



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Commentary/Letter to Editor

COVID-19 and pets: When pandemic meets panic

Nicola M.A. Parry

Midwest Veterinary Pathology, LLC, Lafayette, IN, United States

ARTICLE INFO

Keywords:

Animal coronaviruses
 COVID-19
 One health
 Pets
 SARS-CoV-2
 Zoonotic disease

ABSTRACT

As the novel coronavirus outbreak spreads globally with devastating effects on human health, pets are also becoming unnecessary victims amidst the pandemic panic. Many have been reluctantly left home alone by owners who have been forced to temporarily evacuate their homes. And, although no evidence exists to indicate that they can either transmit the virus or develop its associated coronavirus disease 2019 (COVID-19), fear among the public that pets might play a role in spreading COVID-19 has resulted in pets being abandoned or even killed. This article outlines some of the ways in which the current pandemic has negatively impacted the welfare of pets. It also highlights the relationships between animal, human, and environmental health, as well as the importance of taking a collaborative transdisciplinary *One Health* approach to help prevent future COVID-19 outbreaks.

Introduction

On December 31, 2019, China alerted the World Health Organization to a cluster of unusual cases of pneumonia that were diagnosed in Wuhan, in Hubei province, China. Although the cause at that time was unknown, the patients' symptoms and clinical features were most suggestive of a viral etiology. On January 7, 2020, officials reported that they had isolated the causative agent behind the cases—a novel coronavirus [1–3].

The name of this novel virus evolved quickly to its now official designation as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), with coronavirus disease 2019 (COVID-19) becoming the official name of the disease caused by the virus [3].

Global spread of the virus has been rapid, and the COVID-19 outbreak was declared a Public Health Emergency of International Concern on January 30, 2020. Worldwide, more than 1 million cases of SARS-CoV-2 infection have now been confirmed, and more than 51,000 people have died of COVID-19 [4].

The animal welfare impact

And while the pandemic has resulted in devastating consequences for health systems and economic stability throughout the world, it has also had undesirable, but perhaps not surprising, ramifications for animal welfare. In particular, for veterinary and animal welfare professionals, the wave of fear among the general public is of great concern with respect to how this pandemic will affect pets.

Unintended initial consequences

At the original epicenter of the outbreak in Wuhan, many residents were forced to leave behind their pets when authorities evacuated people from their homes. Reports suggest that owners left enough food and water to last their pets for a few days until they hoped to be able to return home again. But now, more than 6 weeks later, many owners still have not returned home. Animal welfare organizations in China estimate that, in Hubei alone, tens of thousands of cats and dogs have been left behind, facing starvation and death [5].

Unfounded fears that pets might spread SARS-CoV-2

Concern also rapidly emerged among pet owners and the general public in late February 2020, when a dog in Hong Kong tested positive for the novel coronavirus. This was considered to be the first known case of potential human-to-animal SARS-CoV-2 transmission [6].

The 17-year-old male Pomeranian was tested after his owner developed COVID-19. Although the dog had no clinical signs, he was taken to a nearby animal quarantine facility where oral, nasal, and rectal swab specimens were collected from him for SARS-CoV-2 testing. The oral and nasal swabs returned “weak positive” results. Additional swab specimens were collected from the dog on two further occasions over the next five days, and they again tested “weak positive”. The dog remained under mandatory quarantine at the facility for 14 days before returning home. Nevertheless, despite having no signs of clinical illness, the dog died just 2 days after returning home. The cause of death remains unknown because the owner did not consent to post-mortem

E-mail address: nicola@midwestvetpath.com (N.M.A. Parry).

<http://doi.org/10.1016/j.fsir.2020.100090>

Received 6 April 2020/Accepted 7 April 2020

Available online 11 April 2020

2665-9107/© 2020 The Author(s). Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

examination. However, given the dog's elderly age, and because he reportedly had underlying health conditions, experts believe it is unlikely that his death was related to the positive SARS-CoV-2 test result [7–9].

This first case sparked fears among the public, resulting in acts of animal abuse by people who believed that pets might start to spread the virus to people. One group known as the Urban Construction Administration announced it would kill cats and dogs found outdoors, to prevent transmission of SARS-CoV-2. And even officials in Hunan and Zhejiang provinces announced they would begin killing pets that were found in public [5].

The Hong Kong Society for the Prevention of Cruelty to Animals issued a statement to inform the public that there is no evidence to show that pets can transmit the virus to people, and warning people against compromising animal welfare [5]. But this did little to calm people's fears, and panic among pet owners and the general public has also spread globally. Anecdotal reports have been widespread in the media and on social media about an increase in the number of pets being abandoned at this time. While many owners fear their animals might transmit SARS-CoV-2 to them, others also now find themselves unemployed and unable to afford to care for a pet [10].

On the positive side, with many people now finding themselves isolated at home during the pandemic, rates of pet adoptions and fosters at many shelters have also markedly risen—often cancelling out or markedly exceeding the high rates of abandonment. This is good news for people and pets who now get to enjoy the great advantages of the human–animal bond during this unique time of great need. Inevitably, however, some experts worry that many of these pets will be returned to the shelter when life eventually returns to a new normal [10–12].

So, what's the deal with animals and COVID-19?

The origin of SARS-CoV-2

One common factor linking some of the first patients that were diagnosed with COVID-19 in Wuhan was a history of visiting or working at the local Huanan Seafood Market. This was also reported to be a “wet market” that dealt in the sale of various live animals [1–3]. Because of this, many experts have suggested that the disease in humans originated via initial animal-to-human spread of the novel virus.

The SARS-CoV-2 has been genetically identified and sequenced and shown to be related to other similar known coronaviruses that circulate among bats (such as the SARS coronavirus and the MERS coronavirus) [13]. So, bats are considered to be the most likely natural reservoir of this novel coronavirus.

However, the first case of COVID-19 in Wuhan occurred in a patient who had no link to the seafood market [1]. Also, bats are reported to be rare in markets in China [14]. Although the SARS-CoV-2 may theoretically transmit directly from bats to humans, the evidence so far suggests it more likely spreads indirectly through another animal playing the role of an intermediate host to transmit the virus to humans. Although an intermediary animal species has not yet been definitively identified, it could have been one of the wild live animal species sold at the seafood market in Wuhan.

The idea of this novel virus emerging at the animal-human interface is not a new concept. Zoonotic diseases with a wildlife reservoir have long been recognized as a significant public health problem. Indeed, up to three-quarters of infectious diseases that emerge in humans are known to be zoonotic [15].

The events that facilitate emergence of new zoonotic diseases and their geographical spread are complex and affected by multiple factors at multiple levels, including those related to the pathogen, environment, humans, and animals. Although we still have much to learn about SARS-CoV-2, a complexity of animal, human, and environmental factors have inevitably played a critical role in its emergence [16]. As such, a *One Health* approach will eventually be critical as part of the response to this

emerging infectious disease.

Traditionally, veterinary professionals have treated animals, medical professionals have treated people, and ecologists have taken care of the environment. However, recognizing the complex interconnectedness of the health of animals, humans, and the environment, the *One Health* approach eliminates this fragmented strategy. Instead, it uses “a collaborative, multisectoral, and transdisciplinary approach—working at the local, regional, national, and global levels”, engaging professionals across many disciplines such as veterinary, human, and environmental health [17]. As such, it aims to improve public health outcomes by understanding and preventing risks that arise at the interface between animals, humans, and their environments [16].

Pets and SARS-CoV-2

What about the pets that have tested positive for SARS-CoV-2?

So far, despite more than 1 million people around the world having tested positive for the virus, only 4 cases have been reported in which pets have apparently tested positive for SARS-CoV-2. These have involved 2 dogs and 2 cats. In all 4 cases, the animals' owners were sick with COVID-19 and are believed to be the most likely source of transmission of the virus to their pets. Although neither of the 2 dogs showed any clinical signs, one of the cats did have signs of illness.

Shortly after the Pomeranian in Hong Kong tested positive for SARS-CoV-2, in March 2020, a second dog in Hong Kong also tested positive for the virus. After the second dog's owner, a 30-year-old woman, was diagnosed with COVID-19, her 2 dogs were sent to the quarantine facility for testing. Oral and nasal swabs from one of them, a German shepherd dog, tested positive for the virus. However, swabs collected from the second, a mixed breed dog, tested negative [7,18].

In late March 2020, health officials in Belgium reported that a cat from Liège province had also tested positive for SARS-CoV-2, about 1 week after its owner was diagnosed with COVID-19. Unlike the 2 dogs that tested positive for the virus, the cat did show signs of illness, including diarrhea, vomiting, and difficulty breathing [19]. Samples of vomit and feces from the cat were tested at the Faculty of Veterinary Medicine of the University of Liège and “genetic tests showed high levels of SARS-CoV-2 in those samples”, according to Dr Daniel Desmecht. The cat reportedly recovered after 9 days [19].

On March 31, officials in Hong Kong reported that a cat was being kept in quarantine after testing positive for SARS-CoV-2 via oral, nasal, and rectal swabs. This cat's owner had also been diagnosed with COVID-19. However, the cat had no clinical signs of illness. [20].

Does this mean those four pets were infectious?

So far, for the 4 pets in Hong Kong and Belgium, the available clinical and diagnostic information is incomplete. But, based on what we know at this stage from the media accounts, there is no definitive evidence to suggest that any of the animals were actually infectious.

By all accounts, real-time polymerase chain reaction (RT-PCR) tests were used to detect SARS-CoV-2 in the 4 pets. However, it is important to remind pet owners and members of the general public that, just because a sample from a pet “tests positive” using this method, this is not necessarily synonymous with the pet “being infectious”. And, in the cases of these 4 pets, we also do not have enough information to know whether they were even truly infected with the virus.

Although RT-PCR is a highly sensitive testing method, a positive result indicates only the presence of viral nucleotides in the sample. However, it does not indicate how those viral particles ended up in the sample in the first place. So, it does not tell us whether the virus actually infected the animals (in which case, the viral particles could be a breakdown product of the infection) or whether viral nucleotides were present in the samples because the animals merely came into direct contact with the virus (perhaps by licking either their sick owners or contaminated surfaces in the home). Thus, the positive RT-PCR results in these pets do not

necessarily indicate the presence of viable virus that was infectious and could potentially have put other people (or animals) at risk of SARS-CoV-2 infection.

So, overall, we must be careful to avoid overinterpreting the positive results in these pets. Certainly, in the case of the cat in Belgium, if the owner consents to serologic testing, this may prove helpful to indicate a previous SARS-CoV-2 infection by detecting the presence of SARS-CoV-2-specific antibodies. However, the presence of these antibodies still would not necessarily prove that the SARS-CoV-2 infection had resulted in the cat's clinical signs.

Interestingly, although not a pet, a female Malayan tiger at the Wildlife Conservation Society's Bronx Zoo in New York City also tested positive for SARS-CoV-2 on April 5. Officials believe the source of the virus was a zookeeper who was actively shedding virus. The animal was one of several tigers and lions who showed signs of a dry cough. However, because of the need for general anesthesia to collect diagnostic samples from these big cats, this tiger was the only one of the animals with clinical signs that was tested for the virus [21]. Again, at this stage, the significance of this positive result in this tiger and its association with the animal's clinical signs remain unclear.

But, the cat in Belgium was sick—doesn't that indicate SARS-CoV-2 infection?

Although the cat in Belgium had diarrhea, vomiting, and difficulty breathing, this constellation of clinical signs isn't enough to suggest that the cat had full-blown COVID-19, or even true SARS-CoV-2 infection. These clinical signs are relatively nonspecific and can arise in cats in association with various nonspecific and specific conditions. In fact, one confounding factor in the cat's case is the fact that other coronaviruses do affect cats.

Other coronaviruses are well recognized in cats

Coronaviruses represent a large family of viruses (the *Coronaviridae*) that can cause a variety of diseases of differing severity in animals as well as in humans. These viruses are well established in different animal species as causes of a range of conditions that predominantly affect the gastrointestinal tract, respiratory system, and nervous system [22].

Coronaviruses are well recognized as causes of disease in cats. Feline enteric coronavirus (FECV) is a ubiquitous enteric virus in the cat population. And, although it is highly contagious and commonly infects cats via feco-oral transmission, it typically produces either no clinical signs or only mild diarrhea. However, in a small percentage of cats, FECV undergoes mutation to produce feline infectious peritonitis (FIP) virus. This mutant variant of FECV is responsible for causing FIP, a devastating and lethal systemic infection that is considered to be one of the most significant infectious diseases in cats [23].

Other coronaviruses are also well recognized as causes of disease in dogs

In dogs, canine respiratory coronavirus (CRCoV) affects the respiratory system, typically contributing as one of many pathogenic organisms to cause canine infectious respiratory disease (CIRD), also widely known as "kennel cough". Infection with CRCoV is usually associated with mild, self-limiting clinical signs that typically are nonspecific and include dry cough, sneezing, and nasal discharge. However, infection with this virus can potentially progress to pneumonia in some cases and has been associated with outbreaks of severe respiratory disease in dogs in shelters and boarding facilities [24,25].

Another distinct coronavirus, canine coronavirus (CCoV), affects the gastrointestinal tract in dogs and can cause gastroenteritis that may range in severity from mild to severe disease. Enteric infection in dogs is usually self-limiting and typically produces either no clinical signs or only mild enteritis [26].

In contrast to this CCoV which shows only enteric tropism, a pantropic pathogenic variant of CCoV has also been described in association with an outbreak of fatal systemic disease in puppies aged approximately 6–8 weeks old at a pet shop in Italy. The clinical signs in the puppies included fever, lethargy, inappetence, vomiting, hemorrhagic diarrhea, ataxia, and

seizures. The animals died 2 days after the onset of clinical signs. At post-mortem examination, lesions were present in multiple tissues, including the intestines, liver, spleen, kidneys, lungs, and lymph nodes. CCoV was also detected in multiple tissues, including the lungs, suggesting the potential for this pathogenic variant to also contribute to the pathogenesis of CIRD [26].

However, none of these more typical feline or canine coronaviruses are directly associated with the current novel coronavirus outbreak. Despite belonging in the same family of viruses, they are all distinct from the SARS-CoV-2 which is responsible for causing COVID-19.

No evidence that pets play a key role in SARS-CoV-2 transmission

We are still in the early stages of understanding how this novel virus affects humans, let alone animals. So, more time and testing will be necessary to better understand how exactly SARS-CoV-2 behaves in pets. Routine testing of pets for SARS-CoV-2 is not recommended at this time. Instead, it is currently being reserved for cases in which animal and public health officials believe a pet should be tested because it is linked to a person with confirmed COVID-19 [27]. However, some testing has been performed.

To date, officials in Hong Kong have tested samples collected from more than 25 pets living in homes in which their owners either had received confirmed diagnoses of COVID-19 or had been in close contact with someone with the disease. Yet, only 2 dogs and 1 cat from this group have tested positive for SARS-CoV-2 [20].

IDEXX Laboratories, a multinational veterinary diagnostics company, has also developed a PCR-based SARS-CoV-2 test. Although the test is not available for commercial use, the company is actively monitoring for emergence of SARS-CoV-2 in companion animals. So far, IDEXX has analyzed more than 4000 samples from dogs, cats, and horses with respiratory signs. Many of these specimens came from regions experiencing COVID-19 cases in humans. However, so far, all the samples have tested negative for the novel virus [28].

Conclusion

Overall, based on the early data so far, no significant evidence exists to suggest that pets or other animals pose a substantial threat to people or other animals with respect to transmitting SARS-CoV-2.

Nevertheless, given the rising concern among the general public, major health organizations, including the US Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO), and key animal health organizations have all issued statements aiming to calm people's fears about their pets being a source of the novel virus [20], [29], [30], [31], [32] [33]. "There is no justification in taking measures against companion animals which may compromise their welfare," the World Organisation for Animal Health has emphasized.

Inevitably, the crucial focus right now during this current pandemic is to control human-to-human transmission of SARS-CoV-2, and this requires each of us to play a key role to reduce community spread of the virus. However, the unfolding of this pandemic has again highlighted the complex interrelationships that exist between animals, people, and the environment. Ultimately, a multidisciplinary *One Health* approach will thus inevitably be critical to develop appropriate strategies to effectively prevent and control future outbreaks of COVID-19. And, given the speculation that wild live animal species may be linked to this pandemic, this collaborative approach will also require the expertise of wildlife forensic specialists. At best, trading at wet markets like the one in Wuhan often tends to occur under poor regulatory and welfare standards, and illegal wildlife trade frequently coexists at these locations. Indeed, many experts also hope that this crisis could represent the end of the global wildlife trade.

Declaration of competing interest

The author is a Section Editor of Forensic Science International: Reports and has previously authored chapters of veterinary textbooks

published by Elsevier. The author has no financial or other personal interests to report. The opinions are solely those of the author.

References

- [1] C. Huang, Y. Wang, X. Li, L. Ren, et al., The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health - the latest 2019 novel coronavirus outbreak in Wuhan, China. *Lancet*. 395 (2020) 497–506, doi:http://dx.doi.org/10.1016/S0140-6736(20)30183-5.
- [2] D.S. Hui, E. I Azhar, T.A. Madani, F. Ntoumi, et al., The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health - the latest 2019 novel coronavirus outbreak in Wuhan, China. *Int. J. Infect. Dis.* 91 (2020) 264–266.
- [3] World Health Organization. Rolling updates on coronavirus disease (COVID-19). Available at: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen>. Accessed April 3, 2020.
- [4] Nature, April 1, Coronavirus Latest: Confirmed Cases Cross the One-Million Mark, (2020) Available at: <https://www.nature.com/articles/d41586-020-00154-w>. Accessed April 3, 2020.
- [5] A. Kim, CNN, March 15, 2020. Cats and Dogs Abandoned at the Start of the Coronavirus Outbreak Are Now Starving or Being Killed Available at: <https://www.cnn.com/2020/03/15/asia/coronavirus-animals-pets-trnd/index.html>. Accessed April 3, 2020.
- [6] Agriculture, Fisheries and Conservation Department (AFCD), The government of the Hong Kong Special administrative region. Press releases. March 4, Detection of Low Level of COVID-19 Virus in Pet Dog, (2020) Available at: https://www.afcd.gov.hk/english/publications/publications_press/pr2342.html. Accessed April 3, 2020.
- [7] L. Cheng, South China Morning Post. March 19, 2020. Coronavirus: Hong Kong Confirms a Second Dog Is Infected, (2020) Available at: <https://www.scmp.com/news/hong-kong/health-environment/article/3075993/coronavirus-hong-kong-confirms-second-dog>. Accessed April 3, 2020.
- [8] LiveScience, March 17, First Dog With Confirmed Coronavirus Infection Has Died — but We Don't Know If It Was Because of the Virus, (2020) Available at: <https://www.livescience.com/coronavirus-first-case-human-to-dog-transmission.html>. Accessed April 3, 2020.
- [9] PennLive, March 23, Coronavirus. First Dog Diagnosed With Coronavirus Dies in Hong Kong, Two More Dogs Test Positive in China, (2020) Available at: <https://www.pennlive.com/coronavirus/2020/03/first-dog-diagnosed-with-coronavirus-dies-in-hong-kong-two-more-dogs-test-positive-in-china.html>. Accessed April 3, 2020.
- [10] S. Surkes, The times of Israel. March 29, More Pets Abandoned, and More Adopted, Since Coronavirus Outbreak, (2020) Available at: <https://www.timesofisrael.com/more-pets-abandoned-and-more-adopted-since-coronavirus-outbreak/>. Accessed April 3, 2020.
- [11] S. Barr, Independent. March 26, Coronavirus Pandemic Sees Huge Increase in Cat and Dog Adoptions, (2020) Available at: <https://www.independent.co.uk/life-style/coronavirus-dog-cat-pet-adoption-battersea-rehome-covid-19-a9426741.html>. Accessed April 3, 2020.
- [12] T. Teenan, March 26, Daily Beast. Animal Shelters Have Welcomed the Coronavirus-Related Boom in Pet Adoption and Fostering. But Some Are Also Planning for Large Numbers of Pets Being Returned, and Financial Peril, (2020) Available at: <https://www.thedailybeast.com/coronavirus-sparks-a-pet-adoption-and-fostering-boom-but-animal-shelters-worry-it-may-go-bust>. Accessed April 3, 2020.
- [13] R. Lu, X. Zhao, J. Li, et al., Genomic characterization and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. *Lancet*. 395 (2020) 565–574, doi:http://dx.doi.org/10.1016/S0140-6736(20)30251-8.
- [14] H. Li, E. Mendelsohn, C. Zong, et al., Human-animal interactions and bat coronavirus spillover potential among rural residents in Southern China, *J. Biosaf. Health Educ.* 1 (2019) 84–90, doi:http://dx.doi.org/10.1016/j.bsheat.2019.10.004.
- [15] H. Kruse, A.M. Kirkemo, K. Handeland, Wildlife as source of zoonotic infections, *Emerg. Infect. Dis.* 10 (2004) 2067–2072.
- [16] EclinicalMedicine, Emerging Zoonoses: a One Health Challenge, *EclinicalMedicine*. 19 (2020) 100300, doi:http://dx.doi.org/10.1016/j.eclinm.2020.100300.
- [17] One Health Commission, What Is One Health? (2020) Available at: https://www.onehealthcommission.org/en/why_one_health/what_is_one_health/. Accessed 3, 2020.
- [18] Agriculture, Fisheries and Conservation Department (AFCD), The government of the Hong Kong Special administrative region. Press releases. March 18, Pet Dog Tests Positive for COVID-19 Virus, (2020) Available at: https://www.afcd.gov.hk/english/publications/publications_press/pr2346.html. Accessed April 3, 2020.
- [19] J. Bryner, March 27, LiveScience. Cat Infected With COVID-19 From Owner in Belgium, (2020) . Available at: <https://www.livescience.com/cat-infected-covid-19-from-owner.html>.
- [20] American Veterinary Medical Association (AVMA), April 3, SARS-CoV-2 In Animals, Including Pets, (2020) Available at: <https://www.avma.org/resources-tools/animal-health-and-welfare/covid-19/sars-cov-2-animals-including-pets>. Accessed April 3, 2020.
- [21] United States Department of Agriculture, Animal and Plant Health Inspection Service. April 6, 2020. USDA Statement on the Confirmation of COVID-19 in a Tiger in New York, (2020) Available at: https://www.aphis.usda.gov/aphis/newsroom/news/sa_by_date/sa-2020/ny-zoo-covid-19. Accessed April 6, 2020.
- [22] Y.S. Malik, S. Sircar, S. Bhat, K. Sharun, et al., Emerging novel coronavirus (2019-nCoV)-current scenario, evolutionary perspective based on genome analysis and recent developments, *Vet. Q.* 40 (2020) 68–76, doi:http://dx.doi.org/10.1080/01652176.2020.1727993.
- [23] S. Felten, K. Hartmann, Diagnosis of feline infectious peritonitis: a review of the current literature, *Viruses*. 11 (2019) 1068, doi:http://dx.doi.org/10.3390/v11111068.
- [24] K.L. Reagan, J.E. Sykes, Canine infectious respiratory disease, *Vet. Clin. North Am. Small Anim. Pract.* 50 (2020) 405–418, doi:http://dx.doi.org/10.1016/j.cvsm.2019.10.009.
- [25] A. Szczepanski, K. Owczarek, A. Milewska, et al., Canine respiratory coronavirus enters caveolin-1-mediated pathway for internalization to HRT-18G cells, *Vet. Res.* 49 (2018) 55, doi:http://dx.doi.org/10.1186/s13567-018-0551-9.
- [26] C. Buonavoglia, N. Decaro, V. Martella, et al., Canine coronavirus highly pathogenic for dogs, *Emerg. Infect. Dis.* 12 (2006) 492–494.
- [27] United States Department of Agriculture, FAQ on Companion Animal Coronavirus Testing, (2020) Available at: https://www.aphis.usda.gov/animal_health/one_health/downloads/faq-public-on-companion-animal-testing.pdf. Accessed April 3, 2020.
- [28] IDEXX, March 2020. IDEXX SARS-CoV-2 (COVID-19) RealPCR Test, (2020) Available at: <https://www.idexx.com/en/veterinary/reference-laboratories/idexx-sars-cov-2-covid-19-realpcr-test/>. Accessed April 3, 2020.
- [29] British Veterinary Association, Coronavirus and animals. April 2, (2020) Available at: <https://www.bva.co.uk/news-and-blog/news-article/coronavirus-disease-covid-19-updates-for-the-veterinary-profession/>. Accessed April 3, 2020.
- [30] Centers for Disease Control and Prevention, March 27, 2020. Coronavirus Disease 2019 (COVID-19). If You Have Animals, (2020) Available at: <https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/animals.html>. Accessed April 6, 2020.
- [31] World Organisation for Animal Health (OIE), Questions and Answers on the 2019 Coronavirus Disease (COVID-19), (2020) Available at: <https://www.oie.int/en/scientific-expertise/specific-information-and-recommendations/questions-and-answers-on-2019-novel-coronavirus/>. Accessed April 3, 2020.
- [32] World Health Organization, March 8, 2020. Q&A on Coronaviruses (COVID-19), (2020) Available at: <https://www.who.int/news-room/q-a-detail/q-a-coronaviruses>. Accessed April 6, 2020.
- [33] World Small Animal Veterinary Association (WSAVA), April 3, 2020. COVID-19—Advice and Resources, (2020) Available at: <https://wsava.org/news/highlighted-news/the-new-coronavirus-and-companion-animals-advice-for-wsava-members/>. Accessed April 3, 2020.