ECO-EPIDEMIOLOGICAL SURVEILLANCE OF RABIES: NOTE ABOUT EXAMINED CHIROPTERA IN SOUTHERN BRAZIL

Stefan Vilges de Oliveira [1, 3]*
João Tertuliano Silveira Lopes [2]
Eduardo Pacheco de Caldas [3]

ABSTRACT

Reports of the isolation of rabies virus from different species of animals are becoming more frequent, resulting in changes in the epidemiological profile of the disease. This study monitored and surveyed the rabies virus in bats from the city of Caçapava do Sul (RS – Brazil). Between 2006 and 2009, 243 bats (in 11 species) were collected from urban and rural areas. The results of direct immunofluorescence were negative. Based on this, publications that investigate species of Chiroptera are important because these animals are involved in the maintenance of the rabies cycle.

Keywords: Epidemiology, Bats, Rio Grande do Sul.

VIGILÂNCIA ECOEPIDEMIOLÓGICA DA RAIVA: NOTA SOBRE QUIRÓPTEROS EXAMINADOS NO SUL DO BRASIL

RESUMO

Os relatos de isolamento do vírus rábico em diferentes espécies animais tornam-se cada vez mais frequentes, determinando uma mudança no conhecimento do perfil epidemiológico da doença. O presente trabalho descreve as ações de vigilância e monitoramento para o vírus rábico em morcegos no município de Caçapava do Sul, RS. Entre os anos de 2006 a 2009, foram coletados 243 espécimes de 11 espécies diferentes, em áreas urbanas e rurais, cujos resultados de Imunoflorescência direta foram negativos. Diante disso são relevantes as publicações que contribuem para a investigação de espécies de quirópteros envolvidos na manutenção do ciclo da raiva.

Palavras chaves: Epidemiologia, Morcegos, Rio Grande do Sul

[1] Programa de Pós Graduação em Medicina Tropical - Epidemiologia das Doenças Infecciosas e Parasitárias - Núcleo de Medicina Tropical da Universidade de Brasília, Brasil
[2] Secretaria Municipal da Saúde e do Meio Ambiente - Caçapava do Sul, RS, Brasil
[3] Unidade Técnica de Vigilância de Zoonoses da Coordenação Geral de Doenças Transmissíveis, Departamento de Vigilância das Doenças Transmissíveis, Secretaria de Vigilância em Saúde, Ministério da Saúde, Brasília, Distrito Federal, Brasil
*Contact: Rua 34 Norte, Apto. 1010, Brasília - DF, CEP: 71918-720,Email: stefanbio@yahoo.com.br

INTRODUCTION

Rabies is a zoonosis caused by a virus and occurs naturally in domestic and wild species in the orders Carnivora and Chiroptera (called reservoirs) (Kotait et al., 2007).

The involvement of bats in the transmission of the rabies virus was first suggested in the last century by Carini (1911), and hematophagous bats (especially *Desmodus rotundus*) are reservoirs of variant 3 of this virus. In 2004 and 2005, *D. rotundus* was considered the main vector of human rabies in Latin America, and Brazil had the largest number cases (Kotait et al., 2007).

In Rio Grande do Sul, rabies has occurred in an endemic form for decades, with cases in cattle, horses and pigs, which are caused by variant 3 (Governo do Estado, 2010).

In recent years, reports of isolating rabies from bats with different feeding habits (insectivores, frugivores, omnivores, pollenivores and piscivores) have become more common throughout the world (Uieda et al., 1995; 1996), and many of these are denominated as "lyssavirus" emergent (Fooks, 2004).

The first reports of the presence of the rabies virus in non-hematophagous bats in Rio Grande do Sul were in 1965 (Bauer & Crusius, 1965). Among these bats, *Tadarida brasiliensis* (*morceguinho das casas*), which is in the family Molossidae, tested positive for a type of variant 4.

In 2001, a case of rabies was registered in a domestic cat, which was infected by a virus compatible with the variant 4 virus isolated from *Tadarida* brasiliensisSchaefer et al., 2002). In 2007 a dog died in the Tapes municipality and a rabies analysis confirmed that it was also infected with variant 4 (Caldas et al., 2007).

With the population of bats increasing in urban areas, knowledge of the various risk factors related to the epidemiology of rabies in different bat species is an important tool to control this disease in herbivores, pets and humans (Bredt et al., 1996). Based on this perspective, the objective of this study was to indentify species of bats involved in maintaining the rabies cycle in the municipality of Caçapava do Sul, RS.

MATERIALS AND METHODS

The municipality of Caçapava do Sul (30°31'11' S, 53°29'16" W), in Rio Grande do Sul, is part of the Pampa biome and the zoogeographic region of the Província Pampeana da Serra do Sudeste.

From 2006 to 2009 bats were randomly collected in urban and rural areas of the municipality. To collect the bats, mist nets (11 × 3 m and 10 ×3 m) were mounted next to the exits of the places where the bats live, near feeding areas and where they fly. Individuals were also collected directly from the shelters where they live using tweezers, nets and leather gloves. In addition, bats that were found (dead or alive), in atypical locations or inside houses, were examined. The biometric data was recorded on field sheets and the species were identified using keys (Vizotto & Tadedei, 1973). The collections and euthanasia were authorized by IBAMA (permit number 014/2006 - DITEC) and the entire carcasses were shipped frozen to the diagnostic laboratory at the Instituto de Pesquisas Veterinárias Desidério Finamor, in the city of Eldorado do Sul (RS). The brain tissue was examined using direct immunofluorescence (DIF).

RESULTS AND DISCUSSION

During the study 243 individuals were examined, which belonged to 11 species and had different feeding habitats. Of the total, 45% were collected in shelters in houses, 6% were found in atypical locations, 10% in abandoned buildings, 21% in caves and 18% were captured in mist nets. All of the specimens analyzed tested negative for rabies using DIF (Table 1).

Table 1. Number of specimens collected, families/species, feeding guilds and collection location.

Num.	Families/Species	Feeding Guild	Collection Location
	Vespertilionidae		
7	*Myotis nigricans*	insectivore	shelter
15	*Eptesicus brasiliensis*	insectivore	shelter
50	*Histiotus velatus*	insectivore	shelter
2	*Histiotus velatus*	insectivore	outside of shelter
	Molossidae		
25	*Tadarida brasiliensis*	insectivore	shelter
9	*Tadarida brasiliensis*	insectivore	outside of shelter
12	*Molossus molossus*	insectivore	shelter
2	*Molossus molossus*	insectivore	outside of shelter
1	*Molossus rufus*	insectivore	outside of shelter
	Phyllostomidae		
5	*Glossophaga soricina*	pollenivore/nectivore	mist net
23	*Glossophaga soricina*	pollenivore/nectivore	shelter
35	*Sturnira lilium*	pollenivore/nectivore	mist net
5	*Artibeus fimbriatus*	frugivores	mist net
51	*Desmodus rotundus*	hematophagous	shelter
1	*Chrotopterus auritus*	carnivore	shelter
243	**3 Families - 11 species**		

Of the eleven species examined in the study, ten were already described as reservoirs of the rabies virus in Brazil; the only exception was *Sturnira lilium* (Sodré et al., 2010). Data from Ministry of Health showed a change in epidemiology of rabies in Brazil, in recent years. The significant increase of notifications of rabies in bats, as well as seeking medical attention due to attacks, warn of the risk of infection and illness (Wada et al., 2011).

Although research has not identified species of bats positive, we cannot rule out the possibility of movement of the virus in this area. Studies by several researchers present controversial results related to the amount of infection, which could be related to variations in sampling techniques as well as collection locations (Uieda et al., 1995; 1996).

In bats captured in caves the amount of infection is generally 0.1 to 0.5% (Uieda et al., 1996). In a study in the northeastern region of the state of São Paulo, which used the same methodology, the amount of infection was 1.2% (Queiroz et al., 2009). Souza *et al*. (2005) found, after eight years of epidemiological surveillance for rabies in the

municipality of Botucatu (SP), in 1480 captured bats, low positive results for the rabies virus; only three had rabies, one hematophagous and two insectivorous bats.

Uieda *et al*. (1995) stressed the importance of being suspicious about bats that are found in atypical places, a fact that has been confirmed in insectivorous bats. Although individuals that exhibit abnormal behavior are highly suspect, it is important to note that specimens captured in their shelters, which appeared healthy, have been diagnosed as positive (Uieda et al., 1996). This suggests that it is necessary to search for the virus in animals with no apparent symptoms. We believe that with a greater amount of sampling it will be possible to detect the rabies virus, due to the low number of positive results shown in asymptomatic bats.

As the literature reports more cases of infected bats in multiple environments, the surveillance of these animals is becoming an urgent issue for public health services.

Ecological alterations of wild ecosystems have contributed significantly to an increase in colonies of non-hematophagous bats in urban environments. We emphasize that the destruction of colonies is not an effective method to control the virus in different species of bats. In fact, it is necessary to invest in studies to learn more about the dynamics of the rabies virus in different species. To further understand this situation, it is also important to clarify the role of the bats, and their different feeding habits, in the epidemiology of this zoonosis.

REFERENCES

BAUER, A. G.; CRUSIUS, V. A. Isolamento do vírus rábico de morcego insetívoro na cidade de São Leopoldo no Rio Grande do Sul. In: Conferência Anual da Soc. Vet. do RS. 1965; 4. Porto Alegre, p. 95. 1965.

BREDT A.; ARAUJO, F. A. A.; CAETANO-JR., J.; RODRIGUES, M. G. R.; YOSHIZAWA, M.; SILVA, M. M. S.; HARMANI, N. M. S.; MASSUNAGA, P. N. T.; BURER, S. P.; PORTO, V. A. R.; UIEDA, W. Morcegos em áreas urbanas e rurais: manual de manejo e controle. Brasília, FNS. 117 pp. 1996.

CALDAS, E.; PREDEBON, J.; DIEDRICH, J.; FARINATTI, A.; BARRETO, N.; CAMPIELO, P.; KESSLER, S.; MAGOGA, E.; IRIGARAY, G.; CARRIERI, M. L.; BATISTA, H.; ROSA, J.; FERREIRA, J. C.; ROEHE, P. Descrição do achado de raiva canina por vírus rábico de origem em morcego não hematófago *Tadarida brasiliensis. Bol. Epid.* 9, (2): 1 - 3. 2007.

CARINI, A. Sur une grande epizootie de rage. *Ann. I'Inst. Past.* 25: 843-6. 1911.

FOOKS, A. R. The challenge of new and emerging lyssaviruses. *Expert Rer. Vac.* 3 (4): 333-336. 2004.

Governo do Estado (Rio Grande do Sul, BR). Secretaria da Saúde. (2010) Porto Alegre (Internet). (acessado em 17 de janeiro de 2010). Disponível em: http://www.saude.rs.gov.br/wsa/portal/index.jsp?menu=servicos&cod=22246.

KOTAIT, I.; CARRIERI, M.L.; CARNIELI, P. J.; CASTILHO, J. G.; OLIVEIRA, R. N.; MACEDO, C. I.; FERREIRA, K. C. S.; ACHKAR, S. M. Reservatórios silvestres do vírus da raiva: um desafio para a saúde pública. Bol. Epid. Paul. SP. 4 (40) : 1-10. 2007.

QUEIROZ, L. H.; CARVALHO, C.; BUSO, D. S.; FERRARI, C. I. L.; PEDRO, W. A. Perfil epidemiológico da raiva na região Noroeste do Estado de São Paulo no período de 1993 a 2007. Rev. da Soc. Bras. de Med. Trop. 2009; 42(1): 9-14.

SCHAEFER, R.; CALDAS, E. P.; SCHMIDT, E.; KING, A.; ROEHE, P. M. First case of cat rabies in eleven years in Southern Brazil was caused by a virus of bat origin, distinct from urban rabies virus. Vet. Rec. Ingl. 150 (7): 216. 2002.

SODRÉ, M. M.; GAMA, A. R.; ALMEIDA, M. F. Updated list of bat species positive for rabies in Brazil. *Rev. Inst. Med. Trop. SP*. 52 (2): 75-81. 2010.

SOUZA, L. C.; LANGONI, H.; SILVA, R. C.; LUCHEIS, S. B. Vigilância Epidemiologia da raiva na região de Botucatu-SP: Importância dos Quirópteros na manutenção do vírus na natureza. *ARS Vet., Jab. SP*. 21 (1): 62-68. 2005.

UIEDA, W.; DEBERALDINI, E. R. Papel do morcego hematófago *Desmodus rotundus* na transmissão da raiva. *Divul. do Mus. de Cie. Tecn. Ubea/PUCRS* 2: 32-37. 2003.

UIEDA, W.; HARMANI, N. M. S; SILVA, M. M. Raiva em morcegos insetívoros do sudeste do Brasil. *Rev. de Sau. Publ*. 29: 393-397. 1995.

UIEDA, W.; HAYASHI, M. M.; GOMES, L. H.; SILVA, M. M. Espécies de quirópteros diagnosticadas com raiva no Brasil. *Bol. Inst. Past.* 1:17-35. 1996.

VIZOTTO, L. D.; TADDEI, V. A. Chave para determinação de quirópteros brasileiros. *Rev Fac Fil. Cien Let S José R Preto Bol Cien.* 1: 1-72. 1973;

WADA, M. Y.; ROCHA, S. M.; MAIA-ELKHOURY, A. N. S. Situação da Raiva no Brasil, 2000 a 2009. *Epidemiol. Serv. Saúde, Brasília* 20 (4): 509-518. 2011.