Communication/Comunicação

Cat infected by a variant of bat rabies virus in a 29-year disease-free urban area of southern Brazil

Gato infectado por variante do vírus rábico de morcego em uma área urbana do sul do Brasil há 29 anos livre da doença

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ABSTRACT

Introduction: After 29 years, rabies was detected in a cat in Curitiba, southern Brazil. **Methods:** The fluorescent antibody test (FAT) and mouse inoculation test (MIT) were performed on central nervous system (CNS) samples. **Results:** Direct immunofluorescence was negative, but the biological test was positive and rabies virus was characterized as variant 4 (from *Tadarida brasiliensis*). **Conclusions:** Reappearance of rabies in domestic animals warns of sylvatic-aerial risk of infection and the necessity of monitoring bats in historically rabies-free areas.

Keywords: Feline rabies. Nonhematophagous bat. Epidemiological surveillance.

RESUMO

Introdução: Após 29 anos, raiva em um gato foi detectada em Curitiba, sul do Brasil. **Métodos:** Foram realizados imunofluorescência direta e prova biológica através de inoculação em camundongos para o diagnóstico da raiva. **Resultados:** A imunofluorescência direta foi negativa, mas a prova biológica foi positiva e o vírus caracterizado como variante 4 (de morcegos não hematófagos). **Conclusões:** O reaparecimento da raiva alerta para o risco aéreo-silvestre de infecção e para a necessidade de monitoramento de morcegos em áreas historicamente livres da raiva.

Palavras-chaves: Raiva felina. Morcegos não-hematófagos. Vigilância epidemiológica.

All mammals are susceptible to rabies and transmission in tropical countries involves two major cycles: the urban cycle, in which dogs and cats are the main sources of infection, and the sylvatic, where transmission mainly occurs from bats, monkeys and foxes[1,2]. Mass vaccination campaigns in dogs and cats have strongly reduced rabies throughout Brazil[3]. Meanwhile, cases of rabies transmitted by bats have increased in urban areas as a consequence of the environmental impact of urbanization on bat habitats, the shelter offered by man-made constructions and food from imbalanced urban fauna[4]. Not surprisingly, animal causes of infection in Latin America have switched since 2004 from dogs to bats[2]. The last two cases of human rabies in the State of Paraná, southern Brazil were registered in 1987, with a hematophagous bat (*Desmodus rotundus*) as agent, and in 1975, by a dog in Curitiba[5]. The last canine rabies infection in Curitiba was registered in 1981. Due to rabies control, no current massive rabies vaccination is in effect in Curitiba and the surrounding areas[6]. However, nonhematophagous bats positive for rabies have been recorded annually in recent years (**Table 1**). The present study reports the first case of cat rabies in Curitiba and surrounding areas for the past 29 years.

Curitiba (25°25'47 "S, 49°16'19" W) is the capital of the State of Paraná, southern Brazil, with an estimated population of 1,851,215 inhabitants, the seventh most populated city in Brazil[7]. On April 20th 2010, the Zoonoses Control Center (CCZV) was informed that a 3-year-old male cat not vaccinated against rabies had suddenly had a convulsion and died. Another 8 cats with free-access to the street and 2 dogs lived in the same household. These animals presented no clinical signs compatible with rabies and were vaccinated. The owner had tried to medicate the cat, during which she was bitten on the hand. Despite no definitive diagnosis at the time, the woman was submitted to the standard postinfection protocol for high rabies risk, anti-serum therapy and five doses of cell culture anti-rabies vaccine on days 0, 3, 7, 14 and 28, by the local primary healthcare clinic.

Central nervous system tissue from the cat was sent to the Paraná State Central Reference Laboratory (LACEN-PR), where fluorescent antibody test (FAT)[8] using a panel of monoclonal antibodies proved to be negative. However, the Biological Test by intracerebral inoculation in mice[9] was positive on day 17 out of a total of 21 days, indicating a viral strain with a prolonged incubation period. The owner was notified and local health authorities monitored the complete vaccination protocol and clinical status of the patient. Based on a monoclonal antibody panel, the virus isolated was characterized at the Pasteur Institute of Sao Paulo as variant 4, compatible with isolates from insectivorous bat *Tadarida brasiliensis*[10].

TABLE 1 - Occurrence of nonhematophagous bats positive for rabies in Curitiba since 2006.

Year	Location (neighborhood)	Bat species	Habit
2006	Bairro Alto (1)	*Artibeus lituratus*	frugivores
2007	Santa Felicidade (2)	*Tadarida brasiliensis*	insectivores
2008	Orleans (3)	*Myotis nigricans*	insectivores
2009	Portão (4)	*Tadarida brasiliensis*	insectivores
2009	Centro (downtown) (5)	*Myotis nigricans*	insectivores
2010	São Lourenço (6)	*Sturnira sp*	insectivores

Source: Centro de Saúde Ambiental/Secretaria Municipal de Saúde, 2010. Numbers inside parenthesis (1 to 6) are geo-referenced on the city map (**Figure 1**).

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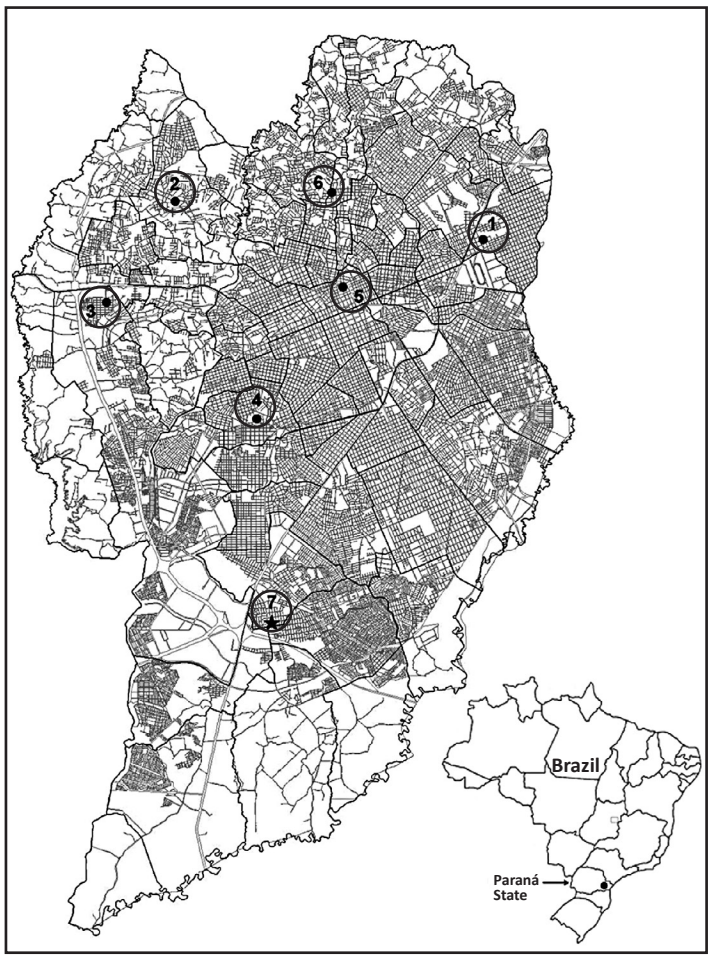

FIGURE 1 - Urbanization map of the City of Curitiba showing the location of six bats (1 to 6) and one cat (7) positive for rabies from 2006 to 2010. Note that the rabies-positive animals were distributed within the city limits, showing that the entire city may be exposed to sylvatic-aerial virus infection.

Massive house to house vaccination was immediately initiated by the CCZV in a 1km diameter, such that a total of 874 dogs and 49 cats were vaccinated. Even though the source of cat infection was not identified, a nonhematophagous bat was probably the source of infection, which may currently represent the most dangerous species for human rabies infection. In 2009 and during the first four months of 2010, the Ministry of Health reported a total of 16 and 13 hematophagous and 165 and 114 nonhematophagous bats positive for rabies, respectively[11]. Although anti-vampire paste and mass capture/euthanasia have been reported as efficient at controlling the spread of hematophagous bat rabies[3], these strategies applied to nonhematophagous bats may lead to species extinction; moreover, nonhematophagous bats are protected by the Brazilian Environmental Laws[12]. The recent capture, euthanasia and brain DIF testing of 200 *T. brasiliensis* bats in Curitiba in 2009 due to a rabies positive bat in a nearby colony resulted in all negative results, showing that geographical proximity may not indicate the source of infection[6]. A recent study has shown that commercial inactivated rabies vaccine immunoprotected the bat *T. brasiliensis* for over a year, suggesting that massive bat vaccination may be an alternative prevention program[10]. Regardless, active surveillance for rabies involving continuous monitoring of such populations should be conducted in urban areas of large Brazilian cities.

In conclusion, historically rabies-free urban areas among dogs and cats may be exposed to new disease cycles, sylvatic-aerial, as a result of recent changes in nonhematophagous bat behavior. Reemerging cases of rabies in disease-free urban areas warns of the importance of mass vaccination of dogs and cats, in association with continuous monitoring of nonhematophagous bats found during the daytime or in unexpected locations. Finally, negative DIF results for rabies must always be followed by at least 21-day biological testing in mice.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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