

SARS-CoV-2 Transmission between Mink (*Neovison vison*) and Humans, Denmark

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Severe acute respiratory syndrome coronavirus 2 has caused a pandemic in humans. Farmed mink (*Neovison vison*) are also susceptible. In Denmark, this virus has spread rapidly among farmed mink, resulting in some respiratory disease. Full-length virus genome sequencing revealed novel virus variants in mink. These variants subsequently appeared within the local human community.

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has caused the ongoing coronavirus disease (COVID-19) pandemic (1). Ferrets, cats, dogs, Syrian hamsters, and nonhuman primates can be infected with the virus and, in some cases, transmit it (2); however, other species, such as pigs and chickens, appear resistant (3,4). Thus, the virus has a restricted host range. Infection with SARS-CoV-2 has occurred in farmed mink in the Netherlands (5).

In Denmark, there are ≈1,200 mink farms (6). Because of contacts between persons with COVID-19 and mink farms, investigation of SARS-CoV-2 infection within mink in Denmark was undertaken. We documented 3 premises in the Northern Jutland region of Denmark with SARS-CoV-2-infected mink and analyzed virus transmission in mink and the local human community.

The Study

We collected blood and throat, nasal, and fecal swab samples from mink adults and kits (Table 1); we

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also sampled feed and air. We assayed viral RNA by quantitative reverse transcription PCR (qRT-PCR) (7). We performed SARS-CoV-2 Ab ELISA (Beijing Wantai Biological Pharmacy Enterprise, <http://www.ystwt.cn>) as described (R. Lassaunière et al., unpub. data, <https://doi.org/10.1101/2020.04.09.20056325>). SARS-CoV-2-positive RNA samples were sequenced and sequences aligned using Mafft (<https://mafft.cbrc.jp/alignment/server/index.html>). Phylogenetic analysis was performed in MEGA 10.1.7 (8) using the maximum-likelihood general time reversible plus invariant sites gamma (2 categories) method (9).

We selected mink farms for investigation because of COVID-19 in persons linked to them. During initial visits, we sampled 30 apparently healthy adult mink; we tested adults and kits in follow-up visits. We analyzed serum samples for SARS-CoV-2 antibodies and assayed swab samples for SARS-CoV-2 RNA (Table 1; Appendix, <https://wwwnc.cdc.gov/EID/article/27/2/20-3794-App1.pdf>). At initial sampling, seroprevalence was high on farm 1 (>95%) and farm 3 (66%) but, in contrast, only 3% on farm 2. However, after the infection spread widely on farm 2, indicated by the increased prevalence of viral RNA (Table 1), a large increase in seroprevalence occurred, to >95%.

Air samples from farm 1 tested negative. However, on farms 2 and 3, multiple samples collected from exhaled air from mink or within 1 m of the cages scored positive, albeit with fairly high (>31) C_t values. None of the air samples collected outside the houses were positive. Feed samples collected at each farm tested negative.

We also sequenced SARS-CoV-2 RNA from samples from each mink farm. The viruses found on farms 1–3 were very similar (Table 2). These sequences and those from humans (H1–H9) linked to

Table 1. Summary of laboratory analyses of mink samples from 3 mink farms tested for severe acute respiratory syndrome coronavirus 2 in Denmark, June–July 2020*

| Sample origin | Test and specimen type, no. positive/no. tested (%) | | | | Date of sample collection | Location |
|--------------------------|---|--------------|-------------|-------------|---------------------------|----------|
| | ELISA | | qRT-PCR | | | |
| | Serum | Throat swabs | Nasal swabs | Fecal swabs | | |
| Live adult mink | 29/30 (97) | NA | NA | 5/30 (17) | 2020 Jun 14 | Farm 1 |
| Dead adult mink | NA | NA | 4/4 (100) | 3/4 (75) | 2020 Jun 14 | Farm 1 |
| Live mink kits | 30/30 (100) | 3/30 (10) | 3/30 (10) | 1/30 (3) | 2020 Jun 17 | Farm 1 |
| Live adult mink | 30/30 (100) | 3/23 (13) | NA | 0/23 (0) | 2020 Jun 17 | Farm 1 |
| Retested adult mink | 4/4 (100) | 2/4 (50) | 2/4 (50) | 1/4 (25) | 2020 Jun 17 | Farm 1 |
| Live adult mink | 1/30 (3) | NA | NA | 0/8 (0) | 2020 Jun 18 | Farm 2 |
| Dead adult mink | NA | 1/8 (13) | NA | NA | 2020 Jun 18 | Farm 2 |
| Live mink kits | 1/50 (2) | 40/50 (80) | 39/50 (78) | NA | 2020 Jun 22 | Farm 2 |
| Live adult mink | 3/50 (6) | 46/50 (92) | NA | NA | 2020 Jun 22 | Farm 2 |
| Dead adult mink | 1/3 (33) | 2/3 (66) | 2/3 (66) | NA | 2020 Jun 22 | Farm 2 |
| Dead adult mink | NA | 3/3 (100) | 3/3 (100) | NA | 2020 Jun 30 | Farm 2 |
| Live adult mink (retest) | 36/37 (97) | 35/37 (95) | 37/37(100) | NA | 2020 Jun 30 | Farm 2 |
| Live adult mink | 20/30 (67) | 6/6†(100) | NA | NA | 2020 Jun 30 | Farm 3 |
| Dead adult mink | NA | 5/5 (100) | NA | NA | 2020 Jun 30 | Farm 3 |
| Live mink kits | 24/30 (80) | 30/30 (100) | 27/30 (90) | NA | 2020 Jul 2 | Farm 3 |
| Live adult mink | 23/30 (77) | 30/30 (100) | 26/30 (87) | NA | 2020 Jul 2 | Farm 3 |

*NA, not applicable; qRT-PCR, quantitative reverse transcription PCR.

†Samples from 30 mink were assayed in 6 pools of 5 swabs each.

Table 2. Location of nt differences identified in genome sequences of selected severe acute respiratory syndrome coronavirus 2 samples from mink and humans in Denmark, June–July 2020, compared with Wuhan and clade 20B reference sequences*

| Virus sample | Genomic location and nt position | | | | | | | | | | | |
|-------------------------------------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|-------|-------|
| | 5' UTR | ORF1a | | | ORF1b | | Spike | | ORF3a | Nucleoprotein | | |
| | 241 | 3037 | 5421 | 9534 | 14408 | 15656 | 22920 | 23403 | 25936 | 28881 | 28882 | 28883 |
| NC045512 (Wuhan) | C | C | A | C | C | C | A | A | C | G | G | G |
| Humans in Jutland (to 2020 Jun 10)† | T | T | A | C | T | C | A | G | C | G | G | G |
| EPI_ISL_455326 20B | T | T | A | C | T | C | A | G | C | A | A | C |
| Index case | T | T | A | C | T | T | A | G | ND | A | A | C |
| Mink_AD4_Farm1 | T | T | G | C | T | T | T | G | T | A | A | C |
| Mink_AL3_Farm1 | T | T | A | C | T | T | A | G | T | A | A | C |
| Mink_KL14_Farm1 | T | T | A | C | T | T | A | G | T | A | A | C |
| Mink_KL11_Farm1 | T | T | A | C | T | T | A | G | T | A | A | C |
| Mink_AD3_Farm1 | T | T | G | C | T | T | T | G | T | A | A | C |
| Mink_AD6_Farm1 | T | T | A | C | T | T | T | G | T | A | A | C |
| Mink_AL64_Farm1 | T | T | A | C | T | T | A | G | T | A | A | C |
| Mink_AL25_Farm1 | T | T | A | C | T | T | T | G | T | A | A | C |
| Mink_AD38_Farm2 | T | T | A | C | T | T | T | G | T | A | A | C |
| Mink_M1-M47_Farm2‡ | T | T | A | C | T | T | T | G | T | A | A | C |
| Mink_AD37_Farm3 | T | T | A | C | T | T | T | G | T | A | A | C |
| Mink_AD40_Farm3 | T | T | A | C | T | T | T | G | T | A | A | C |
| Mink_AL35_Farm3 | T | T | A | C | T | T | T | G | T | A | A | C |
| H1–H7 + H9 | T | T | A | C | T | T | T | G | T | A | A | C |
| H8 | T | T | A | T | T | T | T | G | T | A | A | C |
| In NB01 (NL)§ | T | T | A | C | T | C | A | G | C | G | G | G |
| In NB02 (NL)§ | C | C | A | C | C | C | T>A# | A | C | G | G | G |
| In NB03 (NL)§ | T | T | A | C | T | C | A | G | T | G | G | G |
| In NB04 (NL)§ | T | T | A | C | T | C | A | G | C | G | G | G |
| Humans in Jutland (to 2020 Jul 1) † | T | T | A | C | T | C>T | A>T | G | C>T | G>A | G>A | G>C |
| Encoded amino acid change¶ | NA | NA | I1719 | T3083 | P314 | T730 | Y453 | D614 | H182 | R203 | R203 | G204 |
| | | | V | I | L | I | F | G | Y | K | K | R |

*Red text indicates nt differences from the Wuhan reference strain; pink shading indicates nt changes detected in mink and in human contacts (H1–H9) that differ from the clade 20 B and index case; gray shading indicates a reference clade 20B sequence and the human index case sequence. NA, not applicable, as nt change in the noncoding region; ND, not determined; NL, the Netherlands; ORF, open reading frame.

† The proportions of each nt present at each of these positions in human sequences in Jutland are shown in Appendix Table 1 (<https://wwwnc.cdc.gov/EID/article/27/2/20-3794-App1.pdf>).

‡nts present in farm 2 sequences obtained from throat swab specimens on June 22, 2020 (derived from 20 adult mink and 27 kits).

§The mink sequences from the Netherlands also differ at other locations compared with the Wuhan sequence (5).

¶Encoded amino acid substitutions (with residue number in each protein) compared to Wuhan reference strain are indicated using the single letter code.

#T in 5 of 6 sequences from farm NB02 (5).

the infected farms grouped within the European 20B clade of the global SARS-CoV-2 tree (10,11) (Figure; Appendix Table 1). We deposited the SARS-CoV-2 genome sequences of virus from farm 1 (SARS-CoV-2/mink/DK/AD3_Farm1/2020) in GenBank (accession nos. MT919525–36). The sequences closely matched those of a human case, diagnosed in mid-May, with a direct epidemiologic link to farm 1. This index sequence (only 91% complete) matched the mink viruses at nt 15656 (rare globally) but had A at nt 22920 (Table 2). The nt 25936 in the index case could not be determined. The local phylogeny (Appendix Figure) showed that mink sequences from farm 1 fell into 3 subclusters (defined by the nucleotide changes at positions 5421 and 22920), but sequences from linked humans (H1–H9) and mink in farms 2 and 3 were within subcluster 2 (Appendix Figure).

We found 9 to 11 nt differences (mainly nonsynonymous) between the mink sequences in Denmark and the Wuhan-Hu-1 reference sequence (Table 2). One mutation at nt 23403 (resulting in substitution

D614G in the spike protein) was present in all sequences from mink in Denmark and the Netherlands, except for NB02 from the Netherlands (Table 2) and was predominant in the human population in Jutland (Appendix Table 1) and globally (12). However, another mutation (nt C25936T [as cDNA] encoding H182 to Y within ORF3a) appeared in all mink sequences from Denmark (Table 2) and in human cases (H1–H9) linked to them. This change was not found in human SARS-CoV-2 sequences from Jutland before June 10, 2020 (Appendix Table 1), but reached ≈40% frequency during June 10–July 1, 2020 (Table 2; Appendix Table 2). This mutation has been found only rarely in other SARS-CoV-2 sequences (11) (Appendix Table 1) but was in mink farm NB03 from the Netherlands (SARS-CoV-2/mink/NED/NB03_index/2020; GenBank accession no. MT457400.1).

Another mutation in the spike gene (A22920T, encoding Y453 to F) was present in 4 of 8 sequences from farm 1, in all sequences from farms 2 and 3, and in 5 of 6 sequences from farm NB02 in the

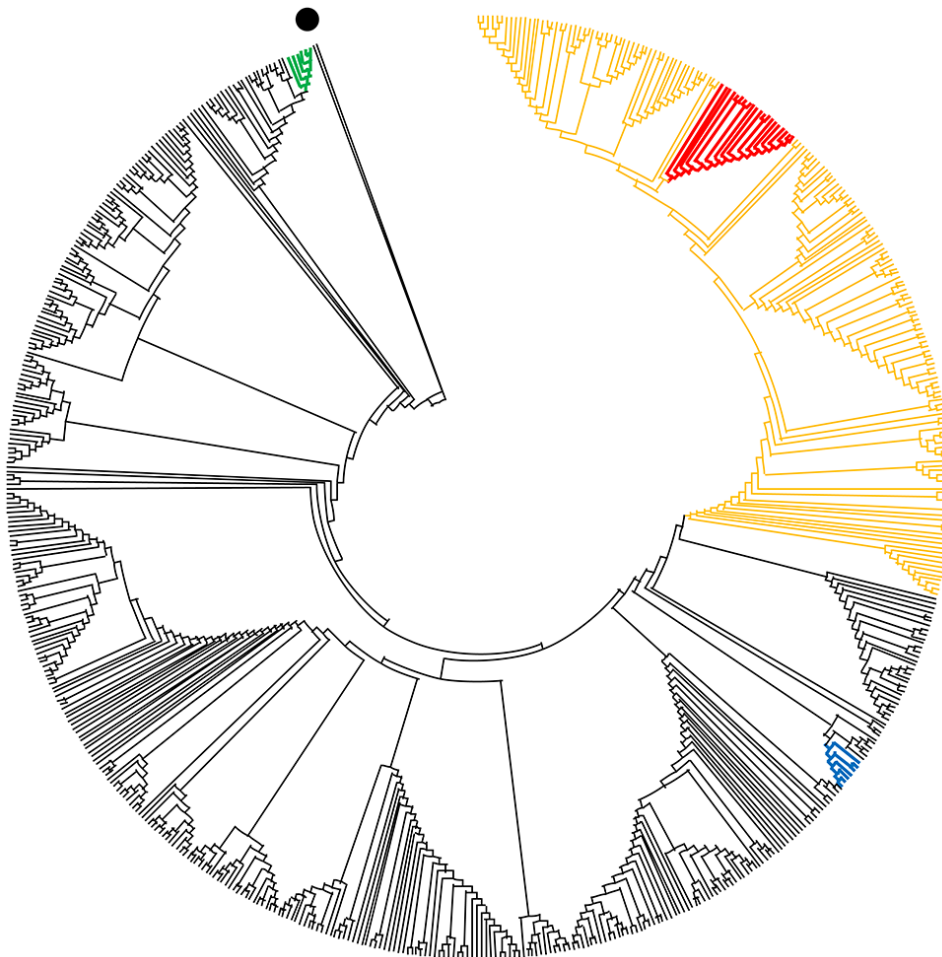


Figure. Phylogenetic tree showing relationships between genome sequences of severe acute respiratory syndrome coronavirus 2 from mink and humans at 3 mink farms in Denmark, June–July 2020 (red), and selected global full-length genome sequences. Black dot indicates Wuhan reference sequence NC_045512.2; green indicates mink farm NB02 in the Netherlands; blue indicates mink farms NB01, NB03, and NB04 in the Netherlands; orange indicates clade 20B.

Netherlands (5). This change was not in the index case or the human population anywhere before June 10 but was subsequently detected in farm-linked humans (H1–H9) and in Jutland (Table 2; Appendix Table 2). Finally, the mutation in the open reading frame 1b gene (C15656T, encoding T730 to I) was present only in mink/human sequences from Denmark (Table 2) and a sequence from New Zealand (Appendix Table 1).

Conclusions

A high proportion of mink on farms can be infected with SARS-CoV-2 within a few days, which may provide major virus exposure to persons working with mink. The infections we describe here occurred with little clinical disease or increase in death (Appendix), making it difficult to detect the spread of infection; thus, mink farms could represent a serious, unrecognized animal reservoir for SARS-CoV-2. There is no evidence for spread of the virus outside of farm buildings, either in Denmark or in the Netherlands (5), except by infected persons. However, there appears to be some risk of virus transmission to persons working with infected mink as well as for their contacts and thus, indirectly, for the public.

On farm 1, the virus had probably been introduced some weeks before detection (Table 1). On farm 2, the low frequency (4%) of seropositivity and the high proportion of qRT-PCR positive animals at second sampling (Table 1) suggested that the virus had been recently introduced but was spreading. Indeed, a third sampling (8 days later) showed a much higher seroprevalence (>90%). Conceivably, the variant viruses that appeared in farm 1 and spread to farms 2 and 3 may be better adapted to mink and thus able to transmit rapidly. The infection at farm 3 was detected relatively late, with a high seroprevalence (66%) at first visit.

A likely scenario for the spread of infection in mink in Denmark is that the index human case-patient, who had nt T15656 introduced it into farm 1. Initially, we observed sequence heterogeneity at nt 22920 in mink on farm 1, but subsequently, we detected only the variant form (T22920) on farms 2 and 3 and in subsequent linked human cases (H1–H9) (Table 2). Remarkably, this heterogeneity also occurred on farm NB02 in the Netherlands. This change, possibly together with the mutation at nt 25936 (Table 2), may represent virus adaptation. It is not yet established whether these changes confer advantages in mink, but the variant viruses in farm 2 spread rapidly. It seems that the variant viruses on farm 1 spread to ≥ 1 human and were then transmitted, presumably by human–human contact, to other

persons and to farms 2 and 3. The change at nt 22920 results in substitution Y453F in the S-protein (Table 2). This Y-residue, within the receptor-binding motif of the S-protein, is highly conserved among SARS-related coronaviruses and is close to residue L455 that is critical for interaction with the cellular ACE2 receptor (13).

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Dr. Hammer, an associate professor at the University of Copenhagen, is a veterinary pathologist with special interest and expertise in pathological methods applied in diagnostics, research, and surveillance of diseases in fur animals and wildlife. Her research focus has been mainly on viral diseases of carnivorous species.

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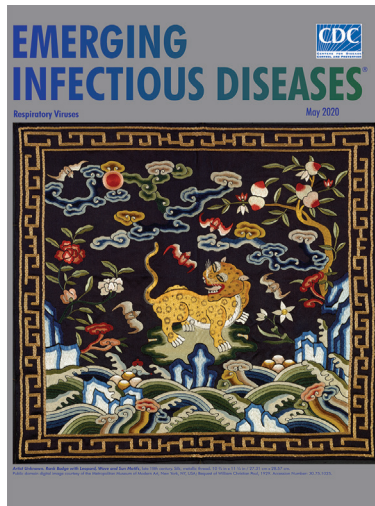
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SARS-CoV-2 Transmission between Mink (*Neovison vison*) and Humans, Denmark

Appendix

Additional Materials and Methods

RT-qPCR

Viral RNAs were extracted from throat, nasal, and fecal swab samples and feed using a MagNaPure 96 robot with the MagNaPure 96 DNA and Viral Small volume kit (Roche, <https://www.roche.com>) and assayed using the E gene RT-qPCR assay (1). Air samples were collected using an AeroCollect electrostatic air sampler (FORCE Technology, <https://forcetechnology.com>). Material captured on filters, during a period of 10–15 min, by the air samplers, was eluted using nuclease-free water and tested directly without prior extraction of RNA. Briefly, eluted samples were screened using the E gene reverse transcription quantitative PCR (RT-qPCR) assay but with the Luna Universal Probe One-Step RT-qPCR Kit, 2x Luna WarmStart RT Enzyme Mix (20X) with added IGEPAL CA-630 (0.3%) (Sigma-Aldrich, <https://www.sigmaaldrich.com>).

Whole Genome Sequencing and Data Analysis

cDNA synthesis was performed with SuperScript IV First Strand Synthesis Kit (Thermo Fisher Scientific, <https://www.thermofisher.com>) according to the manufacturer's specifications. Amplification of the viral cDNA and preparation of the Nanopore sequencing libraries was performed according to the ARTIC sequencing protocol v2 (<https://artic.network/ncov-2019>). Sequence libraries were loaded into a FLO-MIN 106 flow cell and sequenced on a MinION device (Oxford Nanopore Technologies, <https://nanoporetech.com>). High-accuracy base calling was performed using Guppy v3.4.5 (Oxford Nanopore). Reads were imported into CLC Genomics Workbench version 20.04.4 (<http://resources.qiagenbioinformatics.com>). Mapping of long reads against the Wuhan reference sequence (NC_045512.2) was performed using the Long Read support version 20 β 1 (<https://digitalinsights.qiagen.com/plugins/long-read-support>). Raw

reads were trimmed versus the ARCTIC protocol primers and end-trimmed (30 nt). Consensus sequences were generated with a minimum depth of 10 and use of quality-based vote consensus building. All positions with less than 90% site coverage were excluded from the analysis.

A subset of 567 reference sequences used in Nextstrain on June 26, 2020 were downloaded from GISAID; these were selected based on quality and matching the proportionate distribution of the major clades to the set of sequences used in Nextstrain.

The mink-derived sequences and linked human cases belonged to European Clade 20B. This is specifically defined by the mutations G28881A, G28882A, and G28883C and supported by the presence of the mutations C3037T and C14408T (Table 2 in the main article).

Farm Sampling

Sampling and Testing of Mink in Farm 1

Farm 1 was in northern Jutland. It had $\approx 1,800$ adult females and $>9,000$ kits, born around the beginning of May 2020. No excess deaths had occurred but some mild respiratory distress had been observed in a few adult mink. Initially, fecal and nasal swab samples as well as blood samples were collected (Table 1 in the main article). Five of 30 live mink and all 4 deceased mink scored positive by RT-qPCR (Table 1). Furthermore, 29 of 30 animals scored positive by ELISA for anti-SARS-CoV-2 antibodies (Table 1). In contrast, 11 stored mink serum samples, collected in 2016 before the emergence of SARS-CoV-2 in 2019, scored negative in this assay.

In follow-up sampling, 4 of 30 mink kits tested scored SARS-CoV-2 RNA positive (Table 1). Serum samples from all 30 kits and 30 adults scored positive by ELISA. In retesting of 4 adult females that tested positive by RT-qPCR in the initial testing, 3 again tested positive and all 4 were again scored as seropositive (Table 1). Samples of mink feed and of air samples collected from the farm all proved negative in RT-qPCR assays.

Sampling and Analysis of Mink at Farm 2

Farm 2, located ≈ 12 km from farm 1, had ≈ 700 adult female mink and 3,500 kits. One person on this farm, who had contact with the mink, tested positive for SARS-CoV-2 and was linked to infected persons connected to farm 1. Initial sampling from the mink occurred on June 18, 2020, when no clinical signs or excess deaths had been observed. Serum samples from 30 adult mink were assayed by ELISA and one scored positive (Table 1). In addition, samples from

8 live and 8 dead mink were tested by RT-qPCR; 1 throat swab tested strongly positive ($C_t = 20.4$) but none of the rectal swabs did (Table 1). During a follow-up visit on June 22, 40 of the 50 swab samples from mink kits were scored positive by RT-qPCR (Table 1). However, only 1 of the serum samples from these 50 kits tested positive by ELISA. In the adult animals, 46 of 50 throat swab samples were RT-qPCR positive but only 3 serum samples from these animals scored positive by ELISA (Table 1). One of 3 sick mink, with respiratory symptoms, scored strongly positive from testing the throat swab sample ($C_t = 17.6$) and was also seropositive. In addition, an air sample, collected directly from the exhaled air of this mink, scored positive ($C_t = 31.4$).

In the following days, several mink displayed respiratory disease symptoms. On June 30, adult females sampled previously were resampled and some had clear respiratory symptoms and distress. In a period of 8 days, the seroprevalence among the adult mink increased from 6% to >95% and 35 of 37 throat swab samples were again positive by RT-qPCR (Table 1). During June 22–30, 4 of the 50 animals had died. Three of these had high levels of SARS-CoV-2 RNA ($C_t < 25$) in throat swabs; the fourth was unavailable. Three separate mink feed samples were scored negative.

Sampling and Analysis of Mink at Farm 3

Farm 3, with $\approx 1,000$ adult females and almost 4,500 kits is located <1 km from farm 1, and 1 person in contact with the mink had tested positive for SARS-CoV-2. Some clinical signs of respiratory disease had been apparent and 20–30 mink had died in the 2 weeks before initial sampling on June 29, 2020. By ELISA, 20 of the 30 serum samples tested positive (Table 1), suggesting that the infection had been introduced ≥ 1 –2 weeks before this sampling. Throat swabs from 30 live mink were tested in pools; all 6 pools were positive by RT-PCR, as were throat swabs from 5 dead mink. On July 2, during follow-up, 23 of the 30 adult mink were seropositive, as were 24 of the 30 mink kits. All the throat swabs and most of the nasal swabs scored positive by RT-qPCR (Table 1). Air samples collected from near the mink (<1 m from cages) were also positive, but air samples from outside the open buildings (2–3 m from cages) were negative. The mink on farms 1, 2, and 3 have all been culled.

Infection of mink by SARS-CoV-2 has now been detected in Spain ([https://promedmail.org/promed-post/?id = 20200717.7584560](https://promedmail.org/promed-post/?id=20200717.7584560)) and in the United States (<http://www.promedmail.org/post/7692815>).

Reference

<jrn>1. Corman VM, Landt O, Kaiser M, Molenkamp R, Meijer A, Chu DK, et al. Detection of 2019 novel coronavirus (2019-nCoV) by real-time RT-PCR. *Euro Surveill.* 2020;25:2000045. <https://doi.org/10.2807/1560-7917.ES.2020.25.3.2000045></jrn>

Appendix Table 1. Sequence differences between selected samples from mink and humans in Denmark along with reference sequences for defined clades (see also Table 2 in the main article)*

| Sequence | Genomic position (nt) | | | | | | | | | | | |
|---------------------------------|-----------------------|-------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 5'UTR | ORF1a | | | ORF1b | | S | | ORF3a | N | | |
| | 241 | 3037 | 5421 | 9534 | 14408 | 15656 | 22920 | 23403 | 25936 | 28881 | 28882 | 28883 |
| New Zealand /EPI_ISL_456190 | C | C | A | C | C | T | A | A | C | G | G | G |
| Egypt /MT611448.1 | T | T | A | C | T | C | A | G | T | G | G | G |
| Saudi Arabia /EPI_ISL_437692 | T | T | G | C | T | C | A | G | C | G | G | G |
| Sweden /EPI_ISL_469065 | T | T | A | C | T | C | A | G | T | A | A | C |
| Mali /EPI_ISL_487452 | C | C | A | C | C | C | A | A | T | G | G | G |
| EPI_ISL_415504 19A | C | C | A | C | C | C | A | A | C | G | G | G |
| EPI_ISL_435126 19A | C | C | A | C | C | C | A | A | C | G | G | G |
| EPI_ISL_408670 19A | C | C | A | C | C | C | A | A | C | G | G | G |
| EPI_ISL_416885 19B | C | C | A | C | C | C | A | A | C | G | G | G |
| EPI_ISL_408668 19B | C | C | A | C | C | C | A | A | C | G | G | G |
| EPI_ISL_407193 19B | C | C | A | C | C | C | A | A | C | G | G | G |
| EPI_ISL_464200 20A | T | T | A | C | T | C | A | G | C | G | G | G |
| EPI_ISL_418390 20A | T | T | A | C | T | C | A | G | C | G | G | G |
| EPI_ISL_414523 20A | T | T | A | C | T | C | A | G | C | G | G | G |
| EPI_ISL_418397 20B | T | T | A | C | T | C | A | G | C | A | A | C |
| EPI_ISL_452220 20B | T | T | A | C | T | C | A | G | C | A | A | C |
| EPI_ISL_455326 20B | T | T | A | C | T | C | A | G | C | A | A | C |
| EPI_ISL_437095 20C | T | T | A | C | T | C | A | G | C | G | G | G |
| EPI_ISL_419602 20C | T | T | A | C | T | C | A | G | C | G | G | G |
| EPI_ISL_444856 20C DK | T | T | A | C | T | C | A | G | C | G | G | G |
| Mink_AD4_Farm1 | T | T | G | C | T | T | T | G | T | A | A | C |
| Mink_AD6_Farm1 | T | T | A | C | T | T | T | G | T | A | A | C |
| Mink_AD38_Farm 2 | T | T | A | C | T | T | T | G | T | A | A | C |
| Mink_AD40_Farm 3 | T | T | A | C | T | T | T | G | T | A | A | C |
| Mink_AL35_Farm3 | T | T | A | C | T | T | T | G | T | A | A | C |
| H4 | T | T | A | C | T | T | T | G | T | A | A | C |
| H5 | T | T | A | C | T | T | T | G | T | A | A | C |
| H6 | T | T | A | C | T | T | T | G | T | A | A | C |
| H7 | T | T | A | T | T | T | T | G | T | A | A | C |
| H8 | T | T | A | C | T | T | T | G | T | A | A | C |
| NC_045512 (Wuhan) | C | C | A | C | C | C | A | A | C | G | G | G |

*Nucleotide differences from the Wuhan reference sequence are indicated in red. The highlighted changes indicate the location of the sequences from Denmark matching to clade 20B. Selected sequences containing specific mutations shared with the mink sequences from Denmark are also shown.

Appendix Table 2. Heterogeneity at indicated nt in SARS-CoV-2 from the Jutland region of Denmark

| Nt | 241 | 3037 | 5421 | 9534 | 14408 | 15656 | 22920 | 23403 | 25936 | 28881 | 28882 | 28883 |
|----------------------------------|----------|----------|------|------|----------|-------|-------|----------|-------|-------|-------|-------|
| Wuhan (NC045512.2) | C | C | A | C | C | C | A | A | C | G | G | G |
| Humans to 2020 Jul 1, n = 123 | T | T | A | C | T | C>T | A>T | G | C>T | G>A | G>A | G>C |
| A | 0 | 0 | 121 | 0 | 0 | 0 | 77 | 7 | 0 | 51 | 51 | 0 |
| T | 113 | 113 | 0 | 1 | 114 | 46 | 44 | 0 | 46 | 0 | 0 | 0 |
| G | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 113 | 0 | 72 | 72 | 72 |
| C | 8 | 8 | 0 | 121 | 8 | 76 | 0 | 0 | 75 | 0 | 0 | 51 |
| N | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 3 | 2 | 0 | 0 | 0 |
| Humans to 2020 Jun 10, n = 63 | T | T | A | C | T | C | A | G | C | G | G | G |
| A | 0 | 0 | 62 | 0 | 0 | 0 | 61 | 3 | 0 | 4 | 4 | 0 |
| T | 60 | 59 | 0 | 0 | 60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| G | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 58 | 0 | 58 | 58 | 58 |
| C | 3 | 3 | 0 | 62 | 3 | 63 | 0 | 0 | 63 | 0 | 0 | 4 |
| N | 0 | 1 | 1 | 1 | 0 | 0 | 2 | 2 | 0 | 1 | 1 | 1 |

*The predominant nt at the indicated positions in the genome of human samples (63) collected up to 10–06–20 or up to 01–07–20 (123 samples in total) is highlighted in yellow, high frequency variants are highlighted in green. The marked increase in variants in the human population at nt 15656, 22920, 25936 and at 28881–28883 between 10–06–20 and 01–07–20 is apparent. The nts present in the Wuhan reference sequence are indicated in black, the predominant variant at each position is indicated in red and highlighted in yellow, high frequency variants (>40%) are highlighted in green, and minority alternative nts at each position (if any) are indicated in blue.

Appendix Table 3. GISAID acknowledgment table

| Virus name | Accession number | Collected |
|--------------------------------|------------------|------------|
| Romania/Bucuresti-4322/2020 | EPI_ISL_468136 | 22–03–2020 |
| Romania/Suceava-4682/2020 | EPI_ISL_468137 | 22–03–2020 |
| Poland/PL_P29/2020 | EPI_ISL_455442 | 18–03–2020 |
| Norway/1811/2020 | EPI_ISL_420139 | 05–03–2020 |
| CostaRica/02/2020 | EPI_ISL_434535 | 16–03–2020 |
| Thailand/61/2020 | EPI_ISL_403962 | 08–01–2020 |
| Jordan/SR-034/2020 | EPI_ISL_429994 | 17–03–2020 |
| Jordan/SR-045/2020 | EPI_ISL_430003 | 16–03–2020 |
| Jordan/SR-0335/2020 | EPI_ISL_450187 | 08–04–2020 |
| USA/CA2/2020 | EPI_ISL_406036 | 22–01–2020 |
| NewZealand/20VR2065/2020 | EPI_ISL_456356 | 06–04–2020 |
| NewZealand/20VR2085/2020 | EPI_ISL_456369 | 12–04–2020 |
| Austria/CeMM0013/2020 | EPI_ISL_419666 | 11–03–2020 |
| Austria/CeMM0017/2020 | EPI_ISL_419670 | 16–03–2020 |
| Austria/CeMM0020/2020 | EPI_ISL_419673 | 22–03–2020 |
| Austria/CeMM0146/2020 | EPI_ISL_437994 | 28–02–2020 |
| Austria/CeMM0147/2020 | EPI_ISL_437995 | 28–02–2020 |
| Austria/CeMM0156/2020 | EPI_ISL_438002 | 03–03–2020 |
| Austria/CeMM0167/2020 | EPI_ISL_438012 | 06–03–2020 |
| Austria/CeMM0180/2020 | EPI_ISL_438022 | 09–03–2020 |
| Austria/CeMM0186/2020 | EPI_ISL_438028 | 11–03–2020 |
| Austria/CeMM0188/2020 | EPI_ISL_438029 | 13–03–2020 |
| Austria/CeMM0189/2020 | EPI_ISL_438030 | 13–03–2020 |
| Austria/CeMM0191/2020 | EPI_ISL_438032 | 13–03–2020 |
| Austria/CeMM0235/2020 | EPI_ISL_438066 | 19–03–2020 |
| Austria/CeMM0265/2020 | EPI_ISL_438094 | 23–03–2020 |
| Austria/CeMM0267/2020 | EPI_ISL_438096 | 24–03–2020 |
| Austria/CeMM0279/2020 | EPI_ISL_438106 | 25–03–2020 |
| Germany/NW-HHU-03/2020 | EPI_ISL_414498 | 26–02–2020 |
| Germany/NW-HHU-07/2020 | EPI_ISL_414506 | 27–02–2020 |
| Germany/NW-HHU-32/2020 | EPI_ISL_419549 | 15–03–2020 |
| Germany/NW-HHU-36/2020 | EPI_ISL_425120 | 16–03–2020 |
| Germany/NW-HHU-49/2020 | EPI_ISL_425133 | 10–03–2020 |
| Germany/NW-HHU-52/2020 | EPI_ISL_425136 | 14–03–2020 |
| Taiwan/78/2020 | EPI_ISL_428490 | 16–03–2020 |
| Germany/MV-Cento-70004280/2020 | EPI_ISL_459963 | 01–04–2020 |
| Latvia/021/2020 | EPI_ISL_450521 | 28–04–2020 |

| Virus name | Accession number | Collected |
|-------------------------------------|------------------|------------|
| Latvia/022/2020 | EPI_ISL_450522 | 28-04-2020 |
| France/N1620/2020 | EPI_ISL_414624 | 26-02-2020 |
| France/HF1465/2020 | EPI_ISL_418218 | 21-02-2020 |
| France/HF2150/2020 | EPI_ISL_418224 | 08-03-2020 |
| France/ARA12269/2020 | EPI_ISL_419187 | 22-03-2020 |
| France/Valence_532/2020 | EPI_ISL_416749 | 04-03-2020 |
| Portugal/PT0001b/2020 | EPI_ISL_417986 | 03-03-2020 |
| France/HF3295/2020 | EPI_ISL_421511 | 23-03-2020 |
| France/HF3677/2020 | EPI_ISL_428359 | 23-03-2020 |
| Germany/BY-ChVir-929/2020 | EPI_ISL_406862 | 28-01-2020 |
| Japan/P2-1/2020 | EPI_ISL_419297 | 10-03-2020 |
| Bangladesh/CHRF-0001/2020 | EPI_ISL_437912 | 18-04-2020 |
| Bangladesh/CHRF-0003/2020 | EPI_ISL_468071 | 17-04-2020 |
| France/B2335/2020 | EPI_ISL_416504 | 02-03-2020 |
| France/B5685/2020 | EPI_ISL_443291 | 02-04-2020 |
| France/B5434/2020 | EPI_ISL_443279 | 01-04-2020 |
| France/B5456/2020 | EPI_ISL_443281 | 03-04-2020 |
| France/BFC5012/2020 | EPI_ISL_443262 | 02-04-2020 |
| France/OCC-13/2020 | EPI_ISL_434628 | 07-04-2020 |
| France/OCC-14/2020 | EPI_ISL_434629 | 07-04-2020 |
| BosniaandHerzegovina/ChVir7343/2020 | EPI_ISL_462451 | 19-03-2020 |
| BosniaandHerzegovina/ChVir7346/2020 | EPI_ISL_462453 | 20-03-2020 |
| BosniaandHerzegovina/ChVir7347/2020 | EPI_ISL_462454 | 20-03-2020 |
| BosniaandHerzegovina/ChVir7349/2020 | EPI_ISL_462456 | 20-03-2020 |
| BosniaandHerzegovina/ChVir7365/2020 | EPI_ISL_462467 | 26-03-2020 |
| BosniaandHerzegovina/ChVir7370/2020 | EPI_ISL_462471 | 28-03-2020 |
| France/IDF2792/2020 | EPI_ISL_420043 | 18-03-2020 |
| Spain/CM-IBV-003903/2020 | EPI_ISL_474831 | 19-05-2020 |
| Kuwait/KU17/2020 | EPI_ISL_416542 | 02-03-2020 |
| Kuwait/KU09/2020 | EPI_ISL_416541 | 02-03-2020 |
| Iceland/170/2020 | EPI_ISL_417548 | 17-03-2020 |
| Belgium/ULG-10006/2020 | EPI_ISL_421185 | 30-03-2020 |
| Belgium/ULG-10024/2020 | EPI_ISL_421198 | 30-03-2020 |
| Belgium/ULG-10081/2020 | EPI_ISL_424640 | 03-04-2020 |
| Belgium/ULG-10088/2020 | EPI_ISL_424646 | 04-04-2020 |
| Belgium/ULG-10082/2020 | EPI_ISL_424649 | 04-04-2020 |
| Belgium/ULG-10170/2020 | EPI_ISL_455958 | 11-05-2020 |
| Belgium/ULG-10175/2020 | EPI_ISL_455963 | 08-05-2020 |
| Belgium/ULG-10182/2020 | EPI_ISL_455970 | 10-05-2020 |
| Belgium/ULG-10192/2020 | EPI_ISL_471427 | 20-05-2020 |
| Denmark/ALAB-HH11/2020 | EPI_ISL_429270 | 10-03-2020 |
| Denmark/ALAB-HH-104/2020 | EPI_ISL_451990 | 08-03-2020 |
| Denmark/ALAB-HH-156/2020 | EPI_ISL_452031 | 19-03-2020 |
| Denmark/ALAB-HH-177/2020 | EPI_ISL_452045 | 14-04-2020 |
| Denmark/ALAB-HH-213/2020 | EPI_ISL_452068 | 27-04-2020 |
| Denmark/ALAB-HH-233/2020 | EPI_ISL_452077 | 28-04-2020 |
| Denmark/ALAB-HH-244/2020 | EPI_ISL_452082 | 19-04-2020 |
| Denmark/ALAB-HH-262/2020 | EPI_ISL_452093 | 14-04-2020 |
| HongKong/HKPU52-3101/2020 | EPI_ISL_419224 | 13-02-2020 |
| France/IDF0372/2020 | EPI_ISL_406596 | 23-01-2020 |
| Italy/ABR-IZSGC-484/2020 | EPI_ISL_457749 | 27-02-2020 |
| Switzerland/ZH-UZH-1000477377/2020 | EPI_ISL_413020 | 27-02-2020 |
| Malaysia/188407/2020 | EPI_ISL_417918 | 18-03-2020 |
| Cyprus/006/2020 | EPI_ISL_463746 | 11-04-2020 |
| Cyprus/008/2020 | EPI_ISL_463748 | 27-04-2020 |
| England/CAMB-7FB83/2020 | EPI_ISL_433484 | 17-04-2020 |
| England/CAMB-7B853/2020 | EPI_ISL_442170 | 05-04-2020 |
| England/CAMB-8320F/2020 | EPI_ISL_443398 | 14-04-2020 |
| England/CAMB-1AD06E/2020 | EPI_ISL_447960 | 30-04-2020 |
| England/CAMB-1B3EF2/2020 | EPI_ISL_473454 | 08-06-2020 |
| England/CAMB-1B479C/2020 | EPI_ISL_473483 | 03-06-2020 |
| England/CAMB-1B493C/2020 | EPI_ISL_473487 | 04-06-2020 |
| Germany/BY-ChVir-1482/2020 | EPI_ISL_450207 | 07-02-2020 |
| Germany/BY-ChVir-1483/2020 | EPI_ISL_450208 | 08-02-2020 |
| Finland/13M33/2020 | EPI_ISL_418390 | 13-03-2020 |
| Finland/13M57/2020 | EPI_ISL_418391 | 13-03-2020 |
| Finland/13M65/2020 | EPI_ISL_418395 | 13-03-2020 |
| Finland/13M77/2020 | EPI_ISL_418397 | 13-03-2020 |
| Finland/13M82/2020 | EPI_ISL_418399 | 13-03-2020 |

| Virus name | Accession number | Collected |
|---------------------------------------|------------------|------------|
| Finland/14M26/2020 | EPI_ISL_418406 | 14-03-2020 |
| Pakistan/NIH-45090/2020 | EPI_ISL_468161 | 02-06-2020 |
| Denmark/ALAB-SSI120/2020 | EPI_ISL_429349 | 08-03-2020 |
| Denmark/ALAB-SSI126/2020 | EPI_ISL_429354 | 08-03-2020 |
| Denmark/ALAB-SSI150/2020 | EPI_ISL_429368 | 09-03-2020 |
| Denmark/ALAB-SSI237/2020 | EPI_ISL_429415 | 10-03-2020 |
| Denmark/ALAB-SSI365/2020 | EPI_ISL_429473 | 23-03-2020 |
| Denmark/ALAB-SSI394/2020 | EPI_ISL_429489 | 24-03-2020 |
| Denmark/ALAB-SSI514/2020 | EPI_ISL_429582 | 16-03-2020 |
| Denmark/ALAB-SSI-1102/2020 | EPI_ISL_437635 | 18-03-2020 |
| Denmark/ALAB-SSI-133/2020 | EPI_ISL_437642 | 08-03-2020 |
| Denmark/ALAB-SSI-1406/2020 | EPI_ISL_437651 | 04-04-2020 |
| Denmark/ALAB-SSI-991/2020 | EPI_ISL_437683 | 01-04-2020 |
| Denmark/ALAB-SSI-1239/2020 | EPI_ISL_444819 | 11-03-2020 |
| Denmark/ALAB-SSI-1245/2020 | EPI_ISL_444824 | 11-03-2020 |
| Denmark/ALAB-SSI-1390/2020 | EPI_ISL_444855 | 03-04-2020 |
| Denmark/ALAB-SSI-1391/2020 | EPI_ISL_444856 | 04-04-2020 |
| Denmark/ALAB-SSI-735/2020 | EPI_ISL_444881 | 27-03-2020 |
| Denmark/ALAB-SSI-848/2020 | EPI_ISL_444939 | 30-03-2020 |
| Denmark/ALAB-SSI-856/2020 | EPI_ISL_444944 | 29-03-2020 |
| Denmark/ALAB-SSI-861/2020 | EPI_ISL_444946 | 29-03-2020 |
| Norway/2387/2020 | EPI_ISL_449792 | 05-04-2020 |
| Japan/OS-20-07-1/2020 | EPI_ISL_410532 | 23-01-2020 |
| Austria/Graz-MUG5/2020 | EPI_ISL_437201 | 02-04-2020 |
| Austria/Graz-MUG8/2020 | EPI_ISL_437298 | 08-04-2020 |
| Austria/Graz-MUG16/2020 | EPI_ISL_437302 | 17-04-2020 |
| SouthKorea/KCDC2002/2020 | EPI_ISL_425118 | 30-01-2020 |
| Netherlands/NA_32/2020 | EPI_ISL_415489 | 13-03-2020 |
| Netherlands/NoordBrabant_47/2020 | EPI_ISL_415504 | 09-03-2020 |
| Netherlands/Gelderland_10/2020 | EPI_ISL_422638 | 20-03-2020 |
| Netherlands/NA_137/2020 | EPI_ISL_422681 | 19-03-2020 |
| Netherlands/NA_194/2020 | EPI_ISL_422729 | 23-03-2020 |
| Netherlands/NA_195/2020 | EPI_ISL_422730 | 24-03-2020 |
| Netherlands/NoordBrabant_69/2020 | EPI_ISL_422865 | 02-03-2020 |
| Netherlands/ZuidHolland_76/2020 | EPI_ISL_422944 | 26-03-2020 |
| Netherlands/ZuidHolland_81/2020 | EPI_ISL_422949 | 27-03-2020 |
| Netherlands/ZuidHolland_83/2020 | EPI_ISL_422951 | 27-03-2020 |
| Netherlands/ZuidHolland_84/2020 | EPI_ISL_422952 | 27-03-2020 |
| Netherlands/NoordHolland_10001/2020 | EPI_ISL_454750 | 27-02-2020 |
| Netherlands/Utrecht_10026/2020 | EPI_ISL_454775 | 01-04-2020 |
| Netherlands/Utrecht_10030/2020 | EPI_ISL_454779 | 04-04-2020 |
| Netherlands/NA_592/2020 | EPI_ISL_455289 | 09-04-2020 |
| Netherlands/NoordBrabant_107/2020 | EPI_ISL_455291 | 04-04-2020 |
| Netherlands/Friesland_20/2020 | EPI_ISL_460642 | 07-04-2020 |
| Netherlands/Gelderland_22/2020 | EPI_ISL_460658 | 16-04-2020 |
| Netherlands/Gelderland_116/2020 | EPI_ISL_460877 | 22-05-2020 |
| Netherlands/Gelderland_143/2020 | EPI_ISL_460903 | 22-05-2020 |
| Netherlands/Gelderland_148/2020 | EPI_ISL_460908 | 22-05-2020 |
| Netherlands/Gelderland_151/2020 | EPI_ISL_460911 | 22-05-2020 |
| Netherlands/Gelderland_30/2020 | EPI_ISL_460930 | 06-04-2020 |
| Netherlands/Gelderland_62/2020 | EPI_ISL_460961 | 18-05-2020 |
| Netherlands/Gelderland_64/2020 | EPI_ISL_460963 | 18-05-2020 |
| Netherlands/Gelderland_67/2020 | EPI_ISL_460966 | 18-05-2020 |
| Netherlands/Gelderland_96/2020 | EPI_ISL_460995 | 21-05-2020 |
| Netherlands/Limburg_11/2020 | EPI_ISL_460999 | 08-05-2020 |
| Netherlands/NA_666/2020 | EPI_ISL_461101 | 29-02-2020 |
| Netherlands/NoordHolland_24/2020 | EPI_ISL_461214 | 06-05-2020 |
| Netherlands/Utrecht_32/2020 | EPI_ISL_461230 | 23-04-2020 |
| Netherlands/Zeeland_41/2020 | EPI_ISL_461280 | 06-04-2020 |
| Netherlands/Zeeland_6/2020 | EPI_ISL_461288 | 02-04-2020 |
| Latvia/03/2020 | EPI_ISL_421655 | 25-03-2020 |
| Latvia/07/2020 | EPI_ISL_426287 | 30-03-2020 |
| Latvia/08/2020 | EPI_ISL_426288 | 30-03-2020 |
| Brazil/AP-IEC-161167/2020 | EPI_ISL_450873 | 17-03-2020 |
| Chile/Santiago-05015/2020 | EPI_ISL_468751 | 29-04-2020 |
| Russia/SCPM-O-03/2020 | EPI_ISL_451965 | 20-03-2020 |
| BosniaandHerzegovina/04-Sarajevo/2020 | EPI_ISL_467300 | 08-04-2020 |
| Bangladesh/JUST-GC40.86/2020 | EPI_ISL_475573 | 11-06-2020 |
| India/GJ-GBRC174a/2020 | EPI_ISL_467037 | 05-06-2020 |

| Virus name | Accession number | Collected |
|----------------------------|------------------|------------|
| Germany/HE-FFM4/2020 | EPI_ISL_452220 | 02-03-2020 |
| Sweden/20-08801/2020 | EPI_ISL_475120 | 04-04-2020 |
| Poland/1109201/2020 | EPI_ISL_450525 | 28-03-2020 |
| Poland/1109500/2020 | EPI_ISL_450526 | 29-03-2020 |
| Poland/1111628/2020 | EPI_ISL_450530 | 01-04-2020 |
| HongKong/VM20002849/2020 | EPI_ISL_414571 | 22-02-2020 |
| Belgium/ITM_C161/2020 | EPI_ISL_450728 | 29-03-2020 |
| Belgium/ITM_C237/2020 | EPI_ISL_450732 | 01-04-2020 |
| Chile/Santiago_74/2020 | EPI_ISL_445370 | 05-04-2020 |
| Spain/MD-IBV-003699/2020 | EPI_ISL_467231 | 02-04-2020 |
| Spain/MD-IBV-003702/2020 | EPI_ISL_467235 | 02-04-2020 |
| Chile/Chillan_2/2020 | EPI_ISL_445331 | 12-03-2020 |
| Norway/1989/2020 | EPI_ISL_420147 | 10-03-2020 |
| Brazil/SP-06/2020 | EPI_ISL_414015 | 29-02-2020 |
| Spain/CT-HUVH-VH9434/2020 | EPI_ISL_444987 | 26-03-2020 |
| Spain/PV-IBV-000792/2020 | EPI_ISL_452722 | 09-03-2020 |
| Spain/PV-IBV-000779/2020 | EPI_ISL_452726 | 09-03-2020 |
| Spain/PV-IBV-000760/2020 | EPI_ISL_452731 | 10-03-2020 |
| Spain/CN-ISCI3-201939/2020 | EPI_ISL_455326 | 29-02-2020 |
| Spain/AN-IBV-001895/2020 | EPI_ISL_452453 | 15-03-2020 |
| Spain/GA-IBV-002922/2020 | EPI_ISL_474854 | 21-03-2020 |
| Spain/AN-IBV-003033/2020 | EPI_ISL_474935 | 06-04-2020 |
| Spain/AN-ISCI3-201623/2020 | EPI_ISL_455322 | 05-03-2020 |
| Sweden/20-07833/2020 | EPI_ISL_450819 | 24-04-2020 |
| Sweden/20-14647/2020 | EPI_ISL_469059 | 14-05-2020 |
| Sweden/20-04631/2020 | EPI_ISL_430847 | 27-02-2020 |
| Iran/HGRC-2-2162/2020 | EPI_ISL_437512 | 26-03-2020 |
| India/WB-S52/2020 | EPI_ISL_455672 | 03-05-2020 |
| Russia/Moscow_PMVL-7/2020 | EPI_ISL_470900 | 20-03-2020 |
| Italy/LAZ-INMI1-cs/2020 | EPI_ISL_410546 | 29-01-2020 |
| Italy/LAZ-INMI4/2020 | EPI_ISL_417922 | 28-02-2020 |
| Senegal/003/2020 | EPI_ISL_418206 | 28-02-2020 |
| Senegal/016/2020 | EPI_ISL_418207 | 02-03-2020 |
| Croatia/I7-S21new/2020 | EPI_ISL_454606 | 30-03-2020 |
| Croatia/AU-S10new/2020 | EPI_ISL_468656 | 09-04-2020 |
| Poland/IHG_PAS_1_69/2020 | EPI_ISL_450294 | 11-04-2020 |
| Wuhan/IPBCAMS-WH-04/2019 | EPI_ISL_403929 | 30-12-2019 |
| Slovakia/SK-BMC5/2020 | EPI_ISL_417879 | 06-03-2020 |
| Slovakia/SK-BMC6/2020 | EPI_ISL_417880 | 08-03-2020 |
| Portugal/PT0049/2020 | EPI_ISL_421452 | 18-03-2020 |
| Brazil/DF-0001/2020 | EPI_ISL_426580 | 13-03-2020 |
| Israel/CVL-n-6051/2020 | EPI_ISL_474961 | 09-04-2020 |
| Italy/APU-UniMI-804/2020 | EPI_ISL_469019 | 20-03-2020 |
| Italy/APU-UniMI-809/2020 | EPI_ISL_469020 | 19-03-2020 |
| Italy/APU-UniMI-847/2020 | EPI_ISL_469022 | 20-03-2020 |
| Kuwait/KU005/2020 | EPI_ISL_422426 | 16-03-2020 |
| Jamaica/JM-CDC-0078/2020 | EPI_ISL_450792 | 11-03-2020 |
| Jamaica/JM-CDC-4376/2020 | EPI_ISL_450794 | 11-03-2020 |
| Pakistan/KHI1/2020 | EPI_ISL_451958 | 16-03-2020 |
| Japan/DP0134/2020 | EPI_ISL_416577 | 15-02-2020 |
| Japan/DP0482/2020 | EPI_ISL_416606 | 16-02-2020 |
| Sweden/20-50144/2020 | EPI_ISL_454884 | 04-03-2020 |
| Sweden/20-50155/2020 | EPI_ISL_454888 | 04-03-2020 |
| Sweden/20-50094/2020 | EPI_ISL_455850 | 04-03-2020 |
| Sweden/20-50259/2020 | EPI_ISL_455897 | 07-03-2020 |
| Sweden/20-50261/2020 | EPI_ISL_469078 | 07-03-2020 |
| Japan/Donner29/2020 | EPI_ISL_469287 | 01-05-2020 |
| Japan/Donner26/2020 | EPI_ISL_438970 | 25-03-2020 |
| Sweden/20-50130/2020 | EPI_ISL_429141 | 06-03-2020 |
| Sweden/RV-FOI-4/2020 | EPI_ISL_428148 | 18-03-2020 |
| Sweden/20-06909/2020 | EPI_ISL_450811 | 06-04-2020 |
| SouthKorea/KCDC03/2020 | EPI_ISL_407193 | 25-01-2020 |
| Belgium/BC-03016/2020 | EPI_ISL_415157 | 01-03-2020 |
| Belgium/MAC-0324142/2020 | EPI_ISL_420399 | 24-03-2020 |
| Belgium/FAE-030948/2020 | EPI_ISL_420445 | 09-03-2020 |
| Belgium/Rega-0329227/2020 | EPI_ISL_458197 | 29-03-2020 |
| Belgium/Rega-0329233/2020 | EPI_ISL_458203 | 29-03-2020 |
| Belgium/Rega-0330253/2020 | EPI_ISL_458223 | 30-03-2020 |
| Belgium/RJ-0507419/2020 | EPI_ISL_462273 | 07-05-2020 |

| Virus name | Accession number | Collected |
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| Belgium/HI-0507421/2020 | EPI_ISL_462275 | 07-05-2020 |
| Belgium/rega-0407283/2020 | EPI_ISL_464077 | 07-04-2020 |
| Belgium/SA-0409296/2020 | EPI_ISL_464090 | 09-04-2020 |
| Sweden/20-51337/2020 | EPI_ISL_475542 | 08-05-2020 |
| Belgium/UGent-24/2020 | EPI_ISL_425063 | 24-03-2020 |
| Belgium/UGent-98/2020 | EPI_ISL_468746 | 17-03-2020 |
| Belgium/UGent-112/2020 | EPI_ISL_475072 | 18-03-2020 |
| France/IDF5986/2020 | EPI_ISL_443305 | 13-04-2020 |
| France/IDF5650/2020 | EPI_ISL_443284 | 02-04-2020 |
| France/IDF5655/2020 | EPI_ISL_443285 | 02-04-2020 |
| Canada/QC_AC6.1/2020 | EPI_ISL_463904 | 05-04-2020 |
| Canada/QC_BC5/2020 | EPI_ISL_463968 | 09-04-2020 |
| Switzerland/AG-SNRCI-29940361/2020 | EPI_ISL_413999 | 27-02-2020 |
| Switzerland/BL-SNRCI-29950902/2020 | EPI_ISL_414021 | 27-02-2020 |
| Luxembourg/LNS7991123/2020 | EPI_ISL_421753 | 17-03-2020 |
| Luxembourg/LNS6969569/2020 | EPI_ISL_428943 | 01-04-2020 |
| Luxembourg/LNS6854244/2020 | EPI_ISL_428956 | 01-04-2020 |
| Luxembourg/LNS9322962/2020 | EPI_ISL_428961 | 03-04-2020 |
| Luxembourg/LNS0756265/2020 | EPI_ISL_429725 | 30-03-2020 |
| Luxembourg/LNS3212178/2020 | EPI_ISL_429728 | 26-03-2020 |
| Luxembourg/LNS0481305/2020 | EPI_ISL_429729 | 22-03-2020 |
| Luxembourg/LNS7438855/2020 | EPI_ISL_429730 | 09-04-2020 |
| Luxembourg/LNS4107430/2020 | EPI_ISL_429772 | 28-03-2020 |
| Luxembourg/LNS7299024/2020 | EPI_ISL_429775 | 23-03-2020 |
| Luxembourg/LNS0994857/2020 | EPI_ISL_429777 | 24-03-2020 |
| Luxembourg/LNS9865959/2020 | EPI_ISL_445056 | 22-04-2020 |
| Luxembourg/LNS9063347/2020 | EPI_ISL_445067 | 21-04-2020 |
| Luxembourg/LNS7342327/2020 | EPI_ISL_459905 | 12-05-2020 |
| Luxembourg/LNS1874423/2020 | EPI_ISL_419573 | 11-03-2020 |
| Luxembourg/LNS3879580/2020 | EPI_ISL_419585 | 14-03-2020 |
| Luxembourg/LNS4836560/2020 | EPI_ISL_419588 | 16-03-2020 |
| Luxembourg/LNS4845603/2020 | EPI_ISL_419589 | 15-03-2020 |
| Luxembourg/LNS8188502/2020 | EPI_ISL_419598 | 14-03-2020 |
| Luxembourg/LNS9324837/2020 | EPI_ISL_419602 | 12-03-2020 |
| Luxembourg/LNS9627078/2020 | EPI_ISL_419604 | 15-03-2020 |
| Sweden/20-08719/2020 | EPI_ISL_429135 | 02-04-2020 |
| Sweden/20-08715/2020 | EPI_ISL_450836 | 02-04-2020 |
| Uruguay/UY-NYUMC869/2020 | EPI_ISL_457965 | 03-04-2020 |
| Peru/LIM-010/2020 | EPI_ISL_415787 | 10-03-2020 |
| Romania/283584/2020 | EPI_ISL_455469 | 12-05-2020 |
| Romania/284056/2020 | EPI_ISL_455473 | 14-05-2020 |
| Romania/284762/2020 | EPI_ISL_455475 | 14-05-2020 |
| Romania/284371/2020 | EPI_ISL_455477 | 13-05-2020 |
| Romania/Buzau-291946/2020 | EPI_ISL_471416 | 01-06-2020 |
| Romania/Buzau-293197/2020 | EPI_ISL_471419 | 03-06-2020 |
| Taiwan/CGMH-CGU-12/2020 | EPI_ISL_417525 | 14-03-2020 |
| Taiwan/CGMH-CGU-26/2020 | EPI_ISL_452178 | 19-04-2020 |
| Greece/12/2020 | EPI_ISL_418264 | 18-03-2020 |
| Greece/16/2020 | EPI_ISL_418265 | 18-03-2020 |
| Greece/38/2020 | EPI_ISL_434460 | 23-03-2020 |
| Greece/220_35357/2020 | EPI_ISL_437887 | 18-03-2020 |
| Greece/33_36910/2020 | EPI_ISL_437893 | 29-03-2020 |
| Greece/42_36236/2020 | EPI_ISL_437899 | 23-03-2020 |
| Greece/56_37161/2020 | EPI_ISL_437911 | 31-03-2020 |
| Poland/Pom4/2020 | EPI_ISL_451645 | 02-05-2020 |
| Italy/FVG-ICGEB-S5/2020 | EPI_ISL_417419 | 01-03-2020 |
| Italy/FVG-ICGEB-S18/2020 | EPI_ISL_428854 | 30-03-2020 |
| Italy/FVG-ICGEB-S1/2020 | EPI_ISL_417418 | 01-03-2020 |
| Italy/LAZ-INMI1-B2/2020 | EPI_ISL_451299 | 04-02-2020 |
| Italy/LAZ-INMI1-N/2020 | EPI_ISL_451300 | 03-02-2020 |
| Italy/LAZ-INMI11-B/2020 | EPI_ISL_451304 | 23-03-2020 |
| Kazakhstan/38716/2020 | EPI_ISL_454575 | 09-05-2020 |
| NewZealand/20VR1278/2020 | EPI_ISL_456203 | 20-03-2020 |
| Latvia/010/2020 | EPI_ISL_437089 | 23-03-2020 |
| Latvia/016/2020 | EPI_ISL_437095 | 23-03-2020 |
| England/LIVE-A0293/2020 | EPI_ISL_472098 | 02-06-2020 |
| England/LIVE-A0767/2020 | EPI_ISL_472133 | 02-06-2020 |
| Morocco/RMPS-04/2020 | EPI_ISL_469052 | 30-03-2020 |
| Australia/QLDID929/2020 | EPI_ISL_420878 | 24-03-2020 |

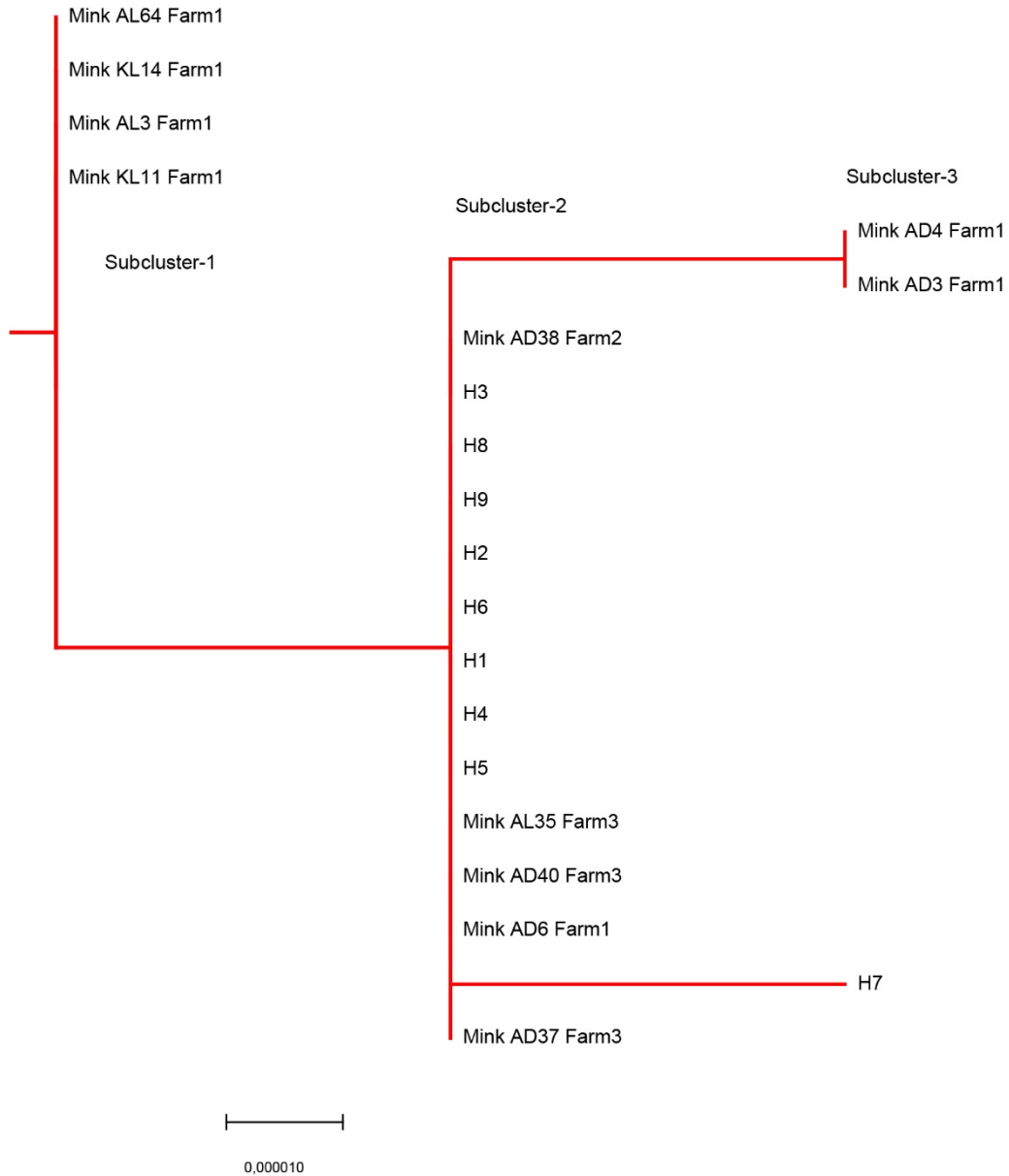
| Virus name | Accession number | Collected |
|----------------------------------|------------------|------------|
| Germany/BY-MVP-0028/2020 | EPI_ISL_437227 | 13-04-2020 |
| Germany/BY-MVP-0037/2020 | EPI_ISL_437236 | 22-03-2020 |
| Germany/BY-MVP-0040/2020 | EPI_ISL_437239 | 02-04-2020 |
| Germany/BY-MVP-0051/2020 | EPI_ISL_437250 | 12-03-2020 |
| Germany/BY-MVP-0055/2020 | EPI_ISL_437254 | 17-03-2020 |
| Germany/BY-MVP-0061/2020 | EPI_ISL_437260 | 22-03-2020 |
| Germany/BY-MVP-0070/2020 | EPI_ISL_437266 | 26-03-2020 |
| Germany/BY-MVP-0088/2020 | EPI_ISL_437282 | 01-04-2020 |
| Germany/BY-MVP-0098/2020 | EPI_ISL_452104 | 04-04-2020 |
| Germany/BY-MVP-0185/2020 | EPI_ISL_466878 | 13-04-2020 |
| Germany/BY-MVP-0218/2020 | EPI_ISL_466891 | 22-04-2020 |
| Germany/BY-MVP-0246/2020 | EPI_ISL_466901 | 30-04-2020 |
| Germany/BY-MVP-0247/2020 | EPI_ISL_466902 | 30-04-2020 |
| Germany/BY-MVP-0268/2020 | EPI_ISL_466910 | 17-05-2020 |
| Germany/BY-MVP-0277/2020 | EPI_ISL_466920 | 25-05-2020 |
| Germany/BY-MVP-0287/2020 | EPI_ISL_466921 | 25-05-2020 |
| Germany/BY-MVP-0289/2020 | EPI_ISL_466922 | 25-05-2020 |
| Germany/BY-MVP-0294/2020 | EPI_ISL_466924 | 26-05-2020 |
| Germany/BY-MVP-V2012622/2020 | EPI_ISL_420911 | 19-03-2020 |
| USA/MI-MDHHS-SC20321/2020 | EPI_ISL_447118 | 27-03-2020 |
| USA/MI-MDHHS-SC20413/2020 | EPI_ISL_452287 | 14-03-2020 |
| Turkey/HSGM-8001/2020 | EPI_ISL_428720 | 21-03-2020 |
| Turkey/HSGM-8964/2020 | EPI_ISL_428723 | 22-03-2020 |
| Turkey/HSGM-4505/2020 | EPI_ISL_429867 | 17-03-2020 |
| Turkey/HSGM-10241/2020 | EPI_ISL_429871 | 23-03-2020 |
| Turkey/HSGM-1428/2020 | EPI_ISL_437311 | 27-03-2020 |
| Turkey/HSGM-302/2020 | EPI_ISL_437313 | 27-03-2020 |
| Turkey/HSGM-510/2020 | EPI_ISL_437314 | 26-03-2020 |
| Turkey/HSGM-1027/2020 | EPI_ISL_437317 | 27-03-2020 |
| Turkey/HSGM-1490/2020 | EPI_ISL_437319 | 19-03-2020 |
| Turkey/HSGM-1492/2020 | EPI_ISL_437320 | 19-03-2020 |
| Turkey/HSGM-1476/2020 | EPI_ISL_437324 | 19-03-2020 |
| Turkey/HSGM-1458/2020 | EPI_ISL_437327 | 19-03-2020 |
| Turkey/HSGM-1014/2020 | EPI_ISL_437331 | 25-03-2020 |
| Turkey/HSGM-4698/2020 | EPI_ISL_437332 | 18-03-2020 |
| Turkey/HSGM-12059/2020 | EPI_ISL_437335 | 25-03-2020 |
| USA/MN-MDH-1071/2020 | EPI_ISL_470751 | 03-06-2020 |
| UnitedArabEmirates/L0184/2020 | EPI_ISL_435121 | 25-02-2020 |
| UnitedArabEmirates/L0904/2020 | EPI_ISL_435126 | 25-02-2020 |
| UnitedArabEmirates/L2409/2020 | EPI_ISL_435131 | 25-02-2020 |
| UnitedArabEmirates/L7356/2020 | EPI_ISL_435140 | 12-03-2020 |
| UnitedArabEmirates/L4711/2020 | EPI_ISL_469278 | 24-03-2020 |
| Russia/CRIE160583/2020 | EPI_ISL_462149 | 30-03-2020 |
| SouthAfrica/KRISP-0055/2020 | EPI_ISL_467444 | 24-03-2020 |
| SouthAfrica/KRISP-0131/2020 | EPI_ISL_467483 | 13-05-2020 |
| SouthAfrica/KRISP-0147/2020 | EPI_ISL_467497 | 30-05-2020 |
| Italy/LOM-INMI-13075-B/2020 | EPI_ISL_451308 | 01-03-2020 |
| Italy/LOM-INMI-BG-11639/2020 | EPI_ISL_460080 | 28-02-2020 |
| Italy/LOM-INMI-7070/2020 | EPI_ISL_460086 | 24-02-2020 |
| Italy/LOM-INMI-5925/2020 | EPI_ISL_460091 | 22-02-2020 |
| Italy/LOM-INMI-9675/2020 | EPI_ISL_460095 | 26-02-2020 |
| CzechRepublic/IAB_16/2020 | EPI_ISL_426891 | 26-03-2020 |
| CzechRepublic/IAB_20/2020 | EPI_ISL_426894 | 27-03-2020 |
| Thailand/Phuket_247/2020 | EPI_ISL_447914 | 25-01-2020 |
| Sweden/20-07295/2020 | EPI_ISL_452235 | 15-04-2020 |
| Sweden/20-06459/2020 | EPI_ISL_445224 | 25-03-2020 |
| Sweden/20-51678/2020 | EPI_ISL_469069 | 25-05-2020 |
| Sweden/20-07440/2020 | EPI_ISL_434671 | 16-04-2020 |
| Sweden/20-14696/2020 | EPI_ISL_469060 | 15-05-2020 |
| Kazakhstan/7263/2020 | EPI_ISL_454571 | 25-03-2020 |
| India/DL-NCDC-01711/2020 | EPI_ISL_435066 | 18-03-2020 |
| India/DL-NCDC-01757/2020 | EPI_ISL_435068 | 18-03-2020 |
| Singapore/3/2020 | EPI_ISL_407988 | 01-02-2020 |
| Vietnam/VR03-38142/2020 | EPI_ISL_408668 | 24-01-2020 |
| Bangladesh/BCSIR-NILMRC-103/2020 | EPI_ISL_475084 | 07-06-2020 |
| Malaysia/MKAK-CL-2020-5045/2020 | EPI_ISL_416829 | 24-01-2020 |
| Malaysia/MKAK-CL-2020-5096/2020 | EPI_ISL_416885 | 30-01-2020 |
| Singapore/9/2020 | EPI_ISL_410715 | 04-02-2020 |
| Singapore/10/2020 | EPI_ISL_410716 | 04-02-2020 |

| Virus name | Accession number | Collected |
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| Singapore/97/2020 | EPI_ISL_443189 | 18-03-2020 |
| Singapore/352/2020 | EPI_ISL_469107 | 28-05-2020 |
| Brunei/2/2020 | EPI_ISL_435674 | 11-03-2020 |
| Brunei/4/2020 | EPI_ISL_435676 | 21-03-2020 |
| Brunei/1/2020 | EPI_ISL_443187 | 11-03-2020 |
| Guam/GU_NHG_03/2020 | EPI_ISL_445000 | 20-03-2020 |
| Nigeria/KW017-CV24/2020 | EPI_ISL_455362 | 10-04-2020 |
| Nigeria/OS075-CV12/2020 | EPI_ISL_455423 | 29-03-2020 |
| Nigeria/OS085-CV14/2020 | EPI_ISL_455424 | 29-03-2020 |
| Ghana/3177_S12/2020 | EPI_ISL_422403 | 30-03-2020 |
| CzechRepublic/ChVir1912/2020 | EPI_ISL_416743 | 05-03-2020 |
| USA/NY-NYUMC279/2020 | EPI_ISL_428793 | 05-04-2020 |
| Oman/205033013/2020 | EPI_ISL_458116 | 01-05-2020 |
| Oman/205028472/2020 | EPI_ISL_458119 | 11-04-2020 |
| Oman/RESP-20-837/2020 | EPI_ISL_457704 | 24-02-2020 |
| Sweden/20-07010/2020 | EPI_ISL_434661 | 07-04-2020 |
| Sweden/20-07480/2020 | EPI_ISL_434673 | 16-04-2020 |
| Norway/1380/2020 | EPI_ISL_417484 | 26-02-2020 |
| Norway/1493/2020 | EPI_ISL_417488 | 29-02-2020 |
| Italy/ABR-IZSGC-6193/2020 | EPI_ISL_420568 | 23-03-2020 |
| Italy/ABR-IZSGC-TE6222/2020 | EPI_ISL_420583 | 23-03-2020 |
| Italy/ABR-IZSGC-TE5056/2020 | EPI_ISL_418257 | 17-03-2020 |
| Vietnam/HCMC-35005/2020 | EPI_ISL_450739 | 17-03-2020 |
| SaudiArabia/KAUST-Madinah50/2020 | EPI_ISL_437490 | 26-03-2020 |
| SaudiArabia/KAUST-Makkah178/2020 | EPI_ISL_437701 | 06-04-2020 |
| Australia/QLD02/2020 | EPI_ISL_407896 | 30-01-2020 |
| Australia/NSW309/2020 | EPI_ISL_451573 | 04-04-2020 |
| Italy/ABR-IZSGC-TE4953/2020 | EPI_ISL_418258 | 14-03-2020 |
| Canada/ON-PHL-2273/2020 | EPI_ISL_418383 | 2020-02 |
| England/NORW-EC671/2020 | EPI_ISL_457546 | 10-05-2020 |
| Georgia/Tb-477/2020 | EPI_ISL_415642 | 10-03-2020 |
| Georgia/Tb-82/2020 | EPI_ISL_415644 | 28-02-2020 |
| Georgia/Tb-712/2020 | EPI_ISL_416481 | 16-03-2020 |
| Lebanon/S9_764/2020 | EPI_ISL_450515 | 11-03-2020 |
| NorthernIreland/NIRE-FB6F7/2020 | EPI_ISL_448968 | 26-03-2020 |
| Croatia/ZG-297-20/2020 | EPI_ISL_451934 | 05-03-2020 |
| England/200990724/2020 | EPI_ISL_414006 | 28-02-2020 |
| England/200990660/2020 | EPI_ISL_414523 | 27-02-2020 |
| England/20134018004/2020 | EPI_ISL_423097 | 23-03-2020 |
| England/20144009104/2020 | EPI_ISL_423504 | 31-03-2020 |
| England/20092000804/2020 | EPI_ISL_464182 | 24-02-2020 |
| England/20098017604/2020 | EPI_ISL_464195 | 26-02-2020 |
| England/20099000304/2020 | EPI_ISL_464199 | 28-02-2020 |
| England/20099000504/2020 | EPI_ISL_464200 | 27-02-2020 |
| England/201061453/2020 | EPI_ISL_464411 | 27-02-2020 |
| England/20149004004/2020 | EPI_ISL_466098 | 02-04-2020 |
| England/20242082604/2020 | EPI_ISL_471520 | 06-06-2020 |
| Indonesia/JK-EIJK-0317/2020 | EPI_ISL_435282 | 19-03-2020 |
| Indonesia/JK-EIJK-02/2020 | EPI_ISL_437190 | 26-03-2020 |
| Indonesia/JK-EIJK-07/2020 | EPI_ISL_467376 | 24-04-2020 |
| Sweden/20-51445/2020 | EPI_ISL_455110 | 14-05-2020 |
| Spain/AN-IBV-001214/2020 | EPI_ISL_452558 | 24-03-2020 |
| Spain/IB-IBV-002492/2020 | EPI_ISL_467056 | 14-03-2020 |
| Spain/IB-IBV-2571/2020 | EPI_ISL_468980 | 07-04-2020 |
| Spain/VC-FISABIO-54/2020 | EPI_ISL_425178 | 28-02-2020 |
| Spain/VC-FISABIO-521/2020 | EPI_ISL_447472 | 26-03-2020 |
| Spain/VC-FISABIO-147/2020 | EPI_ISL_436242 | 18-03-2020 |
| Spain/PV-IBV-2130/2020 | EPI_ISL_468878 | 12-04-2020 |
| Spain/AN-IBV-001927/2020 | EPI_ISL_452447 | 11-03-2020 |
| Italy/ABR-IZSGC-TE26539/2020 | EPI_ISL_436727 | 27-04-2020 |
| Italy/ABR-IZSGC-TE13858/2020 | EPI_ISL_435152 | 09-04-2020 |
| Singapore/5/2020 | EPI_ISL_410536 | 06-02-2020 |
| Sweden/20-08047/2020 | EPI_ISL_454495 | 08-03-2020 |
| Sweden/20-08498/2020 | EPI_ISL_475105 | 25-03-2020 |
| Norway/Trondheim-S4/2020 | EPI_ISL_450346 | 25-03-2020 |
| Norway/Trondheim-S12/2020 | EPI_ISL_450349 | 29-03-2020 |
| Hangzhou/ZJU-Q2/2020 | EPI_ISL_416042 | 26-01-2020 |
| Russia/Yakutia-73709/2020 | EPI_ISL_428874 | 20-03-2020 |
| Russia/Moscow-67609/2020 | EPI_ISL_428882 | 16-03-2020 |

| Virus name | Accession number | Collected |
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| Crimea/SRC-80603/2020 | EPI_ISL_428901 | 23-03-2020 |
| Russia/Buryatia-87105/2020 | EPI_ISL_428920 | 30-03-2020 |
| Norway/2065/2020 | EPI_ISL_420149 | 09-03-2020 |
| CzechRepublic/NRL_2312/2020 | EPI_ISL_471544 | 14-03-2020 |
| CzechRepublic/NRL_2554/2020 | EPI_ISL_471547 | 11-03-2020 |
| Iceland/297/2020 | EPI_ISL_417626 | 18-03-2020 |
| Iceland/303/2020 | EPI_ISL_417632 | 18-03-2020 |
| Iceland/325/2020 | EPI_ISL_417654 | 18-03-2020 |
| Iceland/157/2020 | EPI_ISL_417804 | 13-03-2020 |
| Iceland/167/2020 | EPI_ISL_417809 | 15-03-2020 |
| Iceland/222/2020 | EPI_ISL_417837 | 16-03-2020 |
| Iceland/53/2020 | EPI_ISL_417851 | 05-03-2020 |
| Iceland/56/2020 | EPI_ISL_417852 | 06-03-2020 |
| Iceland/91/2020 | EPI_ISL_417873 | 10-03-2020 |
| Iceland/436/2020 | EPI_ISL_424460 | 20-03-2020 |
| Iceland/470/2020 | EPI_ISL_424493 | 21-03-2020 |
| Taiwan/TSGH-23/2020 | EPI_ISL_436108 | 02-04-2020 |
| Uganda/UG001/2020 | EPI_ISL_451183 | 25-03-2020 |
| Uganda/UG017/2020 | EPI_ISL_451199 | 20-04-2020 |
| Italy/VEN-IZSVe-23-50/2020 | EPI_ISL_452185 | 26-03-2020 |
| Italy/VEN-IZSVe-31-19/2020 | EPI_ISL_452188 | 31-03-2020 |
| Sweden/20-51061/2020 | EPI_ISL_475122 | 07-04-2020 |
| Canada/ON-UHTC_0051/2020 | EPI_ISL_464063 | 03-04-2020 |
| Austria/CeMM0058/2020 | EPI_ISL_437938 | 03-04-2020 |
| Austria/CeMM0101/2020 | EPI_ISL_437962 | 20-03-2020 |
| Austria/CeMM0113/2020 | EPI_ISL_437971 | 18-03-2020 |
| Switzerland/BL-UHB-42169310/2020 | EPI_ISL_418275 | 27-02-2020 |
| Croatia/1560_Split/2020 | EPI_ISL_454583 | 18-03-2020 |
| Norway/1526/2020 | EPI_ISL_417485 | 02-03-2020 |
| Norway/2093/2020 | EPI_ISL_420310 | 16-03-2020 |
| Switzerland/GE-HUG-VD0503/2020 | EPI_ISL_415459 | 29-02-2020 |
| Switzerland/GE-HUG-6065/2020 | EPI_ISL_429220 | 06-04-2020 |
| HongKong/HKU-903b/2020 | EPI_ISL_434566 | 27-01-2020 |
| Greece/222_33921/2020 | EPI_ISL_447643 | 22-03-2020 |
| Greece/227_35969/2020 | EPI_ISL_447644 | 11-03-2020 |
| Greece/34_36284/2020 | EPI_ISL_447832 | 24-03-2020 |
| HongKong/VM2003179/2020 | EPI_ISL_450405 | 08-03-2020 |
| Portugal/PT0144/2020 | EPI_ISL_453860 | 27-03-2020 |
| Portugal/PT0159/2020 | EPI_ISL_453875 | 27-03-2020 |
| Portugal/PT0160/2020 | EPI_ISL_453876 | 27-03-2020 |
| Portugal/PT0199/2020 | EPI_ISL_453915 | 28-03-2020 |
| Portugal/PT0247/2020 | EPI_ISL_453961 | 02-04-2020 |
| Portugal/PT0268/2020 | EPI_ISL_453982 | 04-04-2020 |
| Portugal/PT0275/2020 | EPI_ISL_453989 | 05-04-2020 |
| Portugal/PT0321/2020 | EPI_ISL_454037 | 15-03-2020 |
| Portugal/PT0395a/2020 | EPI_ISL_454114 | 18-04-2020 |
| Portugal/PT0460/2020 | EPI_ISL_454184 | 17-04-2020 |
| Portugal/PT0466/2020 | EPI_ISL_454190 | 18-04-2020 |
| Portugal/PT0480/2020 | EPI_ISL_454204 | 27-03-2020 |
| Portugal/PT0487/2020 | EPI_ISL_454211 | 01-04-2020 |
| Portugal/PT0496/2020 | EPI_ISL_454220 | 30-04-2020 |
| Portugal/PT0509/2020 | EPI_ISL_454233 | 19-03-2020 |
| Portugal/PT0538/2020 | EPI_ISL_454262 | 07-04-2020 |
| Portugal/PT0539/2020 | EPI_ISL_454263 | 07-04-2020 |
| Portugal/PT0548/2020 | EPI_ISL_454272 | 02-05-2020 |
| Portugal/PT0580/2020 | EPI_ISL_454303 | 25-03-2020 |
| Portugal/PT0616/2020 | EPI_ISL_454339 | 17-03-2020 |
| Portugal/PT0549/2020 | EPI_ISL_455627 | 03-04-2020 |
| Zhejiang/OS5/2020 | EPI_ISL_455689 | 24-03-2020 |
| Turkey/IMU-SP-02/2020 | EPI_ISL_460617 | 16-04-2020 |
| Turkey/IMU-SP-01/2020 | EPI_ISL_460618 | 15-04-2020 |
| Sweden/20-50591/2020 | EPI_ISL_475118 | 01-04-2020 |
| Sweden/20-51516/2020 | EPI_ISL_475526 | 17-05-2020 |
| Turkey/ERAGEM-001/2020 | EPI_ISL_424366 | 17-03-2020 |
| Serbia/NP363-04/2020 | EPI_ISL_437436 | 04-04-2020 |
| Australia/VIC81/2020 | EPI_ISL_419793 | 14-03-2020 |
| Australia/VIC876/2020 | EPI_ISL_427131 | 05-04-2020 |
| Italy/ABR-IZSGC-TE12759/2020 | EPI_ISL_435147 | 08-04-2020 |
| Switzerland/ZH-ETHZ-100093/2020 | EPI_ISL_451685 | 13-03-2020 |

| Virus name | Accession number | Collected |
|-----------------------------------|------------------|------------|
| Switzerland/GR-ETHZ-100147/2020 | EPI_ISL_451731 | 16-03-2020 |
| Switzerland/VD-ETHZ-100805/2020 | EPI_ISL_451755 | 25-03-2020 |
| Switzerland/BS-ETHZ-101147/2020 | EPI_ISL_451814 | 31-03-2020 |
| Switzerland/ZH-ETHZ-101172/2020 | EPI_ISL_451835 | 31-03-2020 |
| Switzerland/ZH-ETHZ-110439/2020 | EPI_ISL_451864 | 07-04-2020 |
| Switzerland/BL-ETHZ-110482/2020 | EPI_ISL_451894 | 07-04-2020 |
| Switzerland/VD-ETHZ-110507/2020 | EPI_ISL_451913 | 07-04-2020 |
| Switzerland/TI-ETHZ-100043/2020 | EPI_ISL_466966 | 11-03-2020 |
| Switzerland/TI-ETHZ-100049/2020 | EPI_ISL_466971 | 11-03-2020 |
| Switzerland/SZ-ETHZ-100062/2020 | EPI_ISL_466984 | 12-03-2020 |
| Switzerland/ZH-ETHZ-120244/2020 | EPI_ISL_468303 | 04-05-2020 |
| DRC/KN-0054/2020 | EPI_ISL_417437 | 17-03-2020 |
| DRC/214/2020 | EPI_ISL_420030 | 21-03-2020 |
| DRC/1324/2020 | EPI_ISL_435033 | 07-04-2020 |
| DRC/1151/2020 | EPI_ISL_447596 | 05-04-2020 |
| Poland/PL_P10/2020 | EPI_ISL_451971 | 01-04-2020 |
| Poland/PL_P14/2020 | EPI_ISL_451975 | 31-03-2020 |
| Poland/PL_P18/2020 | EPI_ISL_451979 | 31-03-2020 |
| Poland/PL_P24/2020 | EPI_ISL_451985 | 29-03-2020 |
| Poland/PL_P2/2020 | EPI_ISL_428925 | 28-03-2020 |
| Poland/PL_P7/2020 | EPI_ISL_428930 | 29-03-2020 |
| Hungary/SRC-00066/2020 | EPI_ISL_435403 | 20-03-2020 |
| Hungary/SRC-00067/2020 | EPI_ISL_435404 | 20-03-2020 |
| Hungary/SRC-02801w/2020 | EPI_ISL_435428 | 25-03-2020 |
| Hungary/mb1/2020 | EPI_ISL_416426 | 17-03-2020 |
| Bangladesh/icddrb-2083/2020 | EPI_ISL_470801 | 07-06-2020 |
| Scotland/EDB5590/2020 | EPI_ISL_461759 | 25-05-2020 |
| Scotland/EDB6244/2020 | EPI_ISL_473926 | 21-05-2020 |
| Scotland/EDB6322/2020 | EPI_ISL_473935 | 02-06-2020 |
| England/SHEF-C09D4/2020 | EPI_ISL_475343 | 28-04-2020 |
| England/SHEF-C0D50/2020 | EPI_ISL_475348 | 30-05-2020 |
| Cambodia/0012/2020 | EPI_ISL_411902 | 27-01-2020 |
| Wales/PHWC-162AB2/2020 | EPI_ISL_473158 | 20-05-2020 |
| Wales/PHWC-163161/2020 | EPI_ISL_473254 | 27-05-2020 |
| Russia/StPetersburg-R114546V/2020 | EPI_ISL_427314 | 02-04-2020 |
| Russia/StPetersburg-R114584S/2020 | EPI_ISL_427316 | 03-04-2020 |
| Russia/StPetersburg-R114332S/2020 | EPI_ISL_427339 | 25-03-2020 |
| Russia/StPetersburg-R114938S/2020 | EPI_ISL_430073 | 08-04-2020 |
| Russia/StPetersburg-R115047S/2020 | EPI_ISL_430087 | 10-04-2020 |
| Russia/StPetersburg-R115642S/2020 | EPI_ISL_430095 | 14-04-2020 |
| Russia/StPetersburg-R117464S/2020 | EPI_ISL_450252 | 20-04-2020 |
| Russia/StPetersburg-R117603S/2020 | EPI_ISL_450263 | 21-04-2020 |
| Russia/StPetersburg-R118393S/2020 | EPI_ISL_450279 | 22-04-2020 |
| Russia/StPetersburg-R118402S/2020 | EPI_ISL_450281 | 22-04-2020 |
| Russia/StPetersburg-R118913S/2020 | EPI_ISL_450290 | 23-04-2020 |
| USA/WI1/2020 | EPI_ISL_408670 | 31-01-2020 |
| Sweden/20-07666/2020 | EPI_ISL_445238 | 20-04-2020 |

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Appendix Figure. Phylogenetic tree showing the relationships between SARS-CoV-2 full genome sequences in farms 1, 2, and 3 and connected local human cases (H1–H9). Three subclusters are indicated, which differ by sequence changes at nt positions 5421 and 22920. Scale bar indicates nucleotide substitutions per site.