


Case report - Rabies in a dog, São Paulo city, 2023

Relato de caso - Raiva em cão, São Paulo, 2023

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ABSTRACT

This publication reports on a rabid dog in São Paulo city, Brazil, with the AgV3 variant of rabies virus related to vampire and fruit bats, which is of significant importance to the surveillance of rabies in a region where the typical canine AgV2 rabies virus has been eradicated.

Keywords: Rabies. Dog. Bat. Brazil. Surveillance. Reemergence.

RESUMO

Esta publicação relata um caso de um cão raivoso na cidade de São Paulo, Brasil, com a variante AgV3 do vírus da raiva relacionada a morcegos vampiros e frugívoros, o que é de grande importância para a vigilância da raiva em uma região onde a variante tipicamente canina AgV2 foi erradicada.

Palavras-chave: Raiva. Cão. Morcego. Brasil. Re-emergência.

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On August 27, 2023, a young female stray dog with an unknown history of vaccination was rescued from the streets by a veterinarian on the Western side of São Paulo city, Brazil (23°35'32" S 46°46'19" W), presenting neurological signs such as circling and convulsions, with a presumptive diagnosis of canine distemper. The dog was then taken to a veterinary practice, where it ended up biting five people. As its condition deteriorated, it was euthanized on the following day and necropsied at the School of Veterinary Medicine, University of São Paulo (FMVZ-USP). Gross pathology indicated brain hemorrhage and the central nervous system (CNS) was sent to the Rabies Laboratory at FMVZ-USP.

The direct fluorescent antibody test (dFAT) for *Lyssavirus rabies* (RABV) antigens (Dean et al., 1996) on impressions of brain stem, cerebellum, cortex, and hippocampus all yielded negative results. However, a positive result for qPCR, based on Hayman et al. (2011), was found for the brain stem and cerebellum (Cq=27) but negative for the cortex and hippocampus. Isolation in N2A cells (Webster & Casey, 1996) after one passage produced an inconclusive result.

RABV RNA was confirmed by Sanger sequencing of the qPCR amplicon, but due to the short length of the sequence (53nt), the RABV lineage could not be determined then. Sanger sequencing of a partial G gene amplicon (Sato et al., 2004) obtained from the brain stem (GenBank Accession #OR604581) showed that the RABV strain is in the AgV3 *Desmodus rotundus/ Artibeus* sp. cluster.

Upon notification to the Pasteur Institute, Brazil, the five people bitten by the dog were submitted to the rabies post-exposure prophylaxis (PEP) with four doses of rabies

vaccine and human anti-RABV IgG or equine hyperimmune rabies antiserum regardless of their Pre-exposure prophylaxis (PrEP) status.

In a 500-m radius from the location where the dog was rescued, 1,836 houses were visited, and 1,148 dogs and 368 cats were vaccinated by the staff of the Health Surveillance Coordination (COVISA), São Paulo City, which also conducted an active search for possible further people in contact with the dog.

The CNS sample was also positive for Canine distemper virus (CDV) by PCR (Silva et al., 2023), with a wild-type, vaccine-unrelated strain confirmed by Sanger sequencing (GenBank Accession #OR604582), a finding already reported for wild animals (Moessner et al., 2023).

At the moment, two human cases of rabies have been reported in Brazil in 2023, one caused by the marmoset-transmitted *Callithrix jacchus* lineage and another one by the AgV3 transmitted via contact with a rabid bovine. However, in 2021, a 2-year-old boy died due to AgV2, the typical canid RABV lineage in Brazil, transmitted by a crab-eating fox (*Cerdocyon thous*) (Brasil, 2023).

AgV3, related to *D. rotundus*, is the most common RABV variant found in the country, mainly in cattle on which this vampire bat forages. However, domestic dogs and cats have also been reported as hosts for this variant, possibly transmitted by *Artibeus* sp fruit bats. A human case of rabies with AgV3 transmitted by a cat was reported in 2019, illustrating the so-called change in the epidemiological profile of rabies in Brazil.

Regarding the mode of transmission of AgV3 in this case, a plausible explanation is the dog's direct contact with a rabid *Artibeus* sp fruit bat due to predatory or exploratory behavior, as *D. rotundus* is not commonly found in the city, and *Artibeus* sp might feed on fruit trees that might be found in the area where the case was detected.

The AgV2 canine RABV last occurred in São Paulo city in 1983 after mass dog vaccination campaigns that ceased only in 2020, and the last report of this variant in the State of São Paulo was in 1998 in the Northwestern region of the State (Queiroz et al., 2012). Nonetheless, from 2002 to 2022, 14 dogs and 22 cats with RABV bat variants were found in the state. Specifically, all dogs and 17 cats were identified with AgV3. In comparison, an additional four cats were found to have *Nyctinomops* sp. (n=3) and *Myotis* sp. (n=1) RABV bat lineages, while the lineage from the remaining cat could not be determined (Castilho et al., 2018; Horta et al., 2022; Lima et al., 2023).

These results indicate that dFAT and isolation tests for RABV might lead to false-negative results when virus load is low, stressing the need for qPCR of samples of dogs with neurological signs in order to improve RABV detection

and the guidance to post-exposure prophylaxis in humans. The presence of AgV3 in domestic animals requires public health authorities to re-evaluate surveillance strategies as new cases are being introduced in areas where, for many years, AgV2 has not been detected.

The interference of CDV on the replication of RABV and its implications as an eclipsing disease for rabies, if any, remains to be investigated.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Ethics Statement

Does not apply, as the samples from the dog were received as a part of the Rabies Surveillance Program from São Paulo State.

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