



Fake news about the infection and transmission of COVID-19 between dogs, cats and humans. *Fake news* sobre a infecção e transmissão da COVID-19 entre cães, gatos e seres humanos.

Vitória Erlym Dias Muniz¹, Déborah Milhomem Silva¹, Ana Christina Silva Batista¹, Kryscia Beatriz Teixeira Araújo Varão¹, Thalia Henrique Lima¹, Kalyne Sousa dos Santos¹, Évelyn Bárbara Sousa Maciel¹, [Jailson Honorato](mailto:honorato@uemasul.edu.br)^{1*}

¹- College of Veterinary Medicine, Center of Agrarian Sciences, State University of the Tocantina Region of Maranhao – UEMASUL, Imperatriz, MA, Brazil. *Corresponding author. E-mail: honorato@uemasul.edu.br

Abstract

Dogs and cats occupy a place of honor in the family, in constant interaction and contact, and since the Coronavirus Disease - 2019 (COVID-19) is an intensely contagious respiratory disease concomitant with the circulation of fake news about the possibility of pets transmitting the disease to their tutors, generated great concern, culminating in the abandonment and even mistreatment of animals. The objectives of the study were to analyze information from scientific articles/journalistic articles on infection and transmission of coronavirus in animals and from these to humans, and from that to guide tutors on pet care in relation to COVID-19, also opposing, the fake news published. The following descriptors were used: “coronavirus animals”, “SARS-Cov-2 animals”, in English and Portuguese, published from 2020 to 2022. The search index databases were Google Scholar, Scielo, Pubmed and Scopus. The selected articles showed that the evidence is limited regarding the action of animals in the epidemiological chain of COVID-19, and there is not enough scientific evidence that they can be transmitters to people. And even though some animals have tested positive for SARS-CoV-2, there are no confirmed cases of transmission between these animal species and humans. Thus, it is believed that these bibliographic findings are relevant, due to the need to increase the knowledge of tutors about COVID-19 in dogs and cats, thus avoiding the spread of false news about the epidemiological role of pets.

Keywords: SARS-CoV-2. Coronavirus. Company animals. Pandemic. People.

Resumo

Os cães e gatos, ocupam lugar de honra no âmbito familiar, em constante interação e contato, e uma vez que o Coronavírus Disease - 2019 (COVID-19) é uma doença respiratória intensamente contagiosa concomitante à circulação de *fake news* sobre a possibilidade de os pets transmitirem a doença aos seus tutores, gerou grande preocupação, culminando no abandono e até mesmo maus tratos dos animais. Os objetivos do estudo foram analisar as informações de artigos científicos/matérias jornalísticas sobre infecção e transmissão de coronavírus em animais e destes para humanos, e a partir disso orientar os tutores sobre os cuidados com os pets em relação a COVID-19, contrapondo ainda, as *fake news* publicadas. Foram utilizados os descritores: “coronavírus animais”, “SARS-Cov-2 animais”, nos idiomas inglês e português, publicados de 2020 a 2022. As bases indexadoras de pesquisa foram o Google Acadêmico, Scielo, Pubmed e Scopus. Os artigos selecionados apresentaram que as evidências são limitadas quanto a ação dos animais na cadeia epidemiológica da COVID-19, não havendo evidências científicas suficientes de que possam ser transmissores para pessoas. E mesmo que alguns animais tenham sido positivos para SARS-CoV-2, não existem casos confirmados de transmissão entre estas espécies animais e os seres humanos. Assim, acredita-se que esses achados bibliográficos sejam relevantes, pela necessidade de aumentar o conhecimento dos tutores acerca da COVID-19 em cães e gatos, evitando assim a propagação de notícias falsas acerca do papel epidemiológico dos pets.

Palavras-chave: SARS-CoV-2. Coronavírus. Animais de companhia. Pandemia. Pessoas.

Introduction

Coronavirus 2019 (COVID-19) is an intensely contagious respiratory disease caused by an RNA virus, called coronavirus 2 or SARS-CoV-2. In December 2019, in Wuhan, Hubei province, in central China, health authorities were alerted by the occurrence of a series of cases diagnosed as severe pneumonia, whose etiology was hitherto unknown (PARRY, 2020).

The etiological agent was isolated in early 2020, which is a variant of the coronavirus, which spread around the world, infecting millions of people, which led the World Health Organization (WHO) to declare a global pandemic, making it the main subject in all media (PARRY, 2020; JARDIM et al., 2020).

The susceptibility of new hosts, whether animal or human, is confirmed by the detection of specific antibodies in the blood, which denotes previous exposure to the agent, or when the agent itself is observed in the animal's body in tissues, excretions and secretions. In this scenario, anti-SARS-CoV-2 antibodies that indicate previous infection have already been detected in dogs, cats and wild animals. And even more important, the presence of the virus from exposure to a source of infection (KREUTZ et al., 2021).

As for coronaviruses, the canine coronavirus (CCoV) affects dogs, being one of the most common causes of gastroenteritis in young dogs, causing mild and self-limiting diarrhea, which is highly contagious (GREENE, 2015). The feline coronavirus (FCoV), in turn, affects cats and causes mild diarrhea in infected cats, however, depending on the animal's immune status, an *in vivo* mutation of the agent may occur, triggering feline infectious peritonitis, a serious and debilitating disease that does not have a cure. Although experimental CCoV infection in cats has already been reported, without manifestation of the disease, it is important to emphasize that under natural conditions interspecies transmission does not usually occur (JARDIM et al., 2020).

Dogs and cats occupy a place of honor in the family, sleeping in the tutors' beds and, in some cases, even eating at the table with them. Due to this intimate contact and the existence of coronaviruses (CCoV and FCoV) in these animals, it is natural that there is concern about the participation of dogs and cats in the SARS-CoV-2 transmission cycle (JARDIM et al., 2020).

So far, there is limited evidence that companion animals (dogs and cats) can be infected with the new coronavirus, and there is no scientific evidence that they can be a source of infection and transmission to humans, resulting in COVID-19. Although some dogs and cats have tested positive for SARS-CoV-2, there are no confirmed cases of transmission between these animal species and humans.

It should also be noted that in homes and/or environments where there were infected and quarantined people, the presence of SARS-CoV-2 in dogs and cats was substantially identified. In this way, the conviviality, the intimate and constant contact allowed the transmission of the virus from people to these animals. Therefore, the recommendation is that people with symptoms remain isolated and avoid contact with their pets, to avoid their possible participation in the transmission cycle, such as fomites, carrying the viral agent and allowing the infection of their guardians and other people (JARDIM et al., 2020).

There is great relevance in adequate and up-to-date knowledge about COVID-19, since the guidelines, regarding the proper care of pets, for guardians in relation to the virus are essential, using safe and appropriate information and recommendations, aiming to establish preventive measures for the different cases (MOUTINHO et al., 2021). Owners should be informed about all the procedures they should take when dealing with the appropriate management of their pets,

avoiding fake news, improving the human-animal relationship, aiming to maintain the health of both, aid in prevention and/or even in the interruption of a possible epidemiological chain of transmission.

And since fake news is harmful for those who receive it, especially when the individual does not evaluate the sources of information and the veracity of the facts presented, the present study, and its extensive activities, are justified by the need to increase the knowledge of the tutors about COVID-19 in dogs and cats, and due guidance, the spread of false news about the epidemiological role of pets will be avoided, thus avoiding the risk of helplessness/abandonment of these animals (MOUTINHO et al., 2021; JARDIM et al., 2020).

Material and methods

To achieve the proposed objectives, the project was divided into three phases. The first phase, aligned with research on the central theme of the work, encompassing the relationship between COVID-19 and pets (dogs and cats), in addition to mapping approaches regarding the guidance of tutors on the transmission of COVID-19.

The information was collected from Google Scholar, Scielo, Pubmed, Scopus and from Google and Yahoo websites of reports/journalistic articles about COVID-19 in dogs and cats related to the scientific literature on the subject. In addition, articles were included in this work that present/describe some relationship between the new coronavirus (COVID-19) and domestic animals, with emphasis on pets. The descriptors used being “coronavirus animals”, “SARS-Cov-2 animals”, “canine coronavirus”, “SARS Cov-2 canine”, “feline coronavirus”, “SARS-Cov-2 feline”, in English and Portuguese, published from 2020 to 2022. 35 papers were included, with the aforementioned criteria/filters.

In the second phase, there was an extensive analysis of articles, reports/journalistic articles from Google and Yahoo sites and fake news published on WhatsApp and Facebook, from which a comparative table was prepared, thus presenting the contrasts between true and false information, with the respective definition of fake news.

In the third phase, based on the knowledge obtained, informative booklets were created, about caring for pets in the face of the pandemic and other information about the transmission of the virus, edited by Canva, with true information, denying misrepresented information or fake news, heard and read by tutors in the various media, intended for print and digital distribution to tutors related to the transmission of COVID-19, clarifying the population about the transmission of the disease between animals and humans.

Results and discussion

The present work sought to clarify doubts regarding the possible transmissible potential of SARS-CoV-2 through companion animals, such as dogs and cats, comparing journalistic articles with scientific articles, in order to elucidate whether the information was true. It was observed that part of the electronic newspapers presented the bibliographic reference, that is, the exposed information was confirmed with scientific articles present in the report.

The main and the most shared fake news on social networks/media were selected for inclusion in a comparative table, to contrast correct and false information, clarifying the respective published misinformation. The initially selected fake news are described in Table 1.

Table 1 - Comparison between fake news shared in the media and scientific literature/journalistic articles.

Fake news	Scientific Literature/Journalistic Articles
#FAKE: The coronavirus (COVID-19) is transmitted by animals	According to WHO there is no evidence that pets can get sick and transmit COVID-19; Infection of dogs and cats with SARS-CoV-2 is considered a purely accidental event with no evident epidemiological significance, either in relation to transmission to other animals or transmission to people (FIOCRUZ, 2020a; KREUTZ et al., 2021).
#FAKE: Pets can get sick with COVID-19 and transmit the virus	There is limited evidence that pets can be infected with or transmit SARS-Cov-2, or even that they can become ill from an infection with this new coronavirus; There is little evidence that domestic animals can become infected with SARS-CoV-2; There is the possibility of human-animal transmission, and from animals as carriers of the virus to other animals or humans, but there is still no proven scientific information that dogs and cats are important transmitters in the epidemiological chain of COVID-19; However, some studies indicate that cats are more sensitive to the virus than dogs, requiring further studies and continuous monitoring of pets (KREUTZ et al., 2021; LOPES, 2020).
	You should restrict contact with pets and other animals while you are sick with COVID-19, just as you would with other people (G1, 2020).
#FAKE: It is not necessary to avoid contact with pets or other animals if you are sick with COVID-19	The replication of SARS-CoV-2 in dogs was lower when compared to this replication in ferrets and cats, however, it should be noted that this information does not state that these animals can become infected, show clinical signs of the disease, much less transmit the disease COVID-19 to humans (LOPES, 2020).
#FAKE: Dogs are more susceptible to COVID-19	The few infected animals possibly acquired the infection from their owners, through direct contact, and not the other way around (FIOCRUZ, 2020b; PARRY, 2020).
#FAKE: Domestic dogs and cats can carry/transport the virus into the home where they live with their owners	Paws and muzzle hygiene should only be carried out with water and neutral soap on a damp cloth, since alcohol gel is abrasive and can cause injuries (FIOCRUZ, 2020b; OLIVEIRA et al., 2022).
#FAKE: Alcohol gel should be used to clean pets	There is no veterinary indication for chloroquine or hydroxychloroquine for use in animals, and studies do not indicate its effectiveness in people (FIOCRUZ, 2020b).
#FAKE: Chloroquine is effective against COVID-19 in dogs and cats	The reverse zoonosis of SARS-CoV-2 is more likely, considering that the prevalence in humans is much higher than in domestic animals, or the guardian can infect the animals through sneezing or coughing and from particles in suspension (BOSCO-LAUTH et al., 2020; FIOCRUZ, 2020b).
#FAKE: The coronavirus is a zoonosis transmitted by dogs, cats and wild animals to humans	Although felines are able to eliminate the virus through airborne microparticles via the nasopharynx and rectum, there is currently no scientific evidence on the transmission of this virus to humans (CERQUEIRA et al., 2020).

Source: Prepared by the authors (2022).

The coronavirus is a virus with an average diameter of 80-120 nm, rounded shape, and several glycoprotein projections on the surface of its viral envelope (spikes), as well as having positive-sense single-stranded RNA genomic material (ATTIA; EL-SAADONY; SWELUM et al., 2021). This virus belongs to the order Nidovirales, family Coronaviridae, subfamily Orthocoronavirinae subdivided into four genera: Alfacoronavirus, Betacoronavirus, Gammacoronavirus and Deltacoronavirus (Alphacoronavirus and Betacoronavirus) infect mammals and cause enteric, respiratory and even systemic diseases (CUI et al., 2019; RISTOW et al., 2020).

Of the coronaviruses described in humans, three are of zoonotic origin, being called SARS-CoV, MERS-CoV and currently SARS-CoV-2 (LEROY et al., 2020; OLIVEIRA et al., 2022), and are associated with the syndromes severe acute respiratory distress. The so-called SARS-CoV-2 syndromes, that is, the causative agent of COVID-19, as well as other Betacoronaviruses, originate from an already existing virus in animals, which played an important role both in the onset and in the evolution of COVID -19, as in the case of MERS-CoV and SARS-CoV-1 (RISTOW et al., 2020).

Coronaviruses over time have twice crossed the interspecies barrier during the SARS and MERS outbreaks, and currently SARS-CoV-2 appears to be the result of yet another jump of that barrier, defined as the third time. The emergence of new coronaviruses is associated with enzyme replication instability, RNA-dependent RNA polymerase, lack of proofreading mechanisms, as well as a higher rate of mutations in the RBD of the Spike gene and genetic recombination, increasing the susceptibility of infection. , from other animal or human host species, such as the pathogenicity and transmissibility of the virus can be altered and increased, becoming a situation of global concern (TIWARI et al., 2020; GHAI et al., 2021).

Coronavirus spike glycoproteins enable the virus to enter the host cell by binding the spike protein to angiotensin-converting enzyme type 2 (ACE2) receptors. Subsequently, the fusion of the viral and cellular membrane occurs and the virus enters the host cell (UZUNIAN, 2020).

It is important to point out that these ACE2 receptors are abundantly expressed on the surface of endothelial cells, kidneys, lungs and other organs, and that the amino acid homology of ACE2 between humans and other animals is high, as in the case of chimpanzees (95%), cats (81.2%) and dogs (80.1%). It is due to this high identity of the lipid sequence of the ACE2 receptor of companion animals with humans and their proximity, dogs and cats have gained importance in this scenario (SCHOLZ et al., 2020; SHEN et al., 2020).

Government restrictions in the early stages of the COVID-19 pandemic led to social isolation, with many people spending more time at home with their pets, which provided emotional comfort (BARKLAM; FELISBERTI, 2023). The pathogenicity and transmissibility of SARS-CoV-2 between humans is maintained, while being reduced by sequential passage between cats, likely due to variations in the binding sites on the ACE2 receptor in cats and dogs, making the receptor affinity for SARS-CoV- 2 RBD 3 to 4 times lower compared to humans (WU et al., 2020; BAO et al., 2021).

Under the aegis that in Wuhan, China, a wholesale seafood market, small animals, large animals, and wild animals for human consumption has been the focus of the COVID-19 infection. It was assumed that SARS-CoV-2 was initially transmitted from animals to humans, followed by maintenance via human-to-human transmission, thus having a zoonotic basis in the transmission cycle (GHAI et al., 2021).

The first reported case was a 17-year-old Pomeranian dog, who had several pre-existing diseases, such as pulmonary hypertension, chronic kidney disease, hypothyroidism, grade III heart

murmur and a history of hyperadrenocorticism. Nasal, oral and rectal swab and fecal samples were collected. Virus was detected in the nasal swab sample by RT-qPCR. During the quarantine period, the animal showed no change in clinical condition, and remained alert. The second case was a 2-and-a-half-year-old German Shepherd, who tested positive in oral and nasal swab tests. In both cases, the animals did not present clinical alterations related to respiratory disease. In addition, the second animal had another cohabitant, who tested negative for the tests (SHI et al., 2020).

Other first descriptions of positive companion animals for COVID-19 emerged in Hong Kong in 2020, with all animals belonging to owners infected with the new coronavirus. The disease was first reported in a geriatric dog, then in a 2-year-old young dog, and the third report in a cat, but these did not show any significant symptoms (OLIVEIRA et al., 2022). Also in 2020, two cats were reported to have mild clinical signs and tested positive for COVID-19 in the United States. It was highlighted that only one of the cats was related to an infected person, suggesting that contact with asymptomatic people may have been the source of infection for the animal (NEWMAN et al., 2020; CDC, 2021).

Based on this precept, some animal species have been described as susceptible to natural infection by SARS-CoV-2 (cats, dogs, lions, tigers) or experimental (mice, cats, ferrets, hamsters, primates) (LEROY et al., 2020; ZHANG et al., 2020).

But there is a consensus among authors that the reports published on companion animals are isolated cases, not showing statistically, due to the little evidence, evidence that companion animals, especially dogs and cats, are a source of infection for humans (KREUTZ et al., 2021).

And although some animal species, such as felines, can be infected by SARS-CoV-2, human-to-cat transmission, under natural conditions, rarely occurs. Thus, the most concrete indications only show that only cases in which people infected by COVID-19 can transmit viral particles to animals, either naturally or in cases in which the virus was empirically inoculated in the laboratory (TIWARI et al., 2020).

According to Gandra (2021), in Brazil, veterinarians from a Clinic in Rio de Janeiro and researchers from the Oswaldo Cruz Foundation evaluated 311 domestic animals, 251 dogs and 60 cats. Of these, an average of 19 dogs and 6 cats were infected with SARS-CoV-2, showing flu-like symptoms. And according to Calvet et al. (2021), companion animals residing with infected owners can be exposed and even infected by SARS-CoV-2, developing nonspecific, mild and reversible clinical signs. In this context, castration was a risk factor for SARS-CoV-2 in animals, given that in this condition the pet remains at home longer, in constant contact with the guardian infected with SARS-CoV-2, associated with the fact of the guardian to allow the animal to lie down in his bed.

According to Luan (2020), dogs, cats and ferrets have gained great visibility in this area, given that their ACE2 receptors have a high amino acid sequence identity with human ACE2. However, the receptor in cats has more homology to that of humans than that of dogs, which explains the greater susceptibility of cats to SARS-CoV-2 infection and may present mild and self-limiting clinical signs (SHI et al., 2020; RISTOW et al., 2020).

Even if there is scientific evidence that felines are capable of eliminating the virus through airborne microparticles, nasopharyngeally and rectally, it is important to point out to tutors that there is no scientific evidence on the transmission of this virus from small felines to humans, so what if it has a scientific statement, it shows that there is no possibility of such an occurrence, given that it was not possible to determine the ability of the isolated virus to multiply in tissue of other hosts (GOUMENOU et al., 2020).

Experimentally, dogs inoculated with SARS-CoV-2 showed low viral RNA titers with the development of mild infection. In contrast to this, cats and ferrets, when experimentally infected, in addition to showing greater susceptibility, disseminated large amounts of virus (SHI et al., 2020).

Thus, although dogs have low susceptibility to SARS-CoV-2, without the presence of symptoms, it is due to the low expression of the ACE2 receptor in their respiratory tract, they have ACE2 receptors, similar to those of humans, which function as receptors for SARS-CoV-2, increasing the possibility that dogs can become infected with the virus (SHI et al., 2020; ZHAI et al., 2020).

As for the new variants, it was found that they can affect companion animals. The variant SARS-CoV-2 B.1.1.7 (UK), was detected in two cats and one dog that tested positive, without the presence of respiratory signs. The animal owners were diagnosed with COVID-19 about a few weeks before the animals became ill (FERASIN et al., 2021).

Thus, although companion animals are implicated as a source of emerging pathogens, the reverse zoonosis of SARS-CoV-2 is more likely, since the prevalence in humans is much higher than in domestic animals, with no current evidence of infected dogs or cats transmit SARS-CoV-2 to humans (BOSCO-LAUTH et al., 2020; OLIVEIRA et al., 2022).

It is also important to emphasize that animal hair can be potential fomites for spreading the virus, that is, being sources of reservoirs for COVID-19, between animals and their guardians. If there is a need, to implement hygienic measures after contact with possible sources of contamination or walks (FREITAS et al., 2020).

For animal hygiene, it is recommended to clean the paws and muzzle, with the combined use of water and neutral soap in a damp cloth, which should be done regularly in all animals that go outside. Gel alcohol or liquid alcohol in all its concentrations should not be used, as these can be abrasive to the skin of dogs and cats, especially when used routinely or chronically, leading to the appearance of allergies or topical reactions, also allowing contamination by bacteria and other microorganisms, possibly culminating in dermatopathies (FIOCRUZ, 2020b).

And based on this situation, it is noticeable that misinterpreted results, reading of incomplete, inconclusive and distorted studies, are leading to cases of abandonment and mistreatment of animals. Thus, the term fake news, according to Gomes and Dourado (2019), is defined as “pretendingly factual reports that invent or alter the facts they narrate and that are disseminated, on a large scale, on social media, by people interested in the effects they could produce”, consequently impacting public health, a since the increase in the number of animals on the streets/wanderers, leads to the beginning of outbreaks of zoonoses (rabies, sporotrichosis, leishmaniasis, etc.), and in the number of injuries related to the use of alcohol gel or bleach in the hygiene of animals and pedestrians being run over (FREITAS et al., 2020).

In this way, propagating truthful information is crucial in combating the fake news currently disseminated, both related to the transmission of COVID-19 and the respective care of pets.

According to Jalongo (2023), Until now, COVID-19 research on people and their pets has tended to rely on online surveys administered at a given point in time. This selects respondents with Internet access and groups of participants who have higher incomes and perhaps greater family stability, as they can invest time in filling out a questionnaire.

According G1 (2021), the infection of dogs and cats by the coronavirus has a higher frequency than previously thought, based on a survey with a sample of 311 pets tested in Rio de Janeiro, 251 dogs and 60 cats, resulting in a positivity rate of 19 dogs and 6 cats (11.25%). In addition, it points out that the World Health Organization (WHO) points out that there is no

evidence that dogs and cats have the potential to transmit COVID-19 to humans. However, it states that cats are more vulnerable than dogs and this information is corroborated by Shi et al. (2020), which demonstrated that cats and ferrets are more susceptible to SARS-CoV-2 than dogs, and Calvet et al. (2021), a study in which the frequency of positive felines was 40% and 28% of dogs, in addition to Wu et al. (2020), in which dogs had a low prevalence of binding (< 0.5%) of the virus with the binding enzymes. However, the report by O Globo (2021) does not cite a scientific bibliographic source, which makes it difficult to compare research with scientific articles, unlike other information platforms, such as FIOCRUZ.

According to Ferasin et al. (2021) it was observed that infected animals had cardiac alterations compatible with myocarditis.

Regarding the potential transmission of COVID-19, animals can indeed be agents of transmission of the disease, corroborated by Sila et al. (2022), which demonstrated that a cat that had previous contact with people infected by the virus transmitted the disease to a veterinarian during the consultation. This study analyzed the patient's history and stated that there had been no contact with another infected person and, in addition, the authors performed a genetic analysis of samples collected from the contaminated tutors, the cat and the veterinarian, revealing that they all had the same variant of the virus and with identical genetic sequences, reinforcing the possibility of transmission through the cat. However, there are still not enough studies to state that dogs and cats can transmit SARS-CoV-2 to humans, and the vast majority of research shows that transmission occurs from humans to animals, and not the other way around.

Conclusion

The current literature presents limited evidence regarding the participation of companion animals in the transmission of COVID-19, and there is not enough scientific information to prove that dogs and cats are important transmitters in the epidemiological chain of COVID-19 for humans. However, these can be carriers for humans and other animals, through hair. Thus, requiring correct guidance regarding the hygiene of animals and restriction of contact with their guardians and other infected people.

Conflicts of interest

There were no conflicts of interest for the authors.

Authors' contribution

Vitória Erlym Dias Muniz, Déborah Milhomem Silva and Ana Christina Silva Batista - reading and interpretation of works, data collection and interpretation of results; Kryscia Beatriz Teixeira Araújo Varão, Thalia Henrique Lima, Kalyne Sousa dos Santos and Évelyn Bárbara Sousa Maciel - data collect; Jailson Honorato - original idea, orientation, correction and revision.

Acknowledgment

To the State University of the Tocantina Region of Maranhao for granting scholarships to the first three authors.

Referências bibliográficas

- ATTIA, Y. A.; EL-SAADONY, M. T.; SWELUM, A. A.; QATTAN, S. Y. A.; AL-QURASHI, A. D.; ASIRY, K. A.; SHAFI, M. E.; ELBESTAWY, A. R.; GADO, A. R.; KHAFAGA, A. F.; HUSSEIN, E. O. S.; BA-AWADH, H.; TIWARI, R.; DHAMA, K.; ALHUSSAINI, B.; ALYILEILI, S. R.; EL-TARABILY, K. A.; EL-HACK, M. E. A. COVID-19: pathogenesis, advances in treatment and vaccine development and environmental impact – an updated review. **Environmental Science and Pollution Research**, v. 28, p. 22241-22264, 2021. <https://doi.org/10.1007/s11356-021-13018-1>
- BAO, L.; SONG, Z.; XUE, J.; GAO, H.; LIU, J.; WANG, J.; GUO, Q.; ZHAO, B.; QU, Y.; QI, F.; GONG, S.; LIU, M.; LV, Q.; LI, D.; HAN, Y.; ZHAO, W.; DENG, S.; LIU, Y.; XIANG, Z.; YANG, B.; DENG, W.; YU, H.; CONG, Z.; WEI, Q.; XU, J.; GAO, G. F.; QIN, C. Susceptibility and attenuated transmissibility of SARS-CoV-2 in domestic cats. **The Journal of Infectious Diseases**, v. 223, n. 8, p. 1313-1321, 2021. <https://doi.org/10.1093/infdis/jiab104>
- BARKLAM, E. C.; FELISBERTI, F. M. Pet ownership and wellbeing during the COVID-19 pandemic: the importance of resilience and attachment to pets. **Anthrozoös**, v. 36, n. 2, p. 215-236, 2023. <https://doi.org/10.1080/08927936.2022.2101248>
- BOSCO-LAUTH, A. M.; HARTWIG, A. E.; PORTER, S. M.; GORDY, P. W.; NEHRING, M.; BYAS, A. D.; WOUDE, S. V.; RAGAN, I. K.; MAISON, R. M.; BOWEN, R. A. Experimental infection of domestic dogs and cats with SARS-CoV-2: pathogenesis, transmission, and response to reexposure in cats. **Proceedings of the National Academy of Sciences of the United States of America**, v. 117, n. 42, p. 26382-26388, 2020. <https://doi.org/10.1073/pnas.201310211>
- CALVET, G. A.; PEREIRA, S. A.; OGRZEWALSKA, M.; PAUVOLID-CORRÊA, A.; RESENDE, P. C.; TASSINARI, W. S.; COSTA, A. P.; KEIDEL, L. O.; ROCHA, A. S. B.; SILVA, M. F. B.; SANTOS, S. A.; LIMA, A. B. M.; MORAES, I. C. V.; MENDES JUNIOR, A. A. V.; SOUZA, T. C.; MARTINS, E. B.; ORNELLAS, R. O.; CORRÊA, M. L.; ANTONIO, I. M. S.; GUARALDO, L.; MOTTA, F. C.; BRASIL, P.; SIQUEIRA, M. M.; GREMIÃO, I. D. F.; MENEZES, R. C. Investigation of SARS-CoV-2 infection in dogs and cats of humans diagnosed with COVID-19 in Rio de Janeiro, Brazil. **PLOS ONE**, v. 16, n. 4, p. 1-27, 2021. <https://doi.org/10.1371/journal.pone.0250853>
- CDC. Centers for Disease Control and Prevention. **Confirmation of COVID-19 in two pet cats in New York**. 2020. <https://www.cdc.gov/media/releases/2020/s0422-COVID-19-cats-NYC.html>
- CERQUEIRA, A. C. F.; MARQUARDT, M. H.; CARVALHO, F. R. S. Considerações sobre cães e gatos e COVID-19: transmissibilidade e infecção. **UNESC em Revista**, v. 4, n. 2, p. 142-155, 2020. <http://revista.unesc.br/ojs/index.php/revistaunesc/article/view/203>
- CUI, J.; LI, F.; SHI, Z.-L. Origin and evolution of pathogenic coronaviruses. **Nature Reviews. Microbiology**, v. 17, p. 181-192, 2019. <https://doi.org/10.1038/s41579-018-0118-9>
- FERASIN, L.; FRITZ, M.; FERASIN, H.; BECQUART, P.; CORBET, S.; GOUILH, M. A.; LEGROS, V.; LEROY, E. M. Infection with SARS-CoV-2 variant B.1.1.7 detected in a group of dogs and cats with suspected myocarditis. **Veterinary Record**, v. 189, n. 9, p. 1-9, 2021. <https://doi.org/10.1002/vetr.944>
- FIOCRUZ. Fundação Oswaldo Cruz. **Animais domésticos podem contrair ou transmitir o novo coronavírus?** 2020a. <https://portal.fiocruz.br/pergunta/animais-domesticos-podem-contrair-ou-transmitir-o-novo-coronavirus>

FIOCRUZ. Fundação Oswaldo Cruz. **COVID-19: pesquisador esclarece quais cuidados devem ser tomados com os animais domésticos.** 2020b. <https://portal.fiocruz.br/noticia/covid-19-pesquisador-esclarece-quais-cuidados-devem-ser-tomados-com-os-animais-domesticos>

FLORES, E. F.; CARGNELUTTI, J.; HENZEL, A.; ANZILIERO, D.; BRUM, M. C. S.; LIMA, M.; TORRES, F.; FRANCO, D.; OLIVEIRA, S. A. M.; SILVA, A. M. SARS-cov-2/COVID/19 em animais de companhia. **Ars Veterinaria**, v. 37, n. 1, p. 1-2, 2021. <https://doi.org/10.15361/2175-0106.2021v37n1p01-02>

FREITAS, K.; SILVEIRA, R.; BARBOSA, A. Saúde Única e COVID-19: revisão sobre o potencial dos animais como reservatórios do vírus. **Veterinária e Zootecnia**, v. 27, p. 1-7, 2020. <https://doi.org/10.35172/rvz.2020.v27.481>

G1. **Animais de estimação podem transmitir o novo coronavírus?** 2020. <https://g1.globo.com/bemestar/coronavirus/noticia/2020/02/27/animais-de-estimacao-podem-transmitir-o-novo-coronavirus.ghtml>

GANDRA, A. **Pesquisa mostra taxa maior de infecção de animais pela COVID-19.** Agência Brasil, 2021. <https://agenciabrasil.ebc.com.br/saude/noticia/2021-04/pesquisa-mostra-taxa-maior-de-infeccao-de-animais-pela-covid-19>

GHAI, R. R.; CARPENTER, A.; LIEW, A. Y.; MARTIN, K. B.; HERRING, M. K.; GERBER, S. I.; HALL, A. J.; SLEEMAN, J. M.; VONDOBSCHUETZ, S.; BEHRAVESH, C. B. Animal reservoirs and hosts for emerging alphacoronaviruses and betacoronaviruses. **Emerging Infectious Diseases**, v. 27, n. 4, p. 1015-1022, 2021. <https://doi.org/10.3201/eid2704.203945>

GOMES, W. S.; DOURADO, T. Fake news, um fenômeno de comunicação política entre jornalismo, política e democracia. **Estudos em Jornalismo e Mídia**, v. 16, n. 2, p. 33-45, 2019. <https://doi.org/10.5007/1984-6924.2019v16n2p33>

GOUMENOU, M.; SARIGIANNIS, D.; TSATSAKIS, A.; ANESTI, O.; DOCEA, A. O.; PETRAKIS, D.; TSOUKALAS, D.; KOSTOFF, R.; RAKITSKII, V.; SPANDIDOS, D. A.; ASCHNER, M.; CALINA, D. COVID-19 in Northern Italy: an integrative overview of factors possibly influencing the sharp increase of the outbreak. **Molecular Medicine Reports**, v. 22, n. 1, p. 20-32, 2020. <https://doi.org/10.3892/mmr.2020.11079>

GREENE, C. E. **Doenças Infeciosas em Cães e Gatos.** 4ª edição. Rio de Janeiro: Roca, 2015, 1404p.

JALONGO, M. R. Pet keeping in the time of COVID-19: the canine and feline companions of young children. **Early Childhood Education Journal**, v. 51, p. 1067-1077, 2023. <https://doi.org/10.1007/s10643-021-01251-9>

JARDIM, A. M.; LORENZETTI, E.; GRECCO, F. C. A. R. COVID-19 x Cães e Gatos. **Ensaio**, 24, n. 4, p. 325-328, 2020. <https://doi.org/10.17921/1415-6938.2020v24n4p325-328>

LEROY, E. M.; GOUILH, M. A.; BRUGERE-PICOUX, J. The risk of SARS-CoV-2 transmission to pets and other wild and domestic animals strongly mandates a one-health strategy to control the COVID-19 pandemic. **One Health**, v. 10, 2020. <https://doi.org/10.1016/j.onehlt.2020.100133>

LOPES, O. F. M.; GOMES, N. R. S.; FREITAS, D. R. J.; EVANGELISTA, L. S. M. COVID-19 e os animais domésticos: há alguma evidência de relação entre eles? **Journal of Health and Biological Sciences**, v. 8, n. 1, p. 1-6, 2020. <https://doi.org/10.12662/2317-3076jhbs.v8i1.3225.p1-6.2020>

LUAN, J; LU, Y.; JIN, X.; ZHANG, L. Spike protein recognition of mammalian ACE2 predicts the host range and an optimized ACE2 for SARS-CoV-2 infection. **Biochemical and Biophysical Research Communications**, v. 526, n. 1, p. 165-169, 2020. <https://doi.org/10.1016/j.bbrc.2020.03.047>

- MOUTINHO, F. F. B.; ALBUQUERQUE, G. L.; HOROWICZ, J. M. J. M.; GENTIL, N. R. G.; SERRA, C. M. B. COVID-19: biossegurança e educação em saúde em estabelecimentos veterinários no município de Niterói, RJ, Brasil. **Arquivos de Ciências Veterinárias e Zoologia da Unipar**, v. 24, n. 2, p. 1-11, 2021. <https://doi.org/10.25110/arqvet.v24i2cont.2021.8500>
- MUNIZ, V. E. D. ; SILVA, D. M. ; BATISTA, A. C. S. ; HONORATO, J. Fake news sobre a pandemia de COVID-19 em relação aos cães e gatos e orientação aos tutores de pets sobre a transmissibilidade do vírus a partir dos animais. *In*: IV Congresso Nacional de Educação. **Anais do IV CNE**, Imperatriz, 2023. <https://www.even3.com.br/anais/cneuemasul2023/602272-fake-news-sobre-a-pandemia-de-COVID-19-em-relacao-aos-caes-e-gatos-e-orientacao-aos-tutores-de-pets-sobre-a-trans/>
- NEWMAN, A.; SMITH, D.; GHAI, R. R.; WALLACE, R. M.; TORCHETTI, M. K.; LOIACONO, C.; MURRELL, L. S.; CARPENTER, A.; MOROFF, S.; ROONEY, J. A.; BEHRAVESH, C. B. First reported cases of SARS-CoV-2 infection in companion animals. **Morbidity and Mortality Weekly Report**, v. 69, n. 23, p. 710-713, 2020. <http://doi.org/10.15585/mmwr.mm6923e3external>
- OLIVEIRA, M. C.; GONÇALVES, N. R.; FERREIRA, P. C.; HONÓRIO, A. S.; MORAIS, N. A. SARS-CoV-2 em cães e gatos – revisão de literatura. **Veterinária e Zootecnia**, v. 29, p. 1-12, 2022. <https://doi.org/10.35172/rvz.2022.v29.676>
- PARRY, N. M. A. COVID-19 and pets: when pandemic meets panic. **Forensic Science International: Reports**, v. 2, p. 1-4, 2020. <https://doi.org/10.1016/j.fsir.2020.100090>
- RISTOW, L. E.; CARVALHO, O. V.; GEBARA, R. R.; COVID-19 em felinos, seu papel na saúde humana e possíveis implicações para os seus tutores e para a vigilância em saúde. **Epidemiologia e Serviços de Saúde**, v. 29, n. 2, p. 1-4, 2020. <https://doi.org/10.5123/S1679-49742020000300005>
- SCHOLZ, J. R.; LOPES, M. A. C. Q.; SARAIVA, J. F. K.; COLOMBO, F. C. COVID-19, Renin-Angiotensin System, Angiotensin-Converting Enzyme 2, and Nicotine: what is the interrelation? **Arquivos Brasileiros de Cardiologia**, v. 115, n. 4, p. 708-711, 2020. <https://doi.org/10.36660/abc.20200653>
- SHEN, M.; LIU, C.; XU, R.; RUAN, Z.; ZHAO, S.; ZHANG, H.; WANG, W.; HUANG, X.; YANG, L.; TANG, Y.; YANG, T.; JIA, X. Predicting the animal susceptibility and therapeutic drugs to SARS-CoV-2 based on spike glycoprotein combined with ACE2. **Frontiers in Genetics**, v. 11, p. 1-10, 2020. <https://doi.org/10.3389/fgene.2020.575012>
- SHI, J.; WEN, Z.; ZHONG, G.; YANG, H.; WANG, C.; HUANG, B.; LIU, R.; HE, X.; SHUAI, L.; SUN, Z.; ZHAO, Y.; LIU, P.; LIANG, L.; CUI, P.; WANG, J.; ZHANG, X.; GUAN, Y.; TAN, W.; WU, G.; CHEN, H.; BU, Z. Susceptibility of ferrets, cats, dogs, and other domesticated animals to SARS-coronavirus 2. **Science**, v. 368, n. 6494, p. 1016-1020, 2020. <https://doi.org/10.1126/science.abb7015>
- SILA, T.; SUNGHAN, J.; LAOCHAREONSUK, W.; SURASOMBATPATTANA, S.; KONGKAMOL, C.; INGVIYA, T.; SIRIPAITOON, P.; KOSITPANTAWONG, N.; KANCHANASUWAN, S.; HORTIWAKUL, T.; CHARERNMAK, B.; NWABOR, O. F.; SILPAPOJAKUL, K.; CHUSRI, S. Suspected cat-to-human transmission of SARS-CoV-2. **Emerging Infectious Diseases**, v. 28, n. 7, p. 1485-1488, 2022. <https://doi.org/10.3201/eid2807.212605>
- TIWARI, R.; DHAMA, K.; SHARUN, K.; YATOO, M. I.; MALIK, Y. S.; SINGH, R.; MICHALAK, I.; SAH, R.; BONILLA-ALDANA, D. K.; RODRIGUEZ-MORALES, A. J. COVID-19: animals, veterinary and zoonotic links. **Veterinary Quarterly**, v. 40, n. 1, p. 169-182, 2020. <https://doi.org/10.1080/01652176.2020.1766725>
- UZUNIAN, A. Coronavírus SARS-CoV-2 e COVID-19. **Jornal Brasileiro de Patologia e Medicina Laboratorial**, v. 56, p. 1-4, 2020. <https://doi.org/10.5935/1676-2444.20200053>

WU, L.; CHEN, Q.; LIU, K.; WANG, J.; HAN, P.; ZHANG, Y.; HU, Y.; MENG, Y.; PAN, X.; QIAO, C.; TIAN, S.; DU, P.; SONG, H.; SHI, W.; QI, J.; WANG, H.-W.; YAN, J.; GAO, G. F.; WANG, Q. Broad host range of SARS-CoV-2 and the molecular basis for SARS-CoV-2 binding to cat ACE2. **Cell Discovery**, v. 6, p. 1-12, 2020. <https://doi.org/10.1038/s41421-020-00210-9>

ZHAI, X.; SUN, J.; YAN, Z.; ZHANG, J.; ZHAO, J.; ZHAO, Z.; GAO, Q.; HE, W.-T.; VEIT, M.; SU, S. Comparison of severe acute respiratory syndrome coronavirus 2 spike protein binding to ACE2 receptors from human, pets, farm animals, and putative intermediate hosts. **Journal of Virology**, v. 94, n. 15, p. 1-16, 2020. <https://doi.org/10.1128/jvi.00831-20>

ZHANG, Q.; ZHANG, H.; GAO, J.; HUANG, K.; YANG, Y.; HUI, X.; HE, X.; LI, C.; GONG, W.; ZHANG, Y.; ZHAO, Y.; PENG, C.; GAO, X.; CHEN, H.; ZOU, Z.; SHI, Z.-L.; JIN, M. A serological survey of SARS-CoV-2 in cats in Wuhan. **Emerging Microbes and Infections**, v. 9, n. 1, p. 2013-2019, 2020. <https://doi.org/10.1080/22221751.2020.1817796>

Received on January 14, 2023

Returned for adjustments on April 21, 2023

Received with adjustments on July 22, 2023

Accepted on August 29, 2023