

CRITICAL ANALYSIS OF THE CAT'S ROLE IN THE EPIDEMIOLOGY OF RABIES

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Abstract

Rabies is a fatal zoonosis of world importance that in many aspects is still neglected. Due to national vaccination campaigns for dogs and cats, there has been a drastic reduction in the number of cases of human rabies transmitted by dogs. However, due to species peculiarities, the cat can act as an important link in the epidemiological chain of rabies. Thus, this study aimed to evaluate Brazilian data on canine and feline rabies surveillance to determine the importance of the cat in the current context of rabies epidemiology. In Brazil, recent cases of

human rabies transmitted by cats have been reported, showing the importance of this species in the epidemiological chain of the disease.

Keywords: zoonosis; vaccination; One Health

INTRODUCTION

Rabies is a viral zoonosis that causes acute and fatal encephalitis in mammals, but it is fully preventable by vaccination. The etiologic agent is

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an enveloped RNA virus belonging to the Rhabdoviridae family and the Lyssavirus genus (FAUQUET et al., 2005). Rabies virus (RABV) can be classified into different variants, which have different animals as reservoirs, allowing the identification of the source of infection by laboratory methods (WALLACE e BLANTON, 2020).

The African and Asian continents are responsible for 95% of deaths from human rabies, with an estimated 59,000 cases worldwide per year (ORGANIZAÇÃO MUNDIAL DA SAÚDE, 2019), with the dog being the main reservoir of the RABV for humans (BROBAN et al, 2018). In Brazil, due to the high number of human rabies cases transmitted mainly by dogs, municipalities and states in the 70s developed mass vaccination plans of dogs and cats to control these zoonoses in urban areas, which contributed to the canine variant no longer to circulate in the country since 2016 (MINISTÉRIO DA SAÚDE, 2020). Currently, the viral variants associated with bats are the most prevalent (MINISTÉRIO DA SAÚDE, 2021), this fact associated with the hunting habits of cats,

highlights the importance of this species for the rabies cycle.

The cat has become the most popular pet in many parts of the world. In Brazil, the estimated population of dogs is 55.9 million, and that of cats, 23.9 million (ABINPET, 2021). The expectation is that the total number of cats will exceed 30 million by 2022 (EXAME, 2019). In the United States, between 2017 and 2018, approximately 94.2 million cats and 89.7 million dogs were registered, the cat outnumbered its domestic partner (ANIMAL SHELTERING, 2018). This growing population of cats associated with the peculiarities of the species guides the need for a critical view the cat and rabies. Therefore, the objective was to evaluate the available data from canine and feline rabies surveillance to determine the importance of the cat in the current context of rabies epidemiology.

DEVELOPMENT

A review of the Brazilian data available on the website of the Ministry of Health (MH) was carried out during the period from January 1990 to January 2022. The post-mortem diagnosis of the

animals was performed through the analysis of the central nervous system, using the direct immunofluorescence techniques and/or viral isolation to determine if the sample contained the presence of the virus and PCR with subsequent genetic sequencing for viral typing. All analyzes were carried out in official laboratories of the rabies epidemiological monitoring network accredited to the Ministry of Health. In order for a sample to be submitted to the rabies virus detection tests, the animal had to meet at least one of the criteria: the presence of neurological signs at the time of aggression to a person; development of neurological manifestations within the observation period of up to 10 days after aggression to humans; death as a result of being run over and/or death with no apparent cause (MINISTÉRIO DA SAÚDE, 2021).

About animal rabies, data were obtained for a period of 7 years (2015-2021), bats were the animals most identified with RABV, followed by the dog and then the cat. Although the cat is the least affected by rabies,

there was no tendency to decrease the number of cases over time, as observed for the dog (Table 1). Rabies in cats has been reported in several Latin American countries between 2005 and 2015 (VELASCO-VILLA et al., 2017). Among the dogs and cats vaccinated in the rabies campaign in the city of Uberlândia in 2020, cats represented only 11.6% ($n=7,099/61,233$) of the animals. The estimated feline population for Uberlândia in the same year was 69,910 cats, so the number of cats vaccinated against rabies ($n=7,099$) corresponds to only 10.1% of the estimated population (CENTRO DE CONTROLE DE ZONOSSES DE UBERLÂNDIA, 2020). According to a survey of data from the zoonosis control center in the city of Campinas, São Paulo state, the frequency of vaccinated animals between 2004 and 2014 was less than or equal to 55% of the estimated population of cats (RODRIGUES et al., 2017), also remaining below the ideal vaccination coverage for urban rabies control, which is estimated for cats at 80% (LUCCA et al., 2013).

Table 1 - Distribution of the number of rabies cases in dogs, cats, and bats during the years 2015 to 2021, Brazil.

Animal species	Year							TOTAL
	2015	2016	2017	2018	2019	2020	2021	
Dog	83	11	15	14	16	12	9	160
Cat	8	8	4	2	10	2	7	41
Bat	77	104	288	355	416	155	328	1,723
TOTAL	168	123	307	371	442	169	344	

Source: Ministry of Health, Brazil, 2020

Regarding the RABV variants, the available data refer to a period of 6 years (2015-2020) corresponding to a total of 151 cases of canine rabies evaluated. Of these, it was not possible to typify eight samples. Variant 3, whose reservoir is the vampire bat *Desmodus rotundus*, was observed in 14,0% (20/143) of the cases. About cats, 34 samples (2015-2020) were evaluated, but it was not possible to identify the variants in three cases and one case is listed as “waiting for the result”. Hematophagous or non-hematophagous bat variants were observed in 93.3% (28/30) of feline rabies cases. The wild canid variant was identified in the other two cats. (MINISTÉRIO DA SAÚDE, 2020). Currently, the cat population generates a special concern regarding the reintroduction of rabies, due to the feline characteristics of presenting hunting behavior and of being easily

in contact with bats, mainly lying on the ground, a situation that is related to RABV infection in these animals (DIAS et al., 2013). Regardless of whether the cat has access to the street or not, contact with the bat is a possible event to occur, since infected bats are disoriented and often end up entering homes, even on high floors.

In Brazil, between 1990 and 2009, 574 cases of human rabies transmitted by animals were recorded, with 65.3% (n=375/574) of the cases due to canine aggression and 4% (n=23/574) of the cases due to feline aggression. Between 2010 and 2019, there was a drastic reduction in the total number of cases, and 39 cases were recorded, 23.1% (n=9/39) were by dogs and 10.3% (n=4/39) by cats. Canine aggression was the most frequent event dating from 2010 to 2015, while the most recent cases (2015-2020) had the cat as the main source

of infection for humans (MINISTÉRIO DA SAÚDE, 2020). It was not possible to provide further epidemiological elements regarding these animals, since the source consulted does not detail important characteristics, such as the animal lifestyle.

In 2019, Santa Catarina state confirmed a woman's death from rabies, also involving aggression by a cat with the bat variant. It was the first case of death in human with RABV recorded in the state since 1981, which was, until then, considered controlled for feline and canine rabies (SECRETARIA DO ESTADO DA SAÚDE-SC, 2019). After the case, several actions indicated by the Ministry of Health were taken, among them the vaccination of dogs and cats in the home environment within a radius of five kilometers from the patient's home; active search for sick or dead animals, and guidance of the population (MINISTÉRIO DA SAÚDE, 2021).

A total of seven cats were identified with rabies in 2021, however identification of viral variations is not yet available. In December of this year, a case of rabies was reported in a cat in the city of Belo Horizonte, Minas Gerais state which was considered

free for feline rabies since 1985. The cat was collected dead on a public street by fire fighter and delivered to the zoonosis control center of the Municipal Health Department of Belo Horizonte. The diagnosis of rabies in the cat was confirmed only by the direct immunofluorescence test, as it is a recent case, there is still no typification of the rabies virus. The Epidemiological Alert issued by the City Hall still shows that there has been a significant increase in the number of bats identified with rabies since 2004, with five positive bats identified in 2021 in the same blocking radius as where the cat was found (PREFEITURA DE BELO HORIZONTE, 2021), suggesting that bats may be the possible source of infection since no other urban animal species has been identified with rabies.

Over the years, the canine specie has been favored over the feline, since Brazilian rabies vaccination campaigns aimed at dogs, which contributes to a greater number of these vaccinated animals (GENARO, 2010). Furthermore, in the case of the cats, there is an influence on the choice between public or private places for rabies vaccination. Owners with higher

financial conditions choose to have their cats vaccinated in private clinics or hospitals when compared to owners with lower income (MAGNABOSCO, 2006), which represents a smaller portion of the cat population.

The cats should receive special attention, as they are animals with hunting behavior, which are being highly sought after by Brazilian families and the least taken to municipal anti-rabies campaigns (DIAS et al., 2013). Thus, it is necessary to make owners aware of responsible ownership practices that cover several actions, and in this context, rabies vaccination stands out, which is also part of the One Health concept since it encompasses both animal and human health.

The low adherence of cat owners to municipal vaccination campaigns possibly stems from the insecurity

regarding the places where these are carried out, which are usually in open-air places, with the intense movement of vehicles and people, with the presence of many dogs and without personnel trained with cat friendly techniques, for properly cat containment. In addition to the government management, the involvement of the veterinarian is as important as the role of the physician for human health. The role of the veterinarian in health education in municipal vaccination campaigns is essential; to raise awareness among owners, to adapt the structure of vaccination sites, and to train staff specifically for rabies vaccination in cats.

Thus, it is evident the important role of the cat in the epidemiological chain of feline and human rabies, being a particular species that needs proper care by the government, owners, and veterinarians.

ANÁLISE CRÍTICA DO PAPEL DO GATO NA EPIDEMIOLOGIA DA RAIVA

Resumo

A raiva é uma zoonose fatal de importância mundial que em muitos aspectos ainda é negligenciada. Devido às campanhas nacionais de vacinação de cães e gatos, houve uma redução drástica no número de casos de raiva humana transmitida por cães. Contudo, por peculiaridades da espécie, o gato doméstico pode atuar como um elo importante na cadeia epidemiológica da

raiva. Posto isto, objetivou-se avaliar os dados brasileiros da vigilância da raiva canina e felina para se determinar a importância do gato no contexto atual da epidemiologia da raiva. No Brasil, casos recentes de raiva humana transmitida por gatos foram relatados, evidenciando a importância dessa espécie na cadeia epidemiológica da doença.

Palavras-chave: zoonoses; vacinação; saúde única

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