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EPIDEMIOLOGICAL RESEARCH ON SARS-COV-2 IN ANIMALS DURING THE PERIOD 2020-2024

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Abstract: Coronaviruses are important pathogens responsible for respiratory and enteric diseases in mammals and birds. Among the identified coronaviruses, only six are known to infect humans: HCoV-229E, HCoV-OC43, HCoV-NL63, HCoV-HKU1, SARS-CoV, and MERS-CoV. This study provides a global perspective on SARS-CoV-2 infections in animals, highlighting the species that are receptive and susceptible to this virus in the context of a potential future pandemic. We analyzed epidemiological data on the evolution of infections in both domestic and wild animals, considering the limited number of similar studies conducted in Romania. To obtain a comprehensive overview of the impact of SARS-CoV-2, we correlated data on the first cases of COVID-19 in humans with information on animal infections between 2020 and 2024. So far, SARS-CoV-2 has been detected in 35 animal species across 10 families and 4 orders (Carnivora, Artiodactyla, Primates, and Rodentia). In Europe, the number of confirmed cases in animals has been significant, totaling 18 242 infections during the analyzed period. Our study confirms interspecies transmission events from humans to animals, from animals to animals, and from animals to humans emphasizing the need for continued epidemiological research.

• Introduction

The pandemic caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) lasted for two years and led to millions of infections and deaths among humans, as well as animals.

To date, the animal species known to be capable of transmitting SARS-CoV-2 include the mink, raccoon dog, cat, ferret, hamster, house mouse, Egyptian fruit bat, deer mouse, and white-tailed deer.

Among farm animals, the American mink has the highest likelihood of becoming infected by humans or other animals and subsequently transmitting SARS-CoV-2. Among pets, cats, ferrets, and hamsters present the greatest risk of SARS-CoV-2 infection, most likely originating from an infected person, and they have little to no impact on the circulation of the virus within the human population.

In wild animals (including zoo animals), particularly carnivores, great apes, and white-tailed deer have been reported to be naturally infected with SARS-CoV-2.

In this paper, we summarized some epidemiological data regarding the evolution of SARS-CoV-2 infections in both domestic and wild animals, as well as the susceptible animal species, knowing that in Romania, very few epidemiological studies have been conducted on this subject.

• Material and method

For the preparation of this paper, information was gathered from the official website of the OIE (World Organisation for Animal Health), as well as from the FAO (Food and Agriculture Organization of the United Nations) database, which provides global data on SARS-CoV-2 outbreaks in both domestic and wild animals.

To provide a comprehensive overview of this disease, data from the onset of the first human COVID-19 cases were analyzed in correlation with information on SARS-CoV-2 infections in animals during the period 2020–2024.

To improve the accessibility of the information, tables and graphs were created to more clearly illustrate epidemiological data across various geographic regions, as well as the animal species susceptible to SARS-CoV-2 infection.

Through this paper, we aimed to track the dynamics of the total number of confirmed SARS-CoV-2 cases, the animal species susceptible to infection, and the country-level distribution of cases during the analyzed period, 2020–2024.

Figure 1: Dynamics of the Total Number of Confirmed SARS-CoV-2 Animal Cases Between 2020 and 2024

• Results and discussions

By compiling and correlating data obtained from the official website of the OIE (World Organisation for Animal Health) and the FAO (Food and Agriculture Organization of the United Nations) database, it was observed that globally, a significant number of SARS-CoV-2 cases (18,740) were reported in both domestic and wild animals during the years 2020–2024.

Analyzing the data presented in Figure 1, it can be observed that during the 2020–2024 period, the number of SARS-CoV-2 cases in animals varied significantly by continent. Europe reported the highest number of cases, with 18,242 confirmed, followed by North America with 314 cases, South America with 123 cases, Asia with only 56 confirmed cases, and Africa reporting the fewest, with just 5 cases.

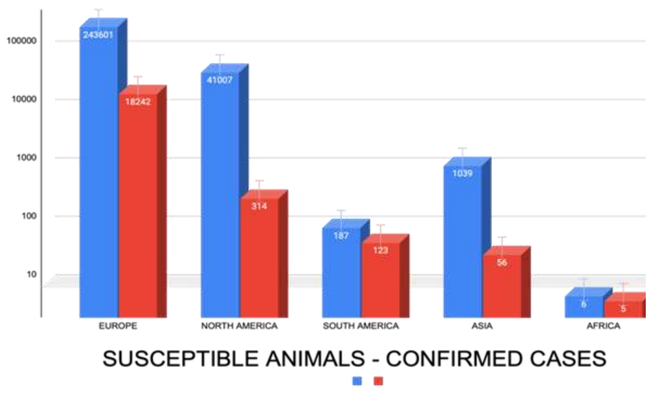

Figure 2: Dynamics of the Confirmed Cases and Susceptible Animals

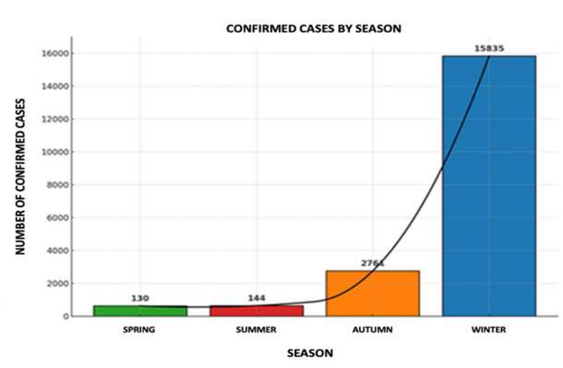

Figure 3: Total Number of Confirmed SARS-CoV-2 Animal Cases by Season

The data presented in Figure 2 highlight a significant difference between the number of susceptible animals and the total number of confirmed SARS-CoV-2 cases, as well as notable differences between continents over the analyzed time period.

In Europe, 243,601 animals were reported as susceptible, of which only 18,242 were confirmed positive for SARS-CoV-2. North America reported 41,007 susceptible animals, with only 314 confirmed cases.

In South America, a sharp decline in case numbers was observed compared to Europe and North America, with just 123 confirmed cases out of 187 susceptible animals.

Asia reported 1,039 susceptible animals—more than South America—but only 56 of them were confirmed positive.

A notable distinction was observed in Africa, where out of 6 susceptible animals, 5 were confirmed positive for SARS-CoV-2 infection.

Another aspect investigated in this study was how the seasonality affects the number of confirmed SARS-CoV-2 cases. Figure 3 illustrates the seasonal distribution of confirmed SARS-CoV-2 cases in both domestic and wild animals across winter, autumn, summer, and spring during the 2020–2024 period.

• Conclusions

Worldwide, between 2020 and 2024, numerous cases of SARS-CoV-2 were reported in both domestic and wild animals. The number of SARS-CoV-2 infections has shown a downward trend from the beginning of the analyzed period in 2020 until the present.

In Europe, the situation was particularly severe in terms of confirmed animal infections with SARS-CoV-2, with a total of 18,242 cases reported during the analyzed period.

SARS-CoV-2 was detected in 35 different animal species from ten families (Felidae, Viverridae, Hyaenidae, Canidae, Mustelidae, Procyonidae, Cervidae, Hippopotamidae, Hominidae, and Cricetidae) belonging to four animal orders (Carnivora, Artiodactyla, Primates, and Rodentia).