2020-EPI_zc	Human	12/14/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4069001/2021-EPI_zc	Human	1/14/21	B.1.234	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4069002/2021-EPI_zc	Human	1/14/21	B.1.1.316	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4069008/2021-EPI_zc	Human	1/15/21	B.1.234	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4069009/2021-EPI_zc	Human	1/14/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4069022/2021-EPI_zc	Human	1/16/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4069023/2021-EPI_zc	Human	1/14/21	B.1.565	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4069028/2021-EPI_zc	Human	1/14/21	B.1.1.316	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4069031/2021-EPI_zc	Human	1/15/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4069049/2021-EPI_zc	Human	1/15/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4069108/2021-EPI_zc	Human	1/15/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4069110/2021-EPI_zc	Human	1/14/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4069120/2021-EPI_zc	Human	1/15/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4069121/2021-EPI_zc	Human	1/15/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4069126/2021-EPI_zc	Human	1/15/21	B.1.311	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4634493/2021-EPI_zc	Human	2/9/21	B.1.1.351	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4634554/2021-EPI_zc	Human	2/11/21	B.1.2	North America / USA / Iowa

Tree node ID	Host	Collection date	Lineage	Location
hCoV-19/USA/IA-CDC-2-4634565/2021-EPI_zc	Human	2/8/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4634583/2021-EPI_zc	Human	2/10/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4634589/2021-EPI_zc	Human	2/10/21	B.1.427	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4634591/2021-EPI_zc	Human	2/10/21	B.1.1.519	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4634651/2021-EPI_zc	Human	2/10/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-2-4634671/2021-EPI_zc	Human	2/8/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-ASC210000174/2021-EPI_zc	Human	2/28/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-ASC210000175/2021-EPI_zc	Human	2/28/21	B.1.311	North America / USA / Iowa
hCoV-19/USA/IA-CDC-ASC210000176/2021-EPI_zc	Human	2/28/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-ASC210000327/2021-EPI_zc	Human	2/28/21	B.1.1.519	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC00002729/2021-EPI_zc	Human	1/4/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0000857/2020-EPI_zc	Human	12/23/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0002727/2021-EPI_zc	Human	1/4/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0002729/2021-EPI_zc	Human	1/4/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0002732/2021-EPI_zc	Human	1/4/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0003220/2021-EPI_zc	Human	1/10/21	B.1	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0004145/2021-EPI_zc	Human	1/2/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0004752/2020-EPI_zc	Human	12/31/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0008648/2021-EPI_zc	Human	1/20/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0008664/2021-EPI_zc	Human	1/20/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0008665/2021-EPI_zc	Human	1/20/21	B.1.427	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0008670/2021-EPI_zc	Human	1/19/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0009085/2021-EPI_zc	Human	1/21/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0009089/2021-EPI_zc	Human	1/21/21	B.1.427	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0011536/2021-EPI_zc	Human	1/28/21	B.1.596	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0011643/2021-EPI_zc	Human	1/29/21	B.1.1.416	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0012002/2021-EPI_zc	Human	1/29/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0012003/2021-EPI_zc	Human	1/29/21	B.1.234	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0012014/2021-EPI_zc	Human	1/29/21	B.1.427	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0012977/2021-EPI_zc	Human	2/1/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0012978/2021-EPI_zc	Human	2/1/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0012979/2021-EPI_zc	Human	2/1/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-LC0020323/2021-EPI_zc	Human	2/22/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-QDX21533090/2021-EPI_zc	Human	1/27/21	B.1.139	North America / USA / Iowa
hCoV-19/USA/IA-CDC-QDX22214251/2021-EPI_zc	Human	2/17/21	B.1.234	North America / USA / Iowa
hCoV-19/USA/IA-CDC-QDX22315846/2021-EPI_zc	Human	2/22/21	B.1.429	North America / USA / Iowa
hCoV-19/USA/IA-CDC-STM-0000013-D03/2021-EPI_zc	Human	1/14/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-STM-000002415/2021-EPI_zc	Human	1/14/21	B.1.1.519	North America / USA / Iowa
hCoV-19/USA/IA-CDC-STM-000005050/2021-EPI_zc	Human	1/22/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-STM-000005985/2021-EPI_zc	Human	1/28/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-STM-000023171/2021-EPI_zc	Human	2/24/21	B.1.1.7	North America / USA / Iowa
hCoV-19/USA/IA-CDC-STM-A019/2021-EPI_zc	Human	1/2/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-STM-A100135/2021-EPI_zc	Human	1/4/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-CDC-STM-A100382/2021-EPI_zc	Human	1/6/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-GMF-02699/2020-EPI_zc	Human	5/8/20	B.1.308	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-08606/2020-EPI_zc	Human	6/29/20	B.1.401	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-08792/2020-EPI_zc	Human	7/1/20	B.1.401	North America / USA / Iowa / Fayette County

Tree node ID	Host	Collection date	Lineage	Location
hCoV-19/USA/IA-GMF-08809/2020-EPI_zc	Human	7/1/20	B.1.401	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-09513/2020-EPI_zc	Human	7/6/20	B.1.401	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-09911/2020-EPI_zc	Human	7/8/20	B.1.413	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-10147/2020-EPI_zc	Human	7/10/20	B.1.413	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-11334/2020-EPI_zc	Human	7/18/20	B.1.565	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-12677/2020-EPI_zc	Human	7/27/20	B.1.565	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-13403/2020-EPI_zc	Human	8/1/20	B.1.582	North America / USA / Iowa / Clayton County
hCoV-19/USA/IA-GMF-13859/2020-EPI_zc	Human	8/4/20	B.1.565	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-14006/2020-EPI_zc	Human	8/5/20	B.1.369	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-15466/2020-EPI_zc	Human	8/14/20	B.1.110.3	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-15767/2020-EPI_zc	Human	8/17/20	B.1.582	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-16252/2020-EPI_zc	Human	8/20/20	B.1.110.3	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-16267/2020-EPI_zc	Human	8/19/20	B.1.110.3	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-16489/2020-EPI_zc	Human	8/21/20	B.1.110.3	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-17036/2020-EPI_zc	Human	8/24/20	B.1.240	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-18219/2020-EPI_zc	Human	8/31/20	B.1.565	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-18345/2020-EPI_zc	Human	9/1/20	B.1.565	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-18509/2020-EPI_zc	Human	9/2/20	B.1.110.3	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-18813/2020-EPI_zc	Human	9/5/20	B.1.565	North America / USA / Iowa / Howard County
hCoV-19/USA/IA-GMF-18906/2020-EPI_zc	Human	9/5/20	B.1.587	North America / USA / Iowa / Clayton County
hCoV-19/USA/IA-GMF-18913/2020-EPI_zc	Human	9/4/20	B.1.1.222	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-19239/2020-EPI_zc	Human	9/8/20	B.1.2	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-GMF-21220/2020-EPI_zc	Human	9/19/20	B.1.1.464	North America / USA / Iowa / La Crosse County
hCoV-19/USA/IA-GMF-21344/2020-EPI_zc	Human	9/20/20	B.1.582	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-23570/2020-EPI_zc	Human	10/2/20	B.1.2	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-23647/2020-EPI_zc	Human	10/2/20	B.1.565	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-24556/2020-EPI_zc	Human	10/7/20	B.1.565	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-25157/2020-EPI_zc	Human	10/11/20	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-25923/2020-EPI_zc	Human	10/15/20	B.1.565	North America / USA / Iowa / Clayton County
hCoV-19/USA/IA-GMF-25958/2020-EPI_zc	Human	10/15/20	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-26895/2020-EPI_zc	Human	10/20/20	B.1.240	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-27699/2020-EPI_zc	Human	10/25/20	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-28410/2020-EPI_zc	Human	10/28/20	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-28426/2020-EPI_zc	Human	10/28/20	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-31330/2020-EPI_zc	Human	11/4/20	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-31421/2020-EPI_zc	Human	11/4/20	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-31654/2020-EPI_zc	Human	11/5/20	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-32028/2020-EPI_zc	Human	11/7/20	B.1	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-32164/2020-EPI_zc	Human	11/7/20	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-32395/2020-EPI_zc	Human	11/9/20	B.1.2	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-32590/2020-EPI_zc	Human	11/9/20	B.1.139	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-32700/2020-EPI_zc	Human	11/9/20	B.1.396	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-32907/2020-EPI_zc	Human	11/10/20	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-33129/2020-EPI_zc	Human	11/11/20	B.1	North America / USA / Iowa / Clayton County
hCoV-19/USA/IA-GMF-33366/2020-EPI_zc	Human	11/11/20	B.1.241	North America / USA / Iowa / Dubuque County
hCoV-19/USA/IA-GMF-33487/2020-EPI_zc	Human	11/11/20	B.1.110.3	North America / USA / Iowa / Clayton County
hCoV-19/USA/IA-GMF-34475/2020-EPI_zc	Human	11/15/20	B.1.565	North America / USA / Iowa / Chickasaw County

Tree node ID	Host	Collection date	Lineage	Location
hCoV-19/USA/IA-GMF-34972/2020-EPI_zc	Human	11/16/20	B.1.2	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-36354/2020-EPI_zc	Human	11/22/20	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-36674/2020-EPI_zc	Human	11/24/20	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-37933/2020-EPI_zc	Human	11/30/20	B.1.564	North America / USA / Iowa / Howard County
hCoV-19/USA/IA-GMF-38015/2020-EPI_zc	Human	11/30/20	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-38206/2020-EPI_zc	Human	12/1/20	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-3912/2020-EPI_zc	Human	5/20/20	B.1	North America / USA / Iowa / Buchanan County
hCoV-19/USA/IA-GMF-41299/2020-EPI_zc	Human	12/11/20	B.1.596	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-41403/2020-EPI_zc	Human	12/12/20	B.1.110.3	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-43363/2020-EPI_zc	Human	12/19/20	B.1.2	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-46261/2021-EPI_zc	Human	1/3/21	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-46406/2021-EPI_zc	Human	1/3/21	R.1	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-47194/2021-EPI_zc	Human	1/5/21	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-47250/2021-EPI_zc	Human	1/5/21	R.1	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-48948/2021-EPI_zc	Human	1/12/21	B.1.2	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-48951/2021-EPI_zc	Human	1/12/21	B.1.2	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-49259/2021-EPI_zc	Human	1/14/21	B.1.2	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-49459/2021-EPI_zc	Human	1/15/21	B.1.2	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-49508/2021-EPI_zc	Human	1/16/21	B.1.2	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-49510/2021-EPI_zc	Human	1/16/21	B.1.2	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-49586/2021-EPI_zc	Human	1/16/21	B.1.427	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-50144/2021-EPI_zc	Human	1/18/21	B.1.2	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-50146/2021-EPI_zc	Human	1/18/21	B.1.2	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-50340/2021-EPI_zc	Human	1/19/21	B.1.2	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-50854/2021-EPI_zc	Human	1/21/21	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-52611/2021-EPI_zc	Human	1/29/21	B.1.2	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-54488/2021-EPI_zc	Human	2/15/21	B.1.427	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-54489/2021-EPI_zc	Human	2/15/21	B.1.2	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-54550/2021-EPI_zc	Human	2/16/21	B.1.2	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-55353/2021-EPI_zc	Human	2/23/21	B.1.2	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF-55463/2021-EPI_zc	Human	2/24/21	B.1.2	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-B00025/2021-EPI_zc	Human	2/14/21	B.1.2	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-B00028/2021-EPI_zc	Human	2/16/21	B.1.2	North America / USA / Iowa / Fayette County
hCoV-19/USA/IA-GMF-B00034/2021-EPI_zc	Human	2/18/21	B.1.2	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-B00035/2021-EPI_zc	Human	2/19/21	B.1.234	North America / USA / Iowa / Winneshiek County
hCoV-19/USA/IA-GMF-M00005/2020-EPI_zc	Human	5/26/20	B.1.308	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-GMF/20217/2020-EPI_zc	Human	5/26/20	B.1.308	North America / USA / Iowa / Allamakee County
hCoV-19/USA/IA-Noblis-S369B17/2021-EPI_zc	Human	2/23/21	B.1.234	North America / USA / Iowa
hCoV-19/USA/IA-Noblis-S371B18/2021-EPI_zc	Human	2/23/21	B.1.234	North America / USA / Iowa
hCoV-19/USA/IA-Noblis-S51B02/2020-EPI_zc	Human	10/29/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-Noblis-S52B03/2020-EPI_zc	Human	10/29/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-Noblis-S59B12/2020-EPI_zc	Human	12/2/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-Noblis-S61B14/2020-EPI_zc	Human	12/2/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-Noblis-S62B15/2020-EPI_zc	Human	12/20/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-QDX-249/2020-EPI_zc	Human	4/29/20	B.1	North America / USA / Iowa
hCoV-19/USA/IA-QDX-4437/2020-EPI_zc	Human	11/7/20	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-SHL-1013770/2020-EPI_zc	Human	5/18/20	B.1.382	North America / USA / Iowa

Tree node ID	Host	Collection date	Lineage	Location
hCoV-19/USA/IA-SHL-1079193/2020-EPI_zc	Human	6/29/20	B.1.564	North America / USA / Iowa
hCoV-19/USA/IA-SHL-1294465/2020-EPI_zc	Human	9/25/20	B.1.565	North America / USA / Iowa
hCoV-19/USA/IA-SHL-1369391/2020-EPI_zc	Human	10/26/20	B.1.369	North America / USA / Iowa
hCoV-19/USA/IA-SHL-1377598/2020-EPI_zc	Human	10/29/20	B.1.564	North America / USA / Iowa
hCoV-19/USA/IA-SHL-1384887/2020-EPI_zc	Human	11/3/20	B.1.565	North America / USA / Iowa
hCoV-19/USA/IA-SHL-1560811/2021-EPI_zc	Human	1/20/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-SHL-1560839/2021-EPI_zc	Human	1/23/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-SHL-1560855/2021-EPI_zc	Human	1/24/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-SHL-1561390/2021-EPI_zc	Human	1/25/21	B.1.234	North America / USA / Iowa
hCoV-19/USA/IA-SHL-1561772/2021-EPI_zc	Human	1/25/21	B.1.2	North America / USA / Iowa / Johnson
hCoV-19/USA/IA-SHL-1561778/2021-EPI_zc	Human	1/23/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-SHL-1561786/2021-EPI_zc	Human	1/23/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-SHL-1565144/2021-EPI_zc	Human	1/17/21	B.1.1.7	North America / USA / Iowa / Johnson
hCoV-19/USA/IA-SHL-1565147/2021-EPI_zc	Human	1/6/21	B.1.1.7	North America / USA / Iowa / Johnson
hCoV-19/USA/IA-SHL-1565149/2021-EPI_zc	Human	1/21/21	B.1.1.7	North America / USA / Iowa / Bremer
hCoV-19/USA/IA-SHL-1570505/2021-EPI_zc	Human	1/28/21	B.1.2	North America / USA / Iowa / Black Hawk
hCoV-19/USA/IA-SHL-1570506/2021-EPI_zc	Human	1/28/21	B.1.234	North America / USA / Iowa / Buchanan
hCoV-19/USA/IA-SHL-1570723/2021-EPI_zc	Human	1/31/21	B.1.1.7	North America / USA / Iowa / Winneshiek
hCoV-19/USA/IA-SHL-1573391/2021-EPI_zc	Human	1/5/21	B.1.1.7	North America / USA / Iowa / Unknown
hCoV-19/USA/IA-SHL-1574118/2021-EPI_zc	Human	2/1/21	B.1.2	North America / USA / Iowa / Dubuque
hCoV-19/USA/IA-SHL-1574119/2021-EPI_zc	Human	2/1/21	B.1.2	North America / USA / Iowa / Dubuque
hCoV-19/USA/IA-SHL-1574132/2021-EPI_zc	Human	2/1/21	B.1.2	North America / USA / Iowa / Dubuque
hCoV-19/USA/IA-SHL-1574134/2021-EPI_zc	Human	2/1/21	B.1.2	North America / USA / Iowa / Dubuque
hCoV-19/USA/IA-SHL-1574135/2021-EPI_zc	Human	2/1/21	B.1.2	North America / USA / Iowa / Dubuque
hCoV-19/USA/IA-SHL-1574323/2021-EPI_zc	Human	2/1/21	B.1.2	North America / USA / Iowa / Dubuque
hCoV-19/USA/IA-SHL-1576764/2021-EPI_zc	Human	1/27/21	B.1.1.7	North America / USA / Iowa / Polk
hCoV-19/USA/IA-SHL-1602606/2021-EPI_zc	Human	2/25/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-SHL-1602666/2021-EPI_zc	Human	2/25/21	B.1.2	North America / USA / Iowa
hCoV-19/USA/IA-SHL-1780926/2021-EPI_zc	Human	2/8/21	AY.39	North America / USA / Iowa
hCoV-19/USA/IA-UIHC-MO01/2020-EPI_zc	Human	6/8/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO02/2020-EPI_zc	Human	6/8/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO03/2020-EPI_zc	Human	6/9/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO04/2020-EPI_zc	Human	6/9/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO05/2020-EPI_zc	Human	6/10/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO06/2020-EPI_zc	Human	6/11/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO07/2020-EPI_zc	Human	6/11/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO08/2020-EPI_zc	Human	6/11/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO09/2020-EPI_zc	Human	6/12/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO10/2020-EPI_zc	Human	6/12/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO11/2020-EPI_zc	Human	6/14/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO12/2020-EPI_zc	Human	6/15/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO13/2020-EPI_zc	Human	6/16/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO14/2020-EPI_zc	Human	6/16/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO15/2020-EPI_zc	Human	6/16/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO16/2020-EPI_zc	Human	6/17/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO17/2020-EPI_zc	Human	6/18/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO18/2020-EPI_zc	Human	9/2/20	B.1.565	North America / USA / Iowa / Johnson County

Tree node ID	Host	Collection date	Lineage	Location
hCoV-19/USA/IA-UIHC-MO19/2020-EPI_zc	Human	9/3/20	B.1.565	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO20/2020-EPI_zc	Human	9/4/20	B.1.582	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO21/2020-EPI_zc	Human	9/5/20	B.1.565	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO22/2020-EPI_zc	Human	9/5/20	B.1.565	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO23/2020-EPI_zc	Human	9/6/20	B.1.565	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO24/2020-EPI_zc	Human	9/9/20	B.1.565	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO25/2020-EPI_zc	Human	9/9/20	B.1.565	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO26/2020-EPI_zc	Human	9/10/20	B.1.565	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO27/2020-EPI_zc	Human	9/10/20	B.1.565	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO28/2020-EPI_zc	Human	9/10/20	B.1.565	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO29/2020-EPI_zc	Human	5/11/20	B.1	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO30/2020-EPI_zc	Human	7/22/20	B.1.2	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO31/2020-EPI_zc	Human	11/23/20	B.1.2	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UIHC-MO32/2020-EPI_zc	Human	11/25/20	B.1.2	North America / USA / Iowa / Johnson County
hCoV-19/USA/IA-UW-121/2020-EPI_zc	Human	4/11/20	B.1	North America / USA / Iowa / Dubuque County
hCoV-19/USA/IA-UW-2458/2020-EPI_zc	Human	12/22/20	B.1.2	North America / USA / Iowa / Fayette County
21-010357-002s_lion_04-04-21_PA_fc	Lion	4/4/21	B.1.1.7	North America / USA / Pennsylvania
20-022930-002_mink2_8-10-20_UT_F2_Index	Mink	8/10/20	B.1	North America / USA / Utah
20-022930-005_mink2_8-10-20_UT_F3_Index	Mink	8/10/20	B.1	North America / USA / Utah
20-022930-009v_mink2_UT_F3_Index	Mink	8/10/20	B.1	North America / USA / Utah
20-023279-001_mink1_8-14-20_UT_F3_Index	Mink	8/14/20	B.1	North America / USA / Utah
20-023279-002_mink2_8-14-20_UT_F3_Index	Mink	8/14/20	B.1	North America / USA / Utah
20-023279-003_mink1_8-14-20_UT_F4_Index	Mink	8/14/20	B.1	North America / USA / Utah
20-023279-004_mink2_8-14-20_UT_F4_Index	Mink	8/14/20	B.1	North America / USA / Utah
20-023894-003_mink1_8-21-20_UT_F5_Index	Mink	8/21/20	B.1	North America / USA / Utah
20-023894-006_mink2_8-21-20_UT_F5_Index	Mink	8/21/20	B.1	North America / USA / Utah
20-026330-002v_mink1_9-14-20_UT_F6_Index	Mink	9/14/20	B.1	North America / USA / Utah
20-026330-003_mink2_9-14-20_UT_F6_Index	Mink	9/14/20	B.1	North America / USA / Utah
20-026330-003v_mink2_9-14-20_UT_F6_Index	Mink	unknown	unknown	unknown
20-026330-006_mink3_9-14-20_UT_F6_Index	Mink	unknown	unknown	unknown
20-027447-002_mink1_9-22-20_UT_F8_Index	Mink	9/22/20	B.1	North America / USA / Utah
20-027447-004_mink2_9-22-20_UT_F8_Index	Mink	9/22/20	B.1	North America / USA / Utah
20-027448-002_mink1_9-22-20_UT_F7_Index	Mink	9/22/20	B.1	North America / USA / Utah
20-027448-002v_mink1_9-22-20_UT_F7_Index	Mink	unknown	unknown	unknown
20-027448-004_mink2_9-22-20_UT_F7_Index	Mink	9/22/20	B.1	North America / USA / Utah
20-028629-002_minkA_9-28-20_MI_F1_Index	Mink	9/28/20	B.1	North America / USA / Michigan
20-028629-004_minkB_9-28-20_MI_F1_Index	Mink	9/28/20	B.1	North America / USA / Michigan
20-028674-001_mink1_10-1-20_UT_F9_Index	Mink	10/1/20	B.1	North America / USA / Utah
20-028674-001v_mink1_10-1-20_UT_F9_Index	Mink	unknown	unknown	unknown
20-028674-005_mink2_10-1-20_UT_F9_Index	Mink	10/1/20	B.1	North America / USA / Utah
20-028748-001_mink1_10-2-20_WI_F1_Index	Mink	10/2/20	B.1	North America / USA / Wisconsin
20-028748-002_mink2_10-2-20_WI_F1_Index	Mink	10/2/20	B.1	North America / USA / Wisconsin
20-028748-002v_mink2_10-2-20_WI_F1_Index	Mink	unknown	unknown	unknown
20-028748-006v_mink6_10-2-20_WI_F1_Index	Mink	unknown	unknown	unknown
20-031493-001_mink1_10-29-20_WI_F2_Index	Mink	10/28/20	B.1	North America / USA / Wisconsin
20-031493-003_mink3_10-29-20_WI_F2_Index	Mink	10/28/20	B.1	North America / USA / Wisconsin
20-031893-001_mink_10-29-20_UT_F11_Index	Mink	10/29/20	B.1	North America / USA / Utah

Tree node ID	Host	Collection date	Lineage	Location
20-031893-010_mink_10-29-20_UT_F11_Index	Mink	10/29/20	B.1	North America / USA / Utah
20-031894-014_mink_10-29-20_UT_F10_Index	Mink	10/29/20	B.1	North America / USA / Utah
20-031894-017_mink_10-29-20_UT_F10_Index	Mink	10/29/20	B.1	North America / USA / Utah
20-032048-005_mink_10-29-20_UT_F12b_Index	Mink	unknown	unknown	unknown
20-032048-008_mink_10-29-20_UT_F12b_Index	Mink	10/29/20	B.1	North America / USA / Utah
20-032049-004_mink_10-29-20_UT_F12a_Index	Mink	10/29/20	B.1	North America / USA / Utah
20-032049-008_mink_10-29-20_UT_F12a_Index	Mink	10/29/20	B.1	North America / USA / Utah
hCoV-19-mouse-USA-IA-N501Y-MA30/2021-EPI_zc	Mouse	unknown	unknown	unknown
21-011485-003_zc	Otter	unknown	B.1.1.7	unknown
21-011485-003s_otter_04-15-21_GA_np	Otter	unknown	B.1.1.7	unknown
21-011485-005_zc	Otter	unknown	B.1.1.7	unknown
21-011485-005s_otter_04-15-21_GA_np	Otter	unknown	B.1.1.7	unknown
21-011485-007s_otter_04-15-21_GA_np	Otter	unknown	B.1.1.7	unknown
21-011485-007v_otter_04-15-21_GA_np	Otter	unknown	B.1.1.7	unknown
21-011485-009s_otter_04-15-21_GA_np	Otter	unknown	B.1.1.7	unknown
21-011485-009v_otter_04-15-21_GA_np	Otter	unknown	B.1.1.7	unknown
21-011485-011s_otter_04-15-21_GA_np	Otter	unknown	B.1.1.7	unknown
21-011485-011v_otter_04-15-21_GA_np	Otter	unknown	B.1.1.7	unknown
20-035685-003_Snowleopard_12-4-20_KY_fc	Snow leopard	unknown	B.1.2	unknown
20-031353-001_tiger_10-9-20_TN	Tiger	10/19/20	B.1.2	North America / USA / Tennessee
20-031353-002_tiger_10-9-20_TN	Tiger	10/19/20	B.1.2	North America / USA / Tennessee
20-031498-003_tiger_10-27-20_TN_zoo	Tiger	10/27/20	B.1.2	North America / USA / Tennessee
21-001483-001s_tiger_01-10-21_MN_na	Tiger	1/10/21	B.1.564	North America / USA / Minnesota
21-002026-001s_tiger_01-16-21_TX_fc	Tiger	1/16/21	B.1.234	North America / USA / Texas
21-003442-002v_tiger_02-02-21_IN_fc	Tiger	2/2/21	B.1.2	North America / USA / Indiana
21-010728-001s_zc	Tiger	4/9/21	B.1.1.7	North America / USA / Virginia
21-010728-003s_tiger_04-09-21_VA_np	Tiger	unknown	unknown	unknown
21-010728-003v_tiger_04-09-21_VA_np	Tiger	unknown	unknown	unknown
root	Human			Wuhan