

SARS-COV-2 INFECTION IN CATS AND DOGS: CLINICAL ANALYSES

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Abstract

The zoonotic origin of the SARS-CoV-2 requires surveillance on animals. We report the potent active and previous infection with SARS-CoV-2 of household cats and dogs from COVID-19 owners in Romania, during 2021 and 2022. These results are in accordance with those reported globally, confirming the cross-species transmission of SARS-CoV-2 variants. However, there is no evidence that pets are involved in the spread of SARS-CoV-2 in humans, but are instead accidental hosts.

Keywords: dogs, cats, SARS-CoV-2, infection

INTRODUCTION

Since the first report of COVID-19 human case in Wuhan City, China, in December 2019, the SARS-CoV-2 were described as a generalist virus with a wide host tropism. Concerns were raised about the SARS-CoV-2 potency to transmit between pets and their owners

MATERIAL AND METHODS

50 pets (cats and dogs) that had direct contact with owners diagnosed with COVID-19 were sampled as follows: plasma samples, rectal swabs (RS), oropharyngeal swabs (OPS) and nasal swabs (NS). All plasma samples were tested for the presence of anti-SARS-CoV-2 antibodies by ELISA (ID Screen® SARS-CoV-2 Double Antigen Multi-species). Active infection was also screened from all RS, OPS and NS by RT-PCR (ThermoFisher TaqPath™ Covid-19 RT-PCR kit 1.0).

RESULTS AND DISCUSSIONS

Out of plasma samples (5%) were found positive by ELISA. From the total ELISA positive samples, five were coming from clinical healthy animals (3 dogs – case CP20, case 22999 and case 23 and 2 cats – case 16504 and case 19195) that shared

direct contact with their positive COVID-19 owners. With respect to the SARS-COV-2 positivity of the owners, the main symptoms described by them were consisting in respiratory (cases CP20, 23, 16504) and digestive signs (case 16504), while two cases were asymptomatic (cases 22999, 19195).

Other 3 samples (cases 21454, 21596 and 21526) were originated from dogs diagnosed with Canine Parvovirus (CPV) (n=2) and Canine Distemper virus (CDV) infections (n=1), further confirmed by immunocromatographic tests. Moreover, these 3 dogs shared a direct contact with their owners diagnosed with COVID-19 infection (all of them with respiratory signs), since they lived in the same premises.

The dog case 21454, CPV positive, was admitted to the clinic with the following clinical signs: vomiting, bloody diarrhea, lethargy and loss of appetite, symptoms characteristics for the CPV infection. The blood cytological analysis revealed monocytosis and neutrophil left shift, while the complete blood count (CBC) analysis indicated a decreased mean corpuscular haemoglobin concentration (MCHC). The dog fully recovered after the supportive treatment. The dog was in direct contact with the positive COVID-19 owner, presenting respiratory symptoms. The dog case 21596 confirmed with CPV infection, was

presented to the clinic with similar symptomatology: bloody diarrhea, lethargy and loss of appetite. The cytological examination of the blood revealed leucopenia, eosinophilia, neutropenia, monocytosis and lymphopenia. Moreover, the case was confirmed to be *Mycoplasma haemocanis* positive, while the CBC analysis showed lymphopenia, hypochromia and anisocytosis. The dog fully recovered after the supportive treatment. The dog was in direct contact with the positive COVID-19 owner, presenting respiratory symptoms. For both cases of CPV infections, a simultaneous immunochromatographic testing was performed for enteric canine coronavirus (CCoV), resulting in negative status. The decrease of the white blood cells (WBCs) with leukopenia, along with lymphopenia and thrombocytopenia are significantly frequent among dogs infected with CPV (Castro TX et al., 2013; Schoeman JP et al., 2013). The CBC analysis of the first case of CPV infection (case 21454) did not reveal the aforementioned changes, due to an early stage of infection.

The dog case 21526 diagnosed with CDV infection was presented with the following clinical signs: ataxia, incoordination and loss of appetite, symptoms specific for the nervous manifestation. The CBC analysis revealed anaemia, thrombocytopenia and a decreased of MCHC. Given the lifelong neurological symptoms, the dog underwent euthanasia at the owner request. The dog was in direct contact with the positive COVID-19 owner, presenting respiratory symptoms. The persistence of the CDV in the bone marrow is known to cause depletions, which affect the hematopoietic precursors, leading to a decreased production of the total leukocytes. Moreover, the decrease of white blood cells (WBCs) with leukopenia, along with the inhibition of lymphocytes, decreased in MCHC, anaemia and thrombocytopenia is well documented in CDV infection, as reported by Bohn AA, 2013, Carter CM, 2018 and Saaed and Al-Obaidi, 2021. The last 4 ELISA positive samples were coming from a cat (case 14754) diagnosed with lung adenocarcinoma, a cat (case CP14) with pulmonary strongyloidiasis, a dog (case 20687) with haem pericardium, hydro pericardium, splenic and bladder tumours and a dog (case 18476) with infiltrative myocardial pathology.

Therefore, the cat (case 14754) diagnosed with lung adenocarcinoma was presented to the clinic with the following clinical signs: low appetite, somnolence, hoarseness, dyspnoea and abdominal breathing. The CBC analysis showed lymphopenia, while the cytological examination revealed lymphopenia, eosinophilia and neutrophilia. For

this case, there is no follow up information available. The cat was in direct contact with the positive COVID-19 owner, which in turn displayed body weakness and anaemia.

The cat (case CP14) diagnosed with pulmonary strongyloidiasis was presented to the clinic with chronic dry cough and suffocation, lasting for approximately 6 months. The diagnosis was confirmed by pulmonary radiography and parasitological stool examination. The cytological exam revealed neutropenia and lymphocytosis. The cat fully recovered after the specific treatment. The cat shared direct contact with their positive COVID-19 owners, which presented a mild disease with symptoms of fever, myalgia, sore throat, malaise, rhinorrhoea and nasal congestion.

The dog (case 20687) diagnosed with haem pericardium, hydro pericardium, splenic and bladder tumour was presented to the clinic with a poor body condition. Due to the unfavourable clinical outcome of the patient, the owner accepted euthanasia. The cytological exam, revealed eosinophilia, neutrophilia and lymphopenia. The CBC analysis revealed leucocytosis, neutrophilia and thrombocytopenia. The dog shared direct contact with the positive COVID-19 owner, who showed an asymptomatic infection.

The dog (case 18476) came at the clinic with the suspicion of myocardial hypertrophy. Echocardiography revealed a significantly increased thickness of the interventricular septum (10 mm, normal < 8.2 mm) and left ventricular free wall (8.7 mm, normal < 8.3 mm) in diastole with a reduced left ventricular interval diameter (12.2 mm, normal > 1.91 mm). The left atrium size was normal (LA/Ao of 1.35, normal < 1.6). The diastolic function assessed by trans-mitral flow pattern revealed a type 1 diastolic dysfunction with a E/A ratio of 0.64. Color Doppler interrogation of the valves revealed a trivial regurgitating jet over the mitral valve with a maximum velocity of 0.6 m/s. Aortic and pulmonary flows were laminar with normal peak velocities. Troponin level was mildly increased with a value of 0.19 ng/ml. There were no signs of pulmonary hypertension nor pericardial abnormalities. The CBC analysis revealed leucocytosis, monocytosis and neutrophilia. The dog shared direct contact with the positive COVID-19 owner, who showed an asymptomatic infection.

Similar results were found in a study from Italy in 2020 by Patterson et al., reporting a seroprevalence of 12.8% (6/47) in dogs in COVID-19 positive households. Several studies (Sit et al., 2020; Chini M, 2020; Government of Hong Kong, 2020; Davidson M, 2020; Volz A., 2020; Vlasov N., 2020 and Matthews S and Chalmers V., 2020)

highlighted the fact that pets became infected by SARS-CoV-2 following exposure to infected humans in New York, Hong Kong, Belgium, Germany, Spain, France, and Russia.

The results obtained in the present study, are in concordance with those reported all around the world, confirming the fact that SARS-COV-2 infection can cross the species barrier.

CONCLUSIONS

This is the first study that highlights the potent active and previous infection with SARS-CoV-2 of household cats and dogs of COVID-19 owners in Romania. These results are in concordance with those reported all around the world, confirming the fact that SARS-CoV-2 infection can cross barrier-species. However, there is no evidence that pets are involved in the spread of SARS-CoV-2 in humans, but are instead accidental hosts.

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