

# Novel Coronavirus disease (COVID-19)

## Fact sheet

---

### Preamble

This document will be updated periodically as new information becomes available. Please check the **WHA website** [www.wildlifehealthaustralia.com.au](http://www.wildlifehealthaustralia.com.au) for the current version.

### Key points

- there is **no** evidence of SARS-CoV-2 or SARS-CoV-2-like viruses in Australian wildlife
- there is **no** evidence to suggest that any animals in Australia might be a source of COVID-19
- human to animal transmission of SARS-CoV-2 is very rare
- it is safest to assume that any mammal wildlife species **may** have the potential to be infected with SARS-CoV-2 from close exposure to an infected human (similar situations to those described as risky for human to human transmission)
- appropriate precautions are always recommended before, during and after contact with animals (see [National Wildlife Biosecurity Guidelines](#))
- people diagnosed with COVID-19 should not have any contact with Australian wildlife
- if you care for wildlife, you should have a plan in place for the animals in your care in the event you become sick or have to self-isolate
- further information on COVID-19 and animals can be found at the Australian Veterinary Association ([www.ava.com.au/coronavirus](http://www.ava.com.au/coronavirus)) and OIE ([www.oie.int/en/scientific-expertise/specific-information-and-recommendations/questions-and-answers-on-2019novel-coronavirus/](http://www.oie.int/en/scientific-expertise/specific-information-and-recommendations/questions-and-answers-on-2019novel-coronavirus/)).

### Introductory statement

Coronaviruses are the cause of recently emerged diseases which cause significant respiratory symptoms in humans, including Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS) and COVID-19. Evidence suggests bats are the maintenance hosts for both SARS and MERS viruses. None of these viruses have been found in Australian wildlife (see WHA fact sheet “Coronaviruses in Australian Bats”).

In December 2019 a novel coronavirus disease, named COVID-19, emerged in humans in Wuhan, China, and spread progressively through the global human population. WHO declared COVID-19 a "Public Health Emergency of International Concern" in late January 2020 (WHO 2020b). Evidence suggests that a range of animal species may be susceptible to infection acquired from humans who are shedding the virus.

## Public health concerns

COVID-19 disease is spread by human to human transmission. See the WHO website ([www.who.int/emergencies/diseases/novel-coronavirus-2019](http://www.who.int/emergencies/diseases/novel-coronavirus-2019)) and the Australian government Department of Health for information on COVID-19 in humans ([www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert](http://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert)).

## Potential involvement of Australian animals

There is no evidence that Australian animals carry the SARS-CoV-2 virus and no evidence that they can be a source of infection for humans.

There are several reports globally of human-to-animal transmission of SARS-CoV-2, but it is believed that human-to-animal transmission of the virus is very rare. Felids, mustelids and dogs have been involved.

There is evidence that felids can become infected with SARS-CoV-2. Domestic cats have been shown to be infected with SARS-CoV-2, most probably from close contact with infected humans. Clinical signs reported in domestic cats include diarrhoea, vomiting and breathing difficulties, however some confirmed virus positive cats did not show clinical signs (Chini 2020; EVNT 2020; Government of Hong Kong 2020a). Similar reports have been received from a range of countries (e.g. Germany, Belgium, the Netherlands, Russia and Spain).

A tiger at Bronx Zoo tested positive for SARS-CoV-2 in early April 2020 after several tigers and lions at the zoo showed signs of respiratory illness. It is thought an asymptotically infected zoo keeper may have been passed on the infection. The big cats had a dry cough, wheezing and some loss of appetite but were not severely affected. All affected big cats, and one asymptomatic tiger sharing the enclosure, subsequently tested positive to PCR on faecal samples. All cats appeared to recover uneventfully from the infection (USDA 2020; WCS 2020a, 2020b).

There is evidence that mink (Mustelidae, in the same taxonomic family as ferrets and weasels) can become infected. Several mink farms in the Netherlands reported SARS-CoV-2 in farmed mink, presumably after acquiring the virus from infected humans, although farm cats also showed evidence of the virus, and may have been an infection pathway (Oreshkova et al. 2020). Risk of transmission from mink back to humans is considered very low (MANFQ 2020), however the government of the Netherlands subsequently published a letter stating that (due to analysis of the genetic code of the SARS-CoV-2 found in both mink and mink farm-workers), mink to human transmission of the virus was "plausible" (PROMED 2020b).

There is evidence that domestic dogs may also become infected with SARS-CoV-2 after close contact with infected humans, but no signs of disease associated with infection have been reported in dogs (Government of Hong Kong 2020b).

See <https://kb.rspca.org.au/knowledge-base/what-information-do-we-have-about-the-novel-coronavirus-sars-cov-2-and-domestic-animals/> for a regularly updated table of information on SARS-CoV-2 in domestic and wild animals.

Results from laboratory-based infection trials with SARS-CoV-2 suggest ferrets and cats are more susceptible to infection than dogs, and that pigs and poultry are not susceptible. Cats may be able to pass the infection on to other cats. These studies do not necessarily reflect the situation outside a laboratory setting (PROMED 2020a; Shi et al. 2020). A study found that cats in Wuhan showed signs of previous infection (antibodies) after the start of the Wuhan outbreak in humans, whereas no cats sampled before the outbreak had antibodies, indicating cats had been infected during the outbreak (Zhang et al. 2020).

A laboratory study with intranasal inoculation of Egyptian fruit bats (*Rousettus aegyptiacus*) (n=9) resulted in a transient respiratory infection and virus replication. Infected animals did not show any clinical signs. Virus was also detected in one of three in contact bats, which were not directly inoculated. The infected bats shed virus orally and in faeces. Viral RNA was found in respiratory tissues and other body organs. Infectious virus was only isolated from one bat in tracheal and nasal samples, 4 days after inoculation. Low levels of neutralising antibodies were found in infected bats. The infection in this species of bat appeared to be primarily intranasal (PROMED 2020a; Schlottau et al. 2020).

There are published studies of other coronaviruses in Australian animals, with a focus on bats (see WHA fact sheet “Coronaviruses in Australian Bats”). Although some coronaviruses have been found in a variety of Australian bat species, there is NO evidence of SARS-like, MERS-like, or SARS-CoV-2-like viruses in Australian wildlife (including bats). SARS-CoV-2 is not closely related to any known Australian bat coronaviruses and there is no suggestion that SARS-CoV-2 is present in Australian wildlife, although further surveillance and studies are recommended.

Further studies are underway to understand if and how different animals could be affected by SARS-CoV-2. It remains extremely unlikely that animals play any role in transmission of this virus during the current outbreak.

There is no evidence to support restrictions to movement or trade of animals (OIE 2020).

## Testing of animals for SARS-CoV-2

The OIE has published considerations for sampling, testing and reporting of SARS-CoV-2 in animals

Australia’s Animal Health Committee ([www.agriculture.gov.au/animal/health/committees/ahc](http://www.agriculture.gov.au/animal/health/committees/ahc)) advises that diagnostic testing and surveillance in Australian animals for COVID-19 is only recommended on the advice of human and animal health authorities. If testing is undertaken, confirmatory testing should be performed at the CSIRO Australian Centre for Disease Preparedness (the former Australian Animal Health Laboratory). Veterinarians considering testing their patients for SARS Cov-2 must consult with their state or territory animal health authorities in the first instance (Animal Health Committee 2020).

## Precautions when in contact with Australian wildlife

There is no evidence to suggest that any animals (livestock, pets or wildlife) in Australia might be a source of infection of SARS-CoV-2.

Evidence suggests a wide range of distantly-related mammals are likely susceptible to SARS-CoV-2. Until more is known, it is safest to assume that any mammal wildlife species may have the potential to be infected with SARS-CoV-2, from close exposure to an infected human (similar situations to those described as risky for human to human transmission) (Gryseels et al. 2020). Appropriate precautions are always recommended before, during and after contact with animals (including wildlife) and their food, supplies and excreta. This

includes, for example washing hands and cleaning of equipment, clothing and boots and maintaining “social distance” (minimum of 1.5 m) wherever possible (see [National Wildlife Biosecurity Guidelines](#)) (Animal Health Committee 2020).

Wildlife Health Australia, working with a group of government and non-government representatives, has developed information for bat carers, researchers and others interacting with bats (see [www.wildlifehealthaustralia.com.au/ProgramsProjects/BatHealthFocusGroup.aspx#COVIDBats](http://www.wildlifehealthaustralia.com.au/ProgramsProjects/BatHealthFocusGroup.aspx#COVIDBats)).

People who are unwell, including those with COVID-19 like symptoms, should avoid contact with wildlife, wherever possible. People diagnosed with COVID-19 should not have any contact with wildlife. If you care for wildlife, you should have a plan in place for the animals in your care in the event you become sick or have to self-isolate.

If an animal tests positive for SARS-CoV-2, it should be kept away from unexposed susceptible animals and contact with the infected animal should be avoided (OIE 2020).

NSW Department of Primary Industries has developed a document summarising advice on SARS-CoV-2 and Animals in Mass Care and Group Settings:

[https://www.dpi.nsw.gov.au/\\_data/assets/pdf\\_file/0019/1218322/Animals-in-Mass-Care-and-Group-Settings-Advice-Summary.pdf](https://www.dpi.nsw.gov.au/_data/assets/pdf_file/0019/1218322/Animals-in-Mass-Care-and-Group-Settings-Advice-Summary.pdf)

There is no justification in taking measures against animals which may compromise their welfare (OIE 2020).

## Aetiology and possible origin

Coronaviruses are single stranded, enveloped RNA viruses, 75-160 nm in diameter in the family *Coronaviridae*. The subfamily *Coronavirinae* is further divided into four genera Alpha-, Beta-, Gamma-, and Deltacoronavirus. SARS and MERS coronaviruses belong to the betacoronavirus genus and all coronaviruses detected in bats are either Alpha- or Betacoronaviruses (Drexler et al. 2014). Coronaviruses have been shown to have the potential for cross-species transmission and an ability to evolve relatively rapidly, which makes them of interest as potential emerging infectious diseases.

Only some coronaviruses are considered to be zoonotic (passed from animals to humans) (WHO 2020a). While coronaviruses infect a wide range of bird and mammal species, bats appear to be the natural hosts of many coronaviruses. There is evidence to suggest that all coronaviruses recognised in other species originally derived from bats (Vijaykrishna et al. 2007), although others suggest that Alpha- and Betacoronaviruses originated in bats and Gamma- and Deltacoronaviruses originate in birds (Wong et al. 2019). Previous emerging Betacoronaviruses causing respiratory disease in humans (SARS, MERS) have been shown to have recently moved from a bat host, via an intermediate animal host, to humans.

The virus responsible for COVID-19 (now termed SARS-CoV-2) is also a Betacoronavirus and is presumed to have transferred to humans from an (as yet) unidentified animal host.

Many experts consider bats to be the most plausible and probable original host of SARS-CoV-2. SARS-CoV-2 is closely related to a known bat coronavirus (96% genome homology) and is less closely related to SARS virus (~80% homology) (Lu et al. 2020; Zhou et al. 2020). A possible snake origin based on viral genetics was quickly refuted by other virologists (Ji et al. 2020; Lu et al. 2020; Luan et al. 2020; Robertson 2020; Zhou et al. 2020). Many scientists believe an intermediate host has likely been involved in the original movement of the virus from bats into humans. Pangolins were proposed as a possible intermediate host from bats to humans

(Cyranoski 2020) but this was subsequently questioned (Liu et al. 2020). Others suggest that Bovidae and Cricetidae (New World rodents) should be considered as possible intermediate hosts for SARS-CoV-2, based on genetic studies (Luan et al. 2020). Rodents in Australia, including introduced house mice, black and brown rats, and native rodents fall in the Old World rodent group, and are not Cricetidae.

Routes of transmission between bats, and from bats to other hosts, including humans, are yet to be confirmed for coronaviruses (Smith et al. 2016).

## Epidemiology

Although coronaviruses appear to have a relatively narrow host range, one bat species may be infected with multiple different coronaviruses. This potential mixing of viral species, along with their high mutation rate, permits significant genetic recombination allowing coronaviruses to change and evolve relatively rapidly (Woo et al. 2007).

There is no clear evidence of how SARS-CoV-2 moved from bats into humans and whether an intermediate host species was involved in transmission of the emergent disease in humans, as was shown to be the case for both SARS (civets) and MERS (camels).

## Conclusion

SARS-CoV-2 has most likely moved from a natural bat host into humans, possibly via an unidentified intermediate animal host. There is no evidence of SARS-CoV-2 or similar virus in Australian wildlife although there is evidence from overseas that animals can become infected when exposed to an infected human. Good hygiene and infection control practices are always recommended when interacting with animals. This fact sheet will be updated as new information becomes available.

## Acknowledgements

We are extremely grateful to the many people who had input into this fact sheet including Dr Hume Field, Dr Craig Smith and Dr Sam Hamilton. Without their ongoing support production of these fact sheets would not be possible.

Updated: 1 June 2020

## References

Animal Health Committee (2020) 'Policy statement on COVID-19 diagnostic testing and surveillance in animals.' Available at <https://www.agriculture.gov.au/animal/health/committees/ahc> [Accessed 1 June 2020].

Chini M (2020) 'Coronavirus: Belgian woman infected her cat.' Available at <https://www.brusselstimes.com/all-news/belgium-all-news/103003/coronavirus-belgian-woman-infected-her-cat/>

Cyranoski D, (2020) Did pangolins spread the China coronavirus to people? Nature News. Nature, Springer, 7th Feb 2020:

Drexler JF, Corman VM, Drosten C (2014) Ecology, evolution and classification of bat coronaviruses in the aftermath of SARS. *Antiviral Research* **101**, 45-56.

EVNT, (2020) Covid-19 : un deuxième chat détecté porteur du SARS-Cov-2 en France, à Bordeaux. ENVT, Toulouse.

Government of Hong Kong (2020a) 'Pet cat tests positive for COVID-19 virus.' Available at <https://www.info.gov.hk/gia/general/202003/31/P2020033100717.htm?fbclid=IwAR3OevfyjZAJ9MzN1o4Ew-Cr2JBSjo4-jEQDshYu0eiXN5EQNkHA-36T1bk> [Accessed 3 April 2020].

Government of Hong Kong (2020b) 'Pet dog further tests positive for antibodies for COVID-19 virus.' Available at <https://www.info.gov.hk/gia/general/202003/26/P2020032600756.htm> [Accessed 30 March 2020].

Gryseels S, De Bruyn L, Gyselings R, Calvignac-Spencer S, Leendertz F, Leirs H (2020) Risk of Human-to-Wildlife Transmission of SARS-CoV-2.

Ji W, Wang W, Zhao X, Zai J, Li X (2020) Homologous recombination within the spike glycoprotein of the newly identified coronavirus may boost cross-species transmission from snake to human. *Journal of Medical Virology* n/a,

Liu P, Jiang J-Z, Hua Y, Wang X, Hou F, Wan X-F, Chen J, Zou J, Chen J (2020) Are pangolins the intermediate host of the 2019 novel coronavirus (2019-nCoV)? *bioRxiv*

Lu R, Zhao X, Li J, Niu P, Yang B, Wu H, Wang W, Song H, Huang B, Zhu N, Bi Y, Ma X, Zhan F, Wang L, Hu T, Zhou H, Hu Z, Zhou W, Zhao L, Chen J, Meng Y, Wang J, Lin Y, Yuan J, Xie Z, Ma J, Liu WJ, Wang D, Xu W, Holmes EC, Gao GF, Wu G, Chen W, Shi W, Tan W (2020) Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. *The Lancet*

Luan J, Jin X, Lu Y, Zhang L (2020) SARS-CoV-2 spike protein favors ACE2 from Bovidae and Cricetidae *Journal of Medical Virology*

MANFQ (2020) 'SARS-CoV-2 infection of minks in the Netherlands.' Available at [https://www.oie.int/fileadmin/Home/eng/Our\\_scientific\\_expertise/docs/pdf/COVID-19/OIE\\_SARS\\_CoV%20infection\\_of\\_mink\\_in\\_the\\_Netherlands\\_26April2020.pdf](https://www.oie.int/fileadmin/Home/eng/Our_scientific_expertise/docs/pdf/COVID-19/OIE_SARS_CoV%20infection_of_mink_in_the_Netherlands_26April2020.pdf)

OIE (2020) 'Questions and Answers on the 2019 Coronavirus Disease (COVID-19).' Available at <https://www.oie.int/en/scientific-expertise/specific-information-and-recommendations/questions-and-answers-on-2019novel-coronavirus/> [Accessed 1 June 2020].

Oreshkova N, Molenaar R-J, Vreman S, Harders F, Munnink BBO, Honing RWH-v, Gerhards N, Tolsma P, Bouwstra R, Sikkema R (2020) SARS-CoV2 infection in farmed mink, Netherlands, April 2020. *bioRxiv*

PROMED (2020a) 'COVID-19 update (88): Germany, animals, research, pig, chicken, bat, ferret.' Available at <https://promedmail.org/promed-post/?id=7196506> [Accessed 8 April 2020].

PROMED (2020b) 'COVID-19 update (209): Netherlands (NB) farmed mink, animal-to-human, cat, epid.' Available at <https://promedmail.org/promed-post/?id=7375359> [Accessed 1 June 2020].

Robertson DL (2020) 'nCoV's relationship to bat coronaviruses & recombination signals (no snakes).' Available at <http://virological.org/t/ncovs-relationship-to-bat-coronaviruses-recombination-signals-no-snakes/331/14> [Accessed 24 Jan 2020].

Schlottau K, Rissmann M, Graaf A, Schön J, Sehl J, Wylezich C, Höper D, Mettenleiter TC, Balkema-Buschmann A, Harder T (2020) Experimental Transmission Studies of SARS-CoV-2 in Fruit Bats, Ferrets, Pigs and Chickens.

Shi J, Wen Z, Zhong G (2020) Susceptibility of ferrets, cats, dogs, and different domestic animals to SARS-coronavirus-2. *BioRxiv*

Smith C, de Jong C, Meers J, Henning J, Wang L-F, Field H (2016) Coronavirus infection and diversity in bats in the Australasian region. *EcoHealth* **13**, 72-82.

USDA (2020) 'USDA Statement on the Confirmation of COVID-19 in a Tiger in New York.' Available at [https://www.aphis.usda.gov/aphis/newsroom/news/sa\\_by\\_date/sa-2020/ny-zoo-covid-19](https://www.aphis.usda.gov/aphis/newsroom/news/sa_by_date/sa-2020/ny-zoo-covid-19) [Accessed 6 April 2020].

Vijaykrishna D, Smith G, Zhang J, Peiris J, Chen H, Guan Y (2007) Evolutionary insights into the ecology of coronaviruses. *Journal of Virology* **81**, 4012-4020.

WCS (2020a) 'A Tiger at Bronx Zoo Tests Positive for COVID-19; The Tiger and the Zoo's Other Cats Are Doing Well at This Time.' Available at <https://newsroom.wcs.org/News-Releases/articleType/ArticleView/articleId/14010/A-Tiger-at-Bronx-Zoo-Tests-Positive-for-COVID-19-The-Tiger-and-the-Zoos-Other-Cats-Are-Doing-Well-at-This-Time.aspx> [Accessed 6 April 2020].

WCS (2020b) 'Update: Bronx Zoo Tigers and Lions Recovering from COVID-19.' Available at <https://newsroom.wcs.org/News-Releases/articleType/ArticleView/articleId/14084/Update-Bronx-Zoo-Tigers-and-Lions-Recovering-from-COVID-19.aspx> [Accessed 15 May 2020].

WHO (2020a) 'Coronaviruses.' Available at <https://www.who.int/health-topics/coronavirus> [Accessed 12 Feb 2020].

WHO (2020b) 'Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV).' Available at [https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-\(2005\)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-\(2019-ncov\)](https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov)) [Accessed 31 Jan 2020].

Wong AC, Li X, Lau SK, Woo PC (2019) Global epidemiology of bat coronaviruses. *Viruses* **11**, 174.

Woo PC, Wang M, Lau SK, Xu H, Poon RW, Guo R, Wong BH, Gao K, Tsoi H-w, Huang Y (2007) Comparative analysis of twelve genomes of three novel group 2c and group 2d coronaviruses reveals unique group and subgroup features. *Journal of Virology* **81**, 1574-1585.

Zhang Q, Zhang H, Huang K, et al (2020) SARS-CoV-2 neutralizing serum antibodies in cats: a serological investigation. *BioRxiv*

Zhou P, Yang X-L, Wang X-G, Hu B, Zhang L, Zhang W, Si H-R, Zhu Y, Li B, Huang C-L (2020) Discovery of a novel coronavirus associated with the recent pneumonia outbreak in humans and its potential bat origin. *bioRxiv*

## To provide feedback on this fact sheet

Wildlife Health Australia would be very grateful for any feedback on this fact sheet. Please provide detailed comments or suggestions to [admin@wildlifehealthaustralia.com.au](mailto:admin@wildlifehealthaustralia.com.au). We would also like to hear from you if you have a particular area of expertise and would like to produce a fact sheet (or sheets) for the network (or update current sheets). A small amount of funding is available to facilitate this.

## Disclaimer

This fact sheet is managed by Wildlife Health Australia for information purposes only. Information contained in it is drawn from a variety of sources external to Wildlife Health Australia. Although reasonable care was taken in its preparation, Wildlife Health Australia does not guarantee or warrant the accuracy, reliability, completeness, or currency of the information or its usefulness in achieving any purpose. It should not be

relied on in place of professional veterinary or medical consultation. To the fullest extent permitted by law, Wildlife Health Australia will not be liable for any loss, damage, cost or expense incurred in or arising by reason of any person relying on information in this fact sheet. Persons should accordingly make and rely on their own assessments and enquiries to verify the accuracy of the information provided.



Find out more at [www.wildlifehealthaustralia.com.au](http://www.wildlifehealthaustralia.com.au)  
email [admin@wildlifehealthaustralia.com.au](mailto:admin@wildlifehealthaustralia.com.au)  
or call +61 2 9960 6333