COVID-19 and Animals

FREQUENTLY ASKED QUESTIONS FOR VETERINARIANS

April 30, 2020

This document was developed by a working group consisting of Canadian public health and animal health experts, with representation from federal and provincial/territorial governments, the Canadian Veterinary Medical Association, and academia. It takes into consideration past and current research on coronaviruses and COVID-19, as well as expert opinion. The findings and conclusions represent the consensual, but not necessarily unanimous, opinions of the working group participants, and do not necessarily represent the views of the participants' respective organizations.

This information is preliminary and will be updated as further information becomes available.

1) Can companion animals become infected with SARS-CoV-2 (the virus that causes COVID-19 illness in humans) and develop illness?

The probability that companion animals in the household of a COVID-19 case will be exposed and become infected, is thought to be low to moderate, depending on the species. However, only limited information is available and there is still uncertainty about how this virus will behave in various animal species.

At this time, there is evidence that cats, ferrets, hamsters, and dogs have at least some level of susceptibility to infection with SARS-CoV-2 and cats, ferrets, and hamsters may develop illness.

A detailed summary of the current evidence for various animals is provided in the Appendix below.

2) Can livestock become infected with SARS-CoV-2?

To date, there have **not** been any reports of livestock being infected by SARS-CoV-2 anywhere.

- Recent research has **not** found livestock (i.e. pigs, chickens, ducks) to be susceptible to infection with SARS-CoV-2 (Shi et al., 2020, Beer et al., 2020).
- The Canadian Food Inspection Agency (CFIA) is conducting research on domestic animal species (pigs, chickens, turkeys) to determine their susceptibility to SARS-CoV-2 and validate test methods and the potential for transmission between animals.
- Information on the susceptibility of other livestock species to this virus is not currently known. More information from experimental studies being conducted in livestock is anticipated in the coming weeks.

A summary of the current evidence is provided in the table in the Appendix below.

3) Are there other animals that have been shown to be susceptible to infection with SARS-CoV-2?

There have been reports of big cats (tigers and lions) at a zoo in New York as well as farmed mink in the Netherlands testing positive for SARS-CoV-2.

A detailed summary of the current evidence is provided in the Appendix below.

4) If a companion animal becomes infected, what is the evidence that it can transmit the virus to other animals?

There is limited evidence that ferrets, cats, and hamsters can spread the infection to other naïve animals of the same species, under experimental conditions. Dogs have **not** been found to be able to transmit the virus to other dogs.

A summary of the current evidence is provided in the Appendix below.

5) If a companion animal becomes infected, what is the evidence that it can transmit the virus to people?

There have **not** been any reports of transmission of SARS-CoV-2 from a companion animal to a person, despite a widespread international pandemic. The probability of transmission by an infected companion animal to a person is currently considered low in most cases, although this may be somewhat higher for people (such as veterinarians or veterinary technicians) who could have close contact with cats or ferrets from COVID-19 positive households. There is a high level of uncertainty regarding whether or not these animals would shed a sufficient amount of virus to result in transmission under natural conditions.

6) What is the evidence that animals can act as fomites to mechanically transmit SARS-CoV-2, after contamination by a human case, to another person?

Although there is a potential risk of exposure to SARS-CoV-2 through contact with a contaminated hair coat/fur, there is only a theoretical risk of transmission of the virus to a person through this route. It is considered unlikely that a sufficient amount of virus would remain on the hair coat/fur long enough to transmit infection in most cases. Practicing proper hygiene such as handwashing would further reduce any possible risk.

A summary of the current evidence is provided in the Appendix below.

7) As a veterinarian or animal health professional, I am concerned about working around animals (pets/livestock) that have been exposed to people with COVID-19. Are there any extra precautions I should be taking?

This pandemic is being driven by person-to-person transmission; therefore, the main considerations to protect health are maintaining physical distancing, practicing proper hygiene and cleaning, and minimizing contact (both direct and indirect) with your human clients as well as between employees, which poses the greatest risk to the health of you and your staff.

There are still many unknowns about how this virus will behave in various animal species. Two possible transmission routes to consider are:

- **Contact with an infected companion animal:** There have **not** been any reports of transmission from a companion animal to a person, despite a widespread pandemic. However, recent research has found that ferrets, cats, and hamsters can transmit the infection to other ferrets, cats, and hamsters, respectively. The probability of transmission from an infected animal to a person is currently assessed as low in most cases, but this assessment has high uncertainty, given the limited information.

- **Mechanical (fomite) transmission through contact with a contaminated animal:** Although there is a potential risk of exposure to SARS-CoV-2 through contact with a contaminated hair coat/fur, it is considered unlikely that a sufficient amount of virus would remain on the hair coat/fur long enough to transmit infection in most cases.

While the probability of acquiring SARS-CoV-2 through the above routes is thought to be low, and notably much lower than the probability of being infected by another person, the probability is not zero, and may vary depending on circumstances. Animals presenting from households with a history of recent confirmed or suspected COVID-19 illness with no strict measures to minimize contact would be considered higher risk for infection or contamination. Professional judgement should be utilized to assess and identify high-risk situations and determine the appropriate precautionary measures, while helping to conserve and maintain the critical supply of PPE for human healthcare settings.

If an animal from a high-risk household requires urgent care, to help manage these potential risks follow basic public health guidance for preventing zoonotic disease transmission, as well as additional precautions, if necessary:

- wear protective outerwear (e.g. lab coat, gown) to prevent contamination of your clothes

- wear gloves (if possible) and wash your hands before and after touching a high-risk animal or their food/water/supplies, and after cleaning up after them; do not touch your face with unwashed hands

- regularly clean and disinfect any surfaces or objects the animal touches; see Health Canada's approved list of disinfectants here
- minimize the animal's contact with people and other animals
- if close contact with the animal is required (e.g. restraint, or any procedure that brings a person's face close to the animal's face or hair coat/fur), additional personal protective equipment (PPE) (e.g. mask, eye protection if available) can be utilized to further reduce risk, especially to protect from facial contact (eyes, nose, mouth) with the animal directly (hair coat/fur) or with respiratory droplets/aerosols

Additional precautionary measures that could further reduce risk include:

- wiping down animals with a pet-friendly disinfectant product (or potentially bathing, depending on circumstances) could theoretically help to reduce any possible hair coat/fur contamination, although there is no evidence to demonstrate effectiveness
- minimizing handling admitted patient requiring non-emergent care for 2-3 days to reduce the risk of fomite transmission to negligible.

The situation is evolving rapidly and precautions should be considered within the general context of the evolving epidemiology and science.

Follow any further COVID-19 related recommendations from your veterinary licencing authority or associations, or public health authority.

8) My clients heard about animals testing positive for COVID-19 (SARS-CoV-2), and are worried about their health and the health of their families. What advice should I be providing?

This pandemic is being driven by person-to-person transmission. If a household, including any pets, is following current recommended physical distancing measures, it would be considered very unlikely that the animal would be a source of infection for the household. To date, all reports of animals becoming infected with SARS-CoV-2 are believed to be cases of human-to-animal transmission, usually from an infected owner to their pet dog or cat.

Advise your clients that if they have COVID-19 symptoms or are self-isolating due to contact with a COVID-19 case, they should follow similar recommendations around their animals, as they would around people in these circumstances:

- avoid close contact (petting, snuggling, being kissed or licked, sharing food) with their animals during their illness
    - practice good handwashing and avoid coughing and sneezing on animals
- if possible, have another member of their household care for their animals
    - if this is not possible, they should always wash their hands before and after touching their animals, their food and supplies
- restrict their animal's contact with other people and animals outside the household until their illness is resolved or they are no longer required by public health to self-isolate (approximately 14 days)
    - cats should remain indoors at all times
    - dogs should be kept on a leash or within a private fenced area when taken outside for elimination activities, and kept away from other animals and people

Some additional considerations include:

- The greatest risk of infection by far is still from contact with infected people.
- Animals can be a great comfort and help make us happy during times of stress and there are many health benefits to owning a pet, particularly during periods when physical distancing or self-isolation are required.
- There is no reason at this time to think that surrendering an animal will significantly decrease a pet owner's risk.
- There is limited evidence of some companion animals being able to transmit the infection to other animals under experimental conditions, however, there have **not** been any reports of transmission from animals-to-people. The risk of a person getting infected from contact with an infected companion animal is theoretical at this point and considered low in most cases. A summary of the current evidence is provided in the Appendix below.
- Any theoretical risk is transient. Generally speaking, if a companion animal were to become infected from contact with an ill person in the household, once the person (or household) is able to come out of self-isolation (approximately 14 days), their animals can also be out in the community.

9) My client was ill with symptoms of COVID-19 and is now worried that their pet could be an ongoing source of infection for others. Is this a concern?

Even if the pet was exposed to the virus in the household during the owner's illness, it is unlikely that the pet would be a source of the virus (either by being infected themselves or by contamination of their hair coat/fur) beyond the owner's own course of disease. Virus transmission is predominantly person-to-person. There have **not** been any reports of animals transmitting the virus back to people but there are still many unknowns. Precautions should be taken for 14 days after the pet's last unprotected exposure to a human case, including keeping the pet at home and restricting contact with other people and animals. After this time, the pet can also be out in the community.

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Appendix

COVID-19 and Animals – Detailed Evidence Summary

1) Evidence that companion animals can become infected and develop illness

Dogs:

- Two dogs from Hong Kong were reported to have been infected with SARS-CoV-2 after being exposed to COVID-19 positive owners. Neither dog showed any signs of illness but tested positive by RT-PCR on nasal, oral, or rectal swabs, and subsequently seroconverted. Live virus was isolated from one of the dogs.
- An experimental study by Shi et al. (2020) found some of the dogs in the study became infected (seroconverted and viral RNA was detected by rectal swabs) but no live virus was isolated.

Cats:

- There have been several reports of pet cats testing positive for SARS-CoV-2 after being exposed to COVID-19 positive owners:
    - Viral RNA was detected in the feces and vomit of a cat in Belgium who developed respiratory and gastrointestinal signs about a week after the owner developed symptoms.
    - Oral, nasal, and rectal swabs from a cat in Hong Kong tested positive for SARS-CoV-2 by RT-PCR.
    - Two pet cats in separate households in New York state, USA have tested positive for the virus. Both cats had respiratory signs and are thought to have been infected by a COVID-19 human case, however, only one of the cats was confirmed to have a COVID-19 positive owner.
- An experimental study by Shi et al. (2020) found cats to be susceptible to infection, with younger cats developing significant respiratory tract lesions.
- A study that sampled cats in Wuhan, China during the outbreak (January-March, 2020) found that about 11% (11/102) of cats had antibodies to SARS-CoV-2, indicating that they had been infected at some point. Three of these cats were owned by COVID-19 patients, the others were strays or sampled at veterinary clinics (Zhang et al., 2020).

Ferrets:

- Several experimental studies have shown ferrets to be susceptible to infection with SARS-CoV-2 and possibly develop mild clinical signs (Shi et al., 2020; Kim et al., 2020; Richard et al., 2020; Beer et al., 2020; CSIRO, 2020).

Hamsters:

- An experimental study on hamsters found that they could be infected and develop clinical signs such as weight loss, lethargy, and increased respiratory rate (Chan et al., 2020).

2) Evidence that other animals can become infected and develop illness

- A tiger at a zoo in New York tested positive for SARS-CoV-2 by RT-PCR and gene sequencing on respiratory tract samples. The tiger had a cough and reduced appetite. Three other tigers and three lions at the zoo also showed clinical signs and subsequently tested positive for the virus by RT-PCR on fecal samples, along with another tiger not showing clinical signs. It is suspected that the big cats got infected from a zoo employee actively shedding virus.

- Mink at two separate mink farms in the Netherlands tested positive for SARS-CoV-2 after developing respiratory and gastrointestinal signs. Some workers at the farm showed symptoms and also tested positive for the virus. It is believed to be case of human-to-animal transmission.

3) Evidence that companion animals can transmit the virus to other animals

- Recent research has shown that infected ferrets can transmit the virus to naïve ferrets both by direct and indirect contact (Kim et al., 2020, Shi et al., 2020, Richard et al., 2020).

- Similarly, a recent experimental study has shown that infected cats can transmit the virus to naïve cats housed next to the infected cats (Shi et al., 2020).

- An experimental study on hamsters found that infected hamsters could transmit the virus to naïve hamsters in the same cage (Chan et al., 2020).

- Dogs have **not** been found to be able to transmit the virus to other dogs housed in the same room (Shi et al., 2020).

4) Evidence that animals can act as fomites

- An extensive literature review did not find any studies that evaluated fur, hair, skin, or hides as a source of transmission from cats or dogs for the SARS-CoV-2 or the similar virus, MERS-CoV. Only one study on SARS-CoV found that the virus could survive on pig skin in phosphate buffered saline for >24 hours. This is an understudied area.

- Coronaviruses can persist in the environment for days, although it varies by surface. Viruses do not survive as long on porous surfaces (e.g. cotton, paper) compared to non-porous surfaces (e.g. stainless steel, plastic).

    - Recent research has found that SARS-CoV-2 can survive on cardboard for 24 hours and on non-porous surfaces such as stainless steel and plastic for 3 days.

    - A previous study on SARS-CoV that simulated large respiratory droplets falling on cotton gowns found that, at concentrations of virus higher than what would be expected from a nasopharyngeal aspirate, the virus only survived on cotton for 5 minutes. At a higher viral load, the virus was inactivated within 1 hour and at the highest viral load tested, within 24 hours.

Species	Susceptible	Subclinical infection	Clinical signs	Seroconversion	Transmit to other animals	Evidence
Cat	yes	yes	Yes	yes	yes	1,2,3
Ferret	yes	yes	yes	yes	yes	2
Hamster	yes	unknown	Yes	yes	yes	2
Dog	yes, somewhat	yes	no?	yes	no	1,2
Big cat (tiger, lion)	yes	yes	yes	unknown	unknown	1
Mink	yes	unknown	Yes	unknown	unknown	1
Pig	no	n/a	n/a	n/a	n/a	2
Chicken	no	n/a	n/a	n/a	n/a	2
Duck	no	n/a	n/a	n/a	n/a	2

***Based on limited information available as of April 28, 2020. Animal species not listed do not yet have any evidence available.**

Evidence: 1 – Case report; 2 – Experimental finding; 3 – Observational study

Clinical signs: Cat – respiratory, gastrointestinal; Ferret – fever, respiratory, decreased appetite; Hamster – respiratory, lethargy, weight loss; Wild cat – respiratory, decreased appetite; Mink – respiratory, gastrointestinal; Dog – respiratory, decreased appetite

References

Chan JF, Zhang AJ, Yuan S, et al. Simulation of the clinical and pathological manifestations of Coronavirus Disease 2019 (COVID-19) in golden Syrian hamster model: implications for disease pathogenesis and transmissibility [published online ahead of print, 2020 Mar 26]. Clin Infect Dis. 2020;ciaa325. doi:10.1093/cid/ciaa325

Kim YI, Kim SG, Kim SM, et al. Infection and Rapid Transmission of SARS-CoV-2 in Ferrets [published online ahead of print, 2020 Apr 5]. Cell Host Microbe. 2020;S1931-3128(20)30187-6. doi:10.1016/j.chom.2020.03.023

Richard M, Kok A, de Meulder D, et al. SARS-CoV-2 is transmitted via contact and via the air between ferrets [preprint (not peer-reviewed), 2020 Apr 17]. Available from: https://www.biorxiv.org/content/10.1101/2020.04.16.044503v1

Shi J, Wen Z, Zhong G, et al. Susceptibility of ferrets, cats, dogs, and other domesticated animals to SARS-coronavirus 2 [published online ahead of print, 2020 Apr 8]. Science. 2020;eabb7015. doi:10.1126/science.abb7015

Zhang Q, Zhang H, Huang K, et al. SARS-CoV-2 neutralizing serum antibodies in cats: a serological investigation [preprint (not peer-reviewed), 2020 Apr 3]. Available from: https://www.biorxiv.org/content/10.1101/2020.04.01.021196v1

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