virus isolates in Brazil: identification of two reservoirs, dogs and vampire bats. Virology 284: 214-222.

13. Ito, M., Itou, T., Shoji, Y., Sakai, T., Ito, F.H., Arai, Y.T., Takasaki, T. and Kurane, I. 2003. Discrimination between dog-related and vampire bat-related rabies viruses in Brazil by strain-specific reverse transcriptase-polymerase chain reaction and restriction fragment length polymorphism analysis. J. Clin. Virol. 26: 317-330.
14. Ito, N., Sugiyama, M., Oraveerakul, K., Piyaviriyakul, P., Lumlertdacha, B., Arai, Y.T., Tamura, Y., Mori, Y. and Minamoto, N. 1999. Molecular epidemiology of rabies in Thailand. Microbiol. Immunol. 43: 551-559.
15. Johnson H.N. 1952. Rabies. pp.267-299. In: Viral & Rickettsial Infections of Man. 2nd ed. (Rivers T. M., ed.), J. B. Lippincott Company, Philadelphia.
16. Johnson, N., Black, C., Smith, J., Un, H., McElhinney, L.M., Aylan, O. and Fooks, A.R. 2003. Rabies emergence among foxes in Turkey. J. Wildl. Dis. 39: 262-270.
17. Kobayashi, Y., Sato, G., Shoji, Y., Sato, T., Itou, T., Cunha, E.M., Samara, S.I., Carvalho, A.A., Nociti, D.P., Ito, F.H. and Sakai, T., 2005. Molecular epidemiological analysis of bat rabies viruses in Brazil. J. Vet. Med. Sci. 67: 647-652.
18. Koprowski, H. 1996. The mouse inoculation test. pp. 80-87. In: Laboratory Techniques in Rabies, 4th ed. (Meslin, F. -X., Kaplan, M. M. and Koprowski, H., eds.), World Health Organization, Geneva.
19. Nel, L., Jacobs, J., Jaftha, J. and Meredith, C. 1997. Natural spillover of a distinctly Canidae-associated biotype of rabies virus into an expanded wildlife host range in southern Africa. Virus Genes 15: 79-82.
20. Paez, A., Saad, C., Nunez, C. and Boshell, J. 2005. Molecular epidemiology of rabies in northern Colombia 1994-2003. Evidence for human and fox rabies associated with dogs. Epidemiol. Infect. 133:

529-536.

21. Saitou, N. and Nei, M. 1987. The neighbor-joining method: a new method for reconstructing phylogenetic trees. Mol. Biol. Evol. 4: 406-425.
22. Sato, G., Kobayashi, Y., Shoji, Y., Sato, T., Itou, T., Ito, F.H., Santos, H.P., Brito, C.J. and Sakai, T. 2006. Molecular epidemiology of rabies from Maranhao and surrounding states in the northeastern region of Brazil. Arch. Virol. 151: 2243-2251.
23. Shoji, Y., Kobayashi, Y., Sato, Go., A. A. B. Gomes., Itou, T., F. H. Ito. and Sakai, T. 2006. Genetic and Phylogenetic characterization of rabies virus isolates from wildlife and livestock in Paraiba, Brazil. Acta Virol. 50: 33-37.
24. Thompson, J. D., Gibson, T. J., Plewniak, F., Jeanmougin, F. and Higgins, D. G. 1997. The CLUSTAL_X windows interface: flexible strategies for multiple sequence alignment aided by quality analysis tools. Nucleic Acids Res. 25: 4876-4882.
25. Velasco-Villa, A., Orciari, L.A., Souza, V., Juarez-Islas, V., Gomez-Sierra, M., Castillo, A., Flisser, A. and Rupprecht, C.E. 2005. Molecular epizootiology of rabies associated with terrestrial carnivores in Mexico. Virus Res. 111: 13-27.

Figure Captions

Fig. 1. A phylogenetic tree based on the N gene sequences of 1332 nucleotides (89-1420). Bold font indicates the samples for which nucleotide sequences were determined in this study. Accession numbers are given in parentheses.

Fig. 2. Geographic distributions of the Brazilian rabies virus isolates used in this study. The symbols denote the sample's affiliation to the phylogenetic groups illustrated in Fig. 1.

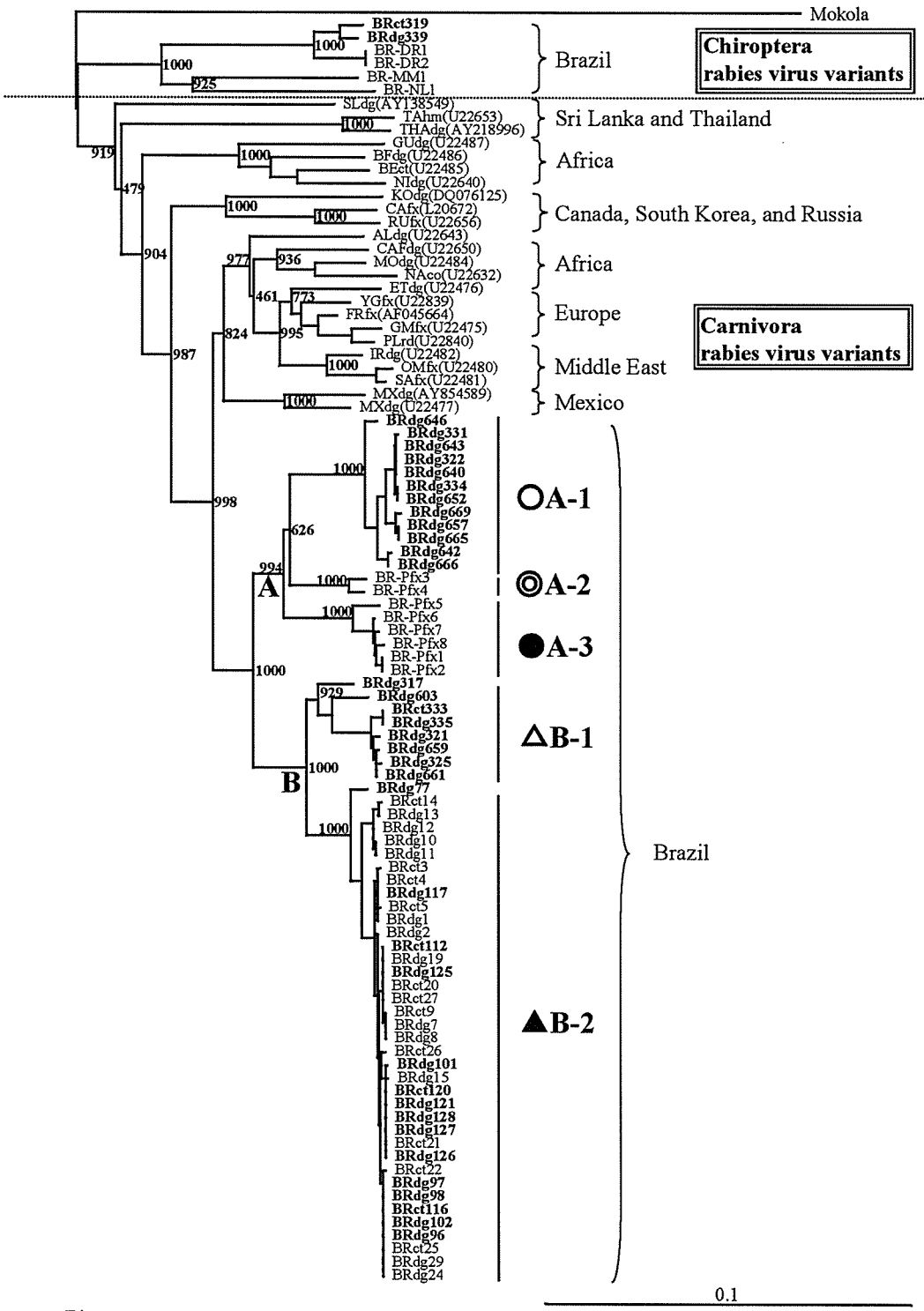
Mokola
BRct319
BRdg339
BR-DR1
BR-DR2
BR-MM1
BR-NL1
Brazil
Chiroptera rabies virus variants
SLdg(AY138549)
TAhm(U22653)
THAdg(AY218996)
Sri Lanka and Thailand
GUdg(U22487)
BFdg(U22486)
BEct(U22485)
NIdg(U22640)
Africa
KOdg(DQ076125)
CAfx(L20672)
RUfx(U22656)
Canada, South Korea, and Russia
ALdg(U22643)
CAFdg(U22650)
MOdg(U22484)
NAco(U22632)
Africa
ETdg(U22476)
YGfx(U22839)
FRfx(AF045664)
GMfx(U22475)
PLrd(U22840)
Europe
Carnivora rabies virus variants
IRdg(U22482)
OMfx(U22480)
SAfx(U22481)
Middle East
MXdg(AY854589)
MXdg(U22477)
Mexico
BRdg646
BRdg331
BRdg643
BRdg322
BRdg640
BRdg334
BRdg652
BRdg669
BRdg657
BRdg665
BRdg642
BRdg666
A-1
A
BR-Pfx3
BR-Pfx4
A-2
BR-Pfx5
BR-Pfx6
BR-Pfx7
BR-Pfx8
BR-Pfx1
BR-Pfx2
A-3
BRdg317
BRdg603
BRct333
BRdg335
BRdg321
BRdg659
BRdg325
BRdg661
B-1
B
BRdg77
BRct14
BRdg13
BRdg12
BRdg10
BRdg11
BRct3
BRct4
BRdg117
BRct5
BRdg1
BRdg2
BRct112
BRdg19
BRdg125
BRct20
BRct27
BRct9
BRdg7
BRdg8
BRct26
BRdg101
BRdg15
BRct120
BRdg121
BRdg128
BRdg127
BRct21
BRdg126
BRct22
BRdg97
BRdg98
BRct116
BRdg102
BRdg96
BRct25
BRdg29
BRdg24
B-2
Brazil
0.1

Fig. 1

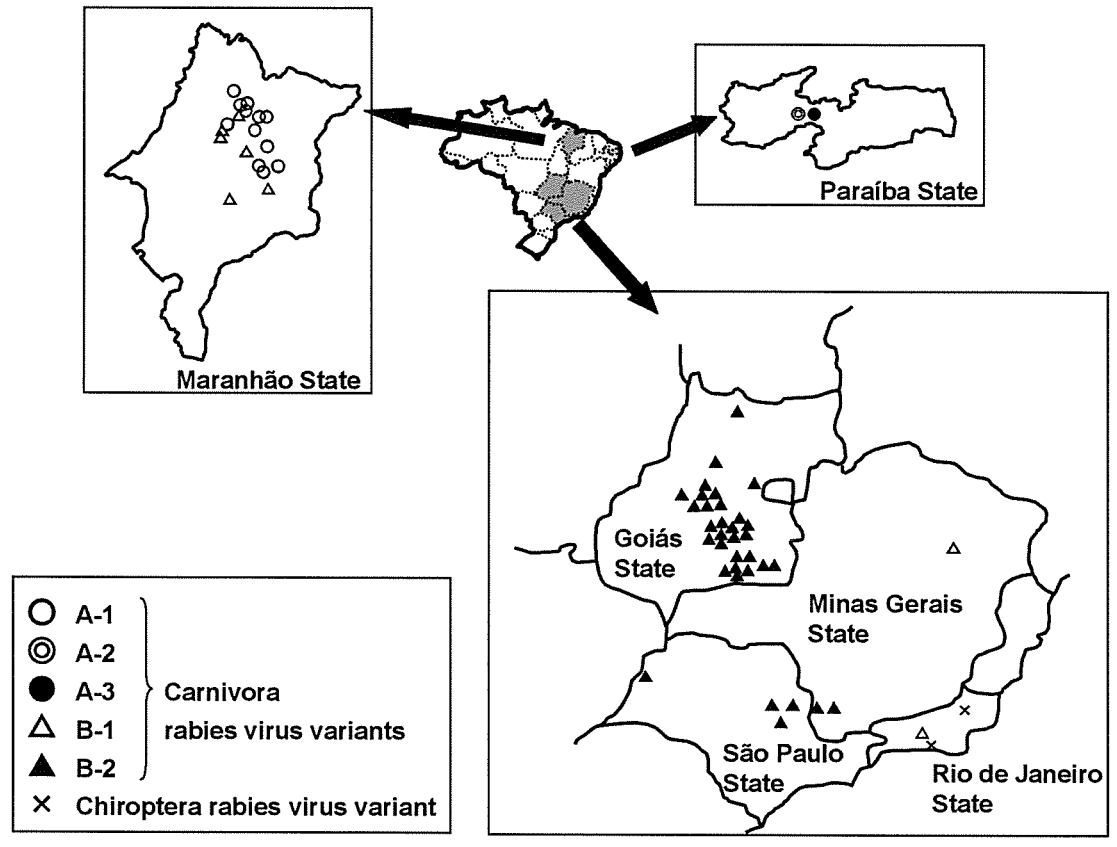
Maranhão State
Paraíba State
Goiás State
Minas Gerais State
São Paulo State
Rio de Janeiro State
A-1
A-2
A-3
B-1
B-2
Carnivora rabies virus variants
Chiroptera rabies virus variant

Fig. 2

Table 1. Brazilian rabies isolates used in this study

Sample name	Lineage[b]	Species[c]	Isolated city	Isolated State	Isolated year	Accession no.
BRdg1	B-2	Dog	Unknown[d]	Goiás	1998	AB263292
BRdg2	B-2	Dog	Goiânia	Goiás	1999	AB083792
BRct3	B-2	Cat	Goiânia	Goiás	1999	AB083793
BRct4	B-2	Cat	Goiânia	Goiás	1999	AB263293
BRct5	B-2	Cat	Goiânia	Goiás	1998	AB083794
BRdg7	B-2	Dog	Morrinhos	Goiás	1999	AB263294
BRdg8	B-2	Dog	Piracanjuba	Goiás	1999	AB263295
BRct9	B-2	Cat	Piracanjuba	Goiás	1998	AB263296
BRdg10	B-2	Dog	Poços de Caldas	Minas Gerais	1987	AB083796
BRdg11	B-2	Dog	Poços de Caldas	Minas Gerais	1987	AB263297
BRdg12	B-2	Dog	Mogi Guaçu	São Paulo	1989	AB083797
BRdg13	B-2	Dog	São João da Boa Vista	São Paulo	1989	AB263298
BRct14	B-2	Cat	São João da Boa Vista	São Paulo	1989	AB263299
BRdg15	B-2	Dog	Anápolis	Goiás	1999	AB083798
BRdg19	B-2	Dog	Caldas Novas	Goiás	1999	AB263300
BRct20	B-2	Cat	Caldas Novas	Goiás	1999	AB263301
BRct21	B-2	Cat	Cocalzinho de Goiás	Goiás	1999	AB263302
BRct22	B-2	Cat	Goianira	Goiás	1998	AB263303
BRdg24	B-2	Dog	Goiás	Goiás	1999	AB263304
BRct25	B-2	Cat	Itaberaí	Goiás	1999	AB263305
BRct26	B-2	Cat	Leopol do Bulhões	Goiás	1999	AB263306
BRct27	B-2	Cat	Morrinhos	Goiás	1999	AB263307
BRdg29	B-2	Dog	Taquaral de Goiás	Goiás	1999	AB263308
BRdg77[a]	B-2	Dog	Andradina	São Paulo	1992	AB263309
BRdg96[a]	B-2	Dog	Itaguaçu	Goiás	2001	AB263310
BRdg97[a]	B-2	Dog	Itaguaçu	Goiás	2001	AB263311
BRdg98[a]	B-2	Dog	Itaguaçu	Goiás	2001	AB263312
BRdg101[a]	B-2	Dog	Santa Tereza de Goiás	Goiás	2001	AB263313
BRdg102[a]	B-2	Dog	Ceres	Goiás	2001	AB263314
BRct112[a]	B-2	Cat	Morrinhos	Goiás	1999	AB263315
BRct116[a]	B-2	Cat	Itaberaí	Goiás	1999	AB263316
BRdg117[a]	B-2	Dog	Unknown[d]	Goiás	1998	AB263317
BRct120[a]	B-2	Cat	Unknown[d]	Goiás	2000	AB263318
BRdg121[a]	B-2	Dog	Goiânia	Goiás	2000	AB263319
BRdg125[a]	B-2	Dog	Morrinhos	Goiás	2000	AB263320
BRdg126[a]	B-2	Dog	Goiânia	Goiás	2000	AB263321
BRdg127[a]	B-2	Dog	Goiânia	Goiás	2000	AB263322
BRdg128[a]	B-2	Dog	Unknown[d]	Goiás	2000	AB263323
BRdg317[a]	B-1	Dog	Rio de Janeiro	Rio de Janeiro	1985	AB263324
BRct319[a]	BT	Cat	Cambuci	Rio de Janeiro	2001	AB263325
BRdg321[a]	B-1	Dog	Bacabal	Maranhão	Unknown[d]	AB263326
BRdg322[a]	A-1	Dog	Miranda do Norte	Maranhão	2003	AB263327
BRdg325[a]	B-1	Dog	Santa Inês	Maranhão	2003	AB263328
BRdg331[a]	A-1	Dog	Coroatá	Maranhão	2003	AB263329
BRct333[a]	B-1	Cat	Gonçalves Dias	Maranhão	2003	AB263330
BRdg334[a]	A-1	Dog	Capinzal do Norte	Maranhão	Unknown[d]	AB263331
BRdg335[a]	B-1	Dog	Barra do Corda	Maranhão	2003	AB263332
BRdg339[a]	BT	Dog	Niterói	Rio de Janeiro	2001	AB263333
BRdg603[a]	B-1	Dog	Turmalina	Minas Gerais	2002	AB263334
BRdg640[a]	A-1	Dog	Santa Rita	Maranhão	2004	AB263335
BRdg642[a]	A-1	Dog	São João Batista	Maranhão	2004	AB263336

Table 1. Continued

Sample name	Lineage[b]	Species[c]	Isolated city	Isolated State	Isolated year	Accession no.
BRdg643[a]	A-1	Dog	Santa Rita	Maranhão	2004	AB263337
BRdg646[a]	A-1	Dog	Codó	Maranhão	2004	AB263338
BRdg652[a]	A-1	Dog	Lima Campos	Maranhão	2004	AB263339
BRdg657[a]	A-1	Dog	São Vicente Ferrer	Maranhão	2005	AB263340
BRdg659[a]	B-1	Dog	Viana	Maranhão	2005	AB263341
BRdg661[a]	B-1	Dog	Pindaré Mirim	Maranhão	2005	AB263342
BRdg665[a]	A-1	Dog	São João Batista	Maranhão	2005	AB263343
BRdg666[a]	A-1	Dog	São João Batista	Maranhão	2005	AB263344
BRdg669[a]	A-1	Dog	Monção	Maranhão	2005	AB263345
BR-Pfx 1	A-3	Fox (*Dusicyon* sp.)	Patos	Paraíba	2002	AB206407
BR-Pfx 2	A-3	Fox (*Dusicyon* sp.)	Patos	Paraíba	2000	AB206408
BR-Pfx 3	A-2	Fox (*Dusicyon* sp.)	Patos	Paraíba	2001	AB206409
BR-Pfx 4	A-2	Fox (*Dusicyon* sp.)	Patos	Paraíba	2002	AB206410
BR-Pfx 5	A-3	Fox (*Dusicyon* sp.)	Patos	Paraíba	2002	AB206411
BR-Pfx 6	A-3	Fox (*Dusicyon* sp.)	Patos	Paraíba	2002	AB207884
BR-Pfx 7	A-3	Fox (*Dusicyon* sp.)	Patos	Paraíba	2002	AB206412
BR-Pfx 8	A-3	Fox (*Dusicyon* sp.)	Patos	Paraíba	2002	AB206413
BR-DR1	BT	Vampire Bat (*Desmodus rotundus*)	Lindóia	São Paulo	2002	AB201803
BR-DR2	BT	Vampire Bat (*Desmodus rotundus*)	Lindóia	São Paulo	2002	AB201804
BR-MM1	BT	Vampire Bat (*Desmodus rotundus*)	Jales	São Paulo	2002	AB201816
BR-NL1	BT	Insect Bat (*Nyctinomops laticaudatus*)	São José do Rio Preto	São Paulo	2002	AB201806

a) Samples with determined nucleotide sequences in this study. b) Lineage as observed in the phylogenetic tree is denoted. BT indicates RV isolates that belonged to the cluster of Chiroptera rabies virus variants. c) Scientific names are given in parentheses. d) There is no reliable

Table 2. Primers used in this study

Primer	Nucleotide sequences (5'-3')	Position[a)]	Sense	Use
RHN1	ACAGACAGCGTCAATTGCAAAGC	28-50	+	RT-PCR/sequencing
BRADN-S2	TGCAGATAGGATAGAGCAGA	565-584	+	Sequencing
BRADN-S4	TGTCTGTTCTAGGGGGCTAT	1083-1102	+	Sequencing
RHNS3	CTAGGATTGACAAAGATTTTGCTC	1516-1539	-	RT-PCR/sequencing
BRADN-C2	GACTTTCCACTCAAGCCTAG	963-944	-	Sequencing
BRADN-C4	TCAGTACGCTTGATCTCCAC	414-395	-	Sequencing
P1[b)]	CTACAATGGATGCCGACAAGA	66-86	+	RT-PCR/sequencing
BRABN-S1[b)]	GGACTAGCTATGGAATCCTG	336-355	+	Sequencing
BRABN-S3[b)]	GGACTGGTGTCATTTACAGG	782-801	+	Sequencing
N8[b)]	AGTTTCTTCAGCCATCTC	1585-1568	-	RT-PCR/sequencing
BRABN-C1[b)]	TCCTCATAAGCAGTGACAACT	774-754	-	Sequencing
BRABN-C3[b)]	TGTCCAGAGATTTTGCTCA	450-431	-	Sequencing

a) Nucleotide positions are numbered according to the PV sequences (M13215). b) These primers were used for BRdg339 and BRct319.

表題：ブラジルの食肉目から分離された野外狂犬病ウイルスの系統学的解析

小林由紀[1)]・井上奈奈[1)]・佐藤　豪[1)]・伊藤琢也[1)]・Santos, H. P.[2)]・Brito, C. J. C.[6)]・Gomes, A. A. B.[3)]・Santos, M. F. C.[4)]・Silva, M. V.[5)]・Mota, C. S.[5)]・Ito, F. H.[6)]・酒井健夫[1)]

所属機関：[1)]日本大学動物医科学研究センター, [2)] School of Veterinary Medicine, Maranhão State University, [3)] Department of Veterinary Medicine, Center of Health and Rural Technology, Federal University of Campina Grande, [4)] Center for Diagnostic and Veterinary Research, Goianian Rural and Fundiary Development Agency, Secretary of Agliculture and Livestock of the State of Goiás, [5)] Jorge Vaitsmann Municipal Institute [6)] Faculty of Veterinary Medicine and Zootechny, University of São Paulo, Brazil

ブラジルではイヌに狂犬病が発生しており、さらに近年、キツネから分離された狂犬病ウイルス(RV)はイヌから分離された RV と遺伝子学的に近縁であることが報告された。本研究はブラジルの食肉目の間で維持されている RV の疫学的特徴を明らかにするために、イヌ、ネコおよびキツネから分離された RV の系統解析を行った。ブラジルで分離された食肉目分離株は、2 つの系統に分類された。第 1 の系統は、家庭動物であるイヌおよびネコから分離された RV によって構成されており、アルゼンチンおよびボリビアで分離された食肉目分離株はこの系統に属した。このことから、第 1 の系統はブラジルおよびその周囲の広範囲な地域に分布することが明らかとなった。第 2 の系統は、イヌ分離株によって構成される 1 つのサブ系統とキツネ分離株によって構成される 2 つのサブ系統によって構成されており、イヌ分離株は、キツネ分離株のサブ系統の分岐として位置していたことから、過去にイヌとキツネの間で RV 伝播が起きた可能性が示唆された。以上、イヌと野生動物の接触は新たな RV 変異株を出現させる可能性があり、狂犬病の流行を防止するためにはイヌと野生動物の両方の狂犬病をコントロールすることが重要である。