



# ProMED

## INTERNATIONAL SOCIETY FOR INFECTIOUS DISEASES

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CORONAVIRUS DISEASE 2019 UPDATE (177): ANIMAL, SWITZERLAND, FOX

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From: Regina Hofmann-Lehmann <[rhofmann@vetclinics.uzh.ch](mailto:rhofmann@vetclinics.uzh.ch)> [edited]

The 1st fox from the Swiss canton of Zurich tested positive for SARS-CoV-2 RNA using RT-qPCR as part of a research project led by the Clinical Laboratory, Vetsuisse Faculty (VSF) at the University of Zurich (UZH), Switzerland. Within the project, routine samples from different animal species and submitted for diagnostic purposes to the laboratory since spring 2020 have been tested for SARS-CoV-2 viral RNA or antibodies in order to improve knowledge on SARS-CoV-2 infections within different animal populations and investigate their potential role in a One Health context.

The RT-qPCR positive fox lived in a zoo in the Canton of Zurich. On 11 Mar 2022, 2 adult foxes from this zoo living in a separate enclosure were presented to the University Animal Hospital in Zurich (Clinic for Zoo Animals, Exotic Pets and Wildlife, VSF, UZH); a conjunctival swab from these 2 foxes tested positive for canine distemper virus (CDV) RNA by RT-qPCR at the Clinical Laboratory (VSF, UZH). The swab samples from these 2 foxes tested negative for SARS-CoV-2 RNA at this time. The 2 foxes were euthanized because of the distemper diagnosis. On 22 Mar 2022, a 3rd male fox was found dead in another enclosure that he had shared with a 2nd fox and 2 bears. The animal underwent a full post mortem examination at the Institute of Veterinary Pathology, VSF, UZH and was diagnosed with multiple wounds consistent with trauma likely due to post mortem biting by a bear, plus a severe verminous pneumonia due to infestation with the nematode *Angiostrongylus vasorum*. Samples taken from the nose and the 3rd eyelid from this fox tested negative for SARS-CoV-2 RNA by RT-qPCR; the fox tested also negative for CDV RNA. The 4th clinically healthy fox living in the enclosure with the 2 bears was quarantined, vaccinated against CDV and sampled on 29 Mar 2022. Combined material from the conjunctival and nasal swab tested negative for CDV RNA. However, the sample tested positive for SARS-CoV-2 RNA with Ct values of 36.9 (E gene assay) and 35.7 (RdRp gene assay), respectively. The limited remaining nucleic acid material was submitted in the framework of an ongoing collaboration to the Department of Biosystems Science and Engineering of the Swiss Federal Institute of Technology (ETH) Zurich for next-generation sequencing. The presence of SARS-CoV-2 RNA was confirmed. The fox died within the naturally structured enclosure, but the carcass could not be found. The source of SARS-CoV-2 infection in this fox is unknown. None of the animal caretakers in contact with the fox knowingly had been infected with SARS-CoV-2 at the time. Possible sources of infection other than the animal caretakers include feeding

animals (rats, rabbits) or other animals, such as free living rodents, martens or even foxes. Since all 4 foxes from this zoo were euthanized or died, to date no further control measures are planned.

Another fox tested serologically positive for SARS-CoV-2 antibodies. The fox had been identified in the framework of a research project on Swiss wildlife mandated and supported by the Swiss authorities. The project is under the responsibility of the Institute for Fish and Wildlife Health (FIWI), VSF at the University of Bern, and of the Clinical Laboratory (VSF, UZH), Switzerland.

This fox had been shot by a game warden in the Swiss canton of Wallis on 31 Jan 2022. On inspection, the animal was in good nutritional and health status (assessed by the game warden) and was estimated to be an adult animal (>1 year old). The fox had been found in close proximity to a human settlement (approximately 150 meters from the closest houses) and had been in contact with municipal waste. A blood sample from this animal taken by the warden after the animal was shot tested questionably positive in the SARS-CoV-2 S1 ELISA at the Clinical Laboratory. The sample was sent for confirmation to the Friedrich-Löffler Institut (FLI) in Germany in the framework of an ongoing collaboration. The fox tested positive in both the SARS-CoV-2 RBD ELISA and the indirect immunofluorescence test (iIFT). The source of infection in this fox is unknown, but the infection could have resulted from an earlier contact with contaminated human waste. The positive fox was one of 176 free-ranging foxes serologically tested so far; apart from the herein reported fox, all foxes tested negative for SARS-CoV-2 antibodies. These preliminary results suggest that exposure of foxes to SARS-CoV-2 is rare in the wild and that there is no reason to see free-ranging foxes as a threat to humans.

These 2 herein reported foxes are the 1st SARS-CoV-2 infected foxes documented in Switzerland. To the best of our knowledge, it is the 1st detection of SARS-CoV-2 RNA in a fox, apart from experimental infections. Both cases are reported to the World Organisation for Animal Health (WOAH).

No control measures are currently planned or deemed necessary. Although we have only limited data so far, the information reported herein indicates that infections of foxes with SARS-CoV-2 are rare in Switzerland. The main source of human infection remains other infected humans.

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Communicated by:

Dr Regina Hofmann-Lehmann

Clinical Laboratory, Department of Clinical Diagnostics and Services

Vetssuisse Faculty, University of Zurich

Zurich, Switzerland

<rhofmann@vetclinics.uzh.ch>

[Carnivores (Order Carnivora) are susceptible to infection by SARS-CoV-2. The pandemic virus has been confirmed so far in carnivores of 6 families: canids (dogs and raccoon dogs), felids (cats, tigers, lions, puma/cougar and snow leopard), mustelids (ferrets and minks), viverrids (binturongs), procyonids (coatimundis), and hyenids (hyenas). In most cases, infections are subclinical or mild, but there are some reports of deaths attributable to COVID-19. Red foxes have been found to be susceptible to SARS-CoV-2 infection experimentally (<https://doi.org/10.1101/2022.01.27.478082>). This report strongly suggests natural infections. - Mod.PMB

ProMED map:

Switzerland: <https://promedmail.org/promed-post?place=8705766,105>]

## See Also

COVID-19 update (19): animal, Slovenia (LJ) pet ferret, OIE 20220117.8700917

COVID-19 update (15): animal, India (UP) wild leopard 20220113.8700842

2021

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COVID-19 update (447): animal, USA (PA) zoo, lynx 20211227.8700517  
COVID-19 update (423): animal, Denmark (SL) zoo, tiger, OIE 20211209.8700158  
COVID-19 update (418): animal, Belgium, zoo, hippopotamus, 1st rep 20211206.8700102  
COVID-19 update (413): animal, Canada, wild deer 20211202.8700020  
COVID-19 update (409): animal, Croatia, zoo, lion, OIE 20211129.8699951  
COVID-19 update (400): animal, sheep, research, experimental infection 20211121.8699806  
COVID-19 update (395): animal, UK, dog, OIE 20211117.8699698  
COVID-19 update (392): animal, USA, zoo, snow leopard, fatal 20211115.8699676  
COVID-19 update (387): animal, Singapore, zoo, lion 20211112.8699622  
COVID-19 update (381): animal, USA, zoo, hyena, 1st rep 20211108.8699526  
COVID-19 update (364): animal, USA (IL) zoo, coatimundi 20211026.8699258  
COVID-19 update (354): animal, USA, zoo, wild carnivore 20211018.8699125  
COVID-19 update (348): animal, USA, zoo, snow leopard, fatal, susp 20211013.8699020  
COVID-19 update (265): animal, USA, zoo, snow leopard 20210802.8563564  
COVID-19 update (254): animal, USA, zoo, snow leopard 20210726.8545843  
COVID-19 update (230): animal, USA, zoo, vaccination 20210705.8496776  
COVID-19 update (197): animal, India, zoo lion, fatal 20210607.8430529  
COVID-19 update (159): animal, India, zoo, lion 20210504.8344580  
COVID-19 update (33): animal, Sweden, zoo, tiger, lion 20210125.8134087  
COVID-19 update (13): animal, USA, zoo, gorilla 20210112.8095510

2020

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COVID-19 update (538): USA, animal, zoo, snow leopard 20201214.8017000  
COVID-19 update (536): animal, USA (UT) wild mink, 1st case 20201213.8015608  
COVID-19 update (525): Spain, animal, zoo, lion, human 20201208.8002466  
COVID-19 update (469): USA (TN) zoo, tiger 20201104.7915683  
COVID-19 update (356): South Africa (GT) animal, puma, zoo, OIE 20200813.7673666  
COVID-19 update (143): USA (NY) animal, zoo, tiger, lion, tests 20200430.7284183  
COVID-19 update (141): India, animal, wild tiger, susp, clarification, RFI 20200430.7281768  
COVID-19 update (138): India, animal, wild tiger, fatal 20200428.7275765  
COVID-19 update (135): Netherlands (NB) animal, farmed mink 20200427.7272289  
COVID-19 update (130): USA (NY) zoo, tiger, lion, new cases 20200425.7266556  
COVID-19 update (85): USA (NY) tiger, OIE 20200406.7191480  
COVID-19 update (84): USA, tigers 20200406.7191352  
COVID-19 update (76): China (HU) animal, cat, owned, stray, seropositive 20200403.7179946  
COVID-19 update (75): China (Hong Kong) cat, OIE 20200403.7179945  
COVID-19 update (70): China (Hong Kong) cat, pets & stock 20200402.7173286  
COVID-19 update (58): Belgium, cat, clinical case, RFI 20200327.7151215  
COVID-19 update (57): global, re-using PPE, DR Congo, more countries, WHO 20200327.7149046  
COVID-19 update (56): China (Hong Kong) animal, dog, final serology positive 20200326.7146438  
COVID-19 update (45): China (Hong Kong) animal, dog, 2nd case PCR positive 20200319.7112693  
COVID-19 update (37): China (Hong Kong) animal, dog, prelim. serology negative 20200312.7081842  
COVID-19 update (30): China (Hong Kong) dog, susp, serology pending 20200306.7057595  
COVID-19 update (25): China (Hong Kong) dog, susp, OIE 20200302.7040373  
COVID-19 update (22): companion animals, dog susp, RFI 20200229.7036661  
COVID-19 update (17): China, animal reservoir, wildlife trade & consumption 20200225.7024245  
COVID-19 update (11): animal reservoir, intermediate hosts, pangolin susp 20200220.7009213  
COVID-19 update (08): companion animals, RFI 20200218.7002276  
COVID-19 update (06): animal reservoir, intermediate hosts 20200217.6997782  
Novel coronavirus (42): China, global, COVID-19, SARS-CoV-2, WHO 20200211.6979942  
Novel coronavirus (40): animal reservoir, pangolin poss intermediate host, RFI 20200210.6972104

Novel coronavirus (28): China (HU) animal reservoir 20200201.6943858

Novel coronavirus (22): reservoir suggested, bats 20200129.6930718

Novel coronavirus (20): China, wildlife trade ban 20200127.6922060

Novel coronavirus (18): China (HU) animal reservoir 20200125.6915411

Novel coronavirus (15): China (HU) wild animal sources 20200123.6909913

Novel coronavirus (03): China (HU) animal reservoir suggested, RFI 20200114.6887480

Novel coronavirus (01): China (HU) WHO, phylogenetic tree 20200112.6885385

Undiagnosed pneumonia - China (HU) (07): official confirmation of novel coronavirus 20200108.6878869

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