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Subject: PRO/AH/EDR> COVID-19 update (70): China (Hong Kong) animal, cat, pets & stock

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CORONAVIRUS DISEASE 2019 UPDATE (70): CHINA (HONG KONG) ANIMAL, CAT, PETS AND STOCK

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A ProMED-mail post
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International Society for Infectious Diseases
http://www.isid.org

In this update:
[1] 2nd domestic cat infected, Hong Kong
[2] Experimental infection trials, companion and farm animals, China

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[1] 2nd domestic cat infected, Hong Kong
Date: Tue 31 Mar 2020
Source: Press release, Government of Hong Kong [edited]
https://www.news.gov.hk/eng/2020/03/20200331/20200331_220128_110.html?type=ticker

The Agriculture, Fisheries & Conservation Department today [31 Mar 2020] said that a pet cat has tested positive for COVID-19. This is the 3rd animal to test positive for the virus in Hong Kong.

The current case involves a domestic short-haired cat that lived in a residence in Aberdeen. When the owner was confirmed with COVID-19, the cat was sent for quarantine at the animal-keeping facility at the Hong Kong Port of the Hong Kong-Zhuhai-Macao Bridge on [Mon 30 Mar 2020]. Its oral cavity, nasal, and rectal samples tested positive for the virus. The cat has not shown any signs of disease.

The department will continue to monitor the cat closely and conduct repeated testing. It advised that mammalian pets, including dogs and cats from households with people confirmed to be infected with COVID-19, should be put under quarantine at its facilities.

The department emphasised that there is currently no evidence that pet animals can be a source of the virus [but see item 2].

Pet owners should always maintain good hygiene practices, and under no circumstances should they abandon their pets.

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[2] Experimental infection trials, companion and farm animals, China
Date: Tue 31 Mar 2020
Source: bioRxiv (preprint, not peer reviewed) [edited]

Reference:
Jianzhong Shi, Zhiyuan Wen, Gongxun Zhong, Huanliang Yang, et al. Susceptibility of ferrets, cats, dogs, and different domestic animals to SARS-coronavirus-2. bioRxiv: preprint (not peer reviewed); doi: https://doi.org/10.1101/2020.03.30.015347.

Abstract

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causes the infectious disease COVID-19, which was 1st reported in Wuhan, China, in December 2019. Despite the tremendous efforts to control the disease, COVID-19 has now spread to over 100 countries and caused a global pandemic. SARS-CoV2 is thought to have originated in bats; however, the intermediate animal sources of the virus are completely unknown.

Here, we investigated the susceptibility of ferrets and animals in close contact with humans to SARS-CoV-2. We found that SARS-CoV-2 replicates poorly in dogs, pigs, chickens, and ducks, but efficiently in ferrets and cats. We found that the virus transmits in cats via respiratory droplets. Our study provides important insights into the animal reservoirs of SARS-CoV-2 and animal management for COVID-19 control.

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[The described experimental infection trials were performed in the biosafety level 4 laboratory and the animal biosafety level 4 facilities in the Harbin Veterinary Research Institute (HVRI) of the Chinese Academy of Agricultural Sciences (CAAS). HVRI is OIE's collaborating Centre for Zoonoses of Asia-Pacific.

Two viruses were used in the study:
1. F13-E [SARS-CoV2/F13/environment/2020/Wuhan, reportedly isolated from an environmental sample collected in the Huanan Seafood Market in Wuhan], used in the ferret experiments.
2. CTan-H [SARS-CoV-2/CTan/human/2020/Wuhan, isolated from a human patient]. This virus was used in the companion (dogs, cats) and farm (pigs, chickens, and ducks) animals.

In all 6 animal species addressed, both inoculation and contact infections were attempted. The ferrets and cats got infected and sero-converted, but only 2 inoculated dogs became seropositive (the 2 contact dogs did not), while remaining subclinical. Pigs, chickens, and ducks were found not susceptible to the virus.

Cats, the world's 2nd-most popular companion animal, got infected through both routes (inoculation and contact) and deserve additional attention. A description of the cat trial follows.

Cat study
Ten outbred domestic juvenile cats (aged between 70 days and 3 months) and 8 outbred subadult cats (aged 6-9 months) were used in this study. To evaluate the replication of SARS-CoV-2, 4 juvenile cats and 2 subadult cats were intranasally inoculated with 105 PFU of CTan-H. Two juvenile cats were euthanized on day 3 p.i.; 2 other juvenile cats and the 2 subadult cats were euthanized on day 6 p.i. Organs and tissues were collected for viral RNA detection, virus titration in Vero E6 cells, and histological studies.

To investigate the transmissibility of SARS-CoV-2 in cats (transmission study), 6 cats were inoculated intranasally with 105 PFU of CTan-H, and each animal was placed in a separate cage within an isolator. A similar-aged naive cat was then placed in each cage adjacent to the one that held the virus-inoculated cat. Feces were collected on days 3, 5, 7, and 9 p.i. from the big cats, and nasal washes were collected from the juvenile cats for viral RNA detection or virus titration. One pair and 2 pairs of the subadult cats were euthanized on days 11 and 12 p.i., respectively, and their organs, including lungs, tracheas, nasal turbinates, soft palates, brains, hearts, submaxillary lymph nodes, tonsils, kidneys, spleens, livers, pancreas, and small intestines, were collected for viral RNA detection and virus titration. Sera were collected, and antibodies against SARS-CoV-2 were detected by using the double antigen sandwich ELISA kit and a neutralization assay.

The results indicated that SARS-CoV-2 can replicate efficiently in cats, with younger cats being more permissive. More important, the virus could transmit between cats via respiratory droplets. The authors concluded that surveillance for SARS-CoV-2 in cats should be considered as an adjunct to elimination of COVID-19 in humans.

Infectious virus was detected from the nasal washes of all challenged ferrets but, in difference from cats, not from the rectal swabs. One ferret from each virus-inoculated group developed fever and loss of appetite on days 10 and 12 p.i., respectively. The authors recall that several studies have reported that SARS-CoV-2 uses angiotensin-converting enzyme 2 (ACE2) as its receptor to enter cells. ACE2 is mainly expressed in type II pneumocytes and serous epithelial cells of tracheo-bronchial submucosal glands in ferrets. Therefore, they claim, the underlying mechanism that prevents the replication of SARS-CoV-2 in the lower respiratory tract of ferrets remains to be investigated. In addition, the fact that SARS-CoV-2 replicates efficiently in the upper respiratory tract of ferrets makes them a candidate animal model for evaluating antiviral drugs or vaccine candidates against COVID-19.

For further details, tables, and figures, subscribers are referred to the source URL. - Mod.AS

HealthMap/ProMED-mail map of Hong Kong: https://promedmail.org/promed-post?place=7173286,198.]

See Also

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COVID-19 update (58): Belgium, animal, cat, clinical case, RFI 20200327.7151215
COVID-19 update (56): China (Hong Kong) animal, dog, final serology positive 20200326.7146438
COVID-19 update (50): China (Hong Kong) animal, dog, 2nd case PCR positive, OIE 20200323.7129951
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) animal, dog, susp, serology pending 20200306.7057595
COVID-19 update (25): China (Hong Kong) animal, 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
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COVID-19 update (08): companion animals, RFI 20200218.7002276
COVID-19 update (06): animal reservoir, intermediate hosts 20200217.6997782
Novel coronavirus (40): animal reservoir, pangolin poss intermediate host, RFI 20200210.6972104
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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

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