Veterinary Microbiology 156 (2012) 429–433

Contents lists available at SciVerse ScienceDirect

Veterinary Microbiology

journal homepage: www.elsevier.com/locate/vetmic

Short communication

Detection of paramyxoviruses in Magellanic penguins (*Spheniscus magellanicus*) on the Brazilian tropical coast[☆]

Luz Alba M.G. Fornells[a,*], Tatiane F. Silva[a], Iliani Bianchi[b], Carlos E.P.F. Travassos[c], Maíra H.T. Liberal[d], Claúdio M. Andrade[d], Melissa P. Petrucci[b], Venicio F. Veiga[a], Maite F.S. Vaslin[a], José Nelson S.S. Couceiro[a]

[a] *Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil*
[b] *Instituto Orca, Vila Velha, Espírito Santo, Brazil*
[c] *Universidade Estadual do Norte Fluminense, Campos, RJ, Brazil*
[d] *Pesagro, Rio de Janeiro, RJ, Brazil*

ARTICLE INFO

Article history:
Received 28 June 2011
Received in revised form 23 November 2011
Accepted 25 November 2011

Keywords:
Paramyxovirus
APMV-2
APMV-10
Penguin
Brazil

ABSTRACT

Aquatic migratory birds are a major vectors by which influenza viruses and paramyxoviruses are spread in nature. Magellanic penguins (*Spheniscus magellanicus*) are usually present on the southern shores of South America and can swim as far as the southern coast of Brazil in winter. In 2008, however, several Magellanic penguins were observed on the northeastern coast of Brazil. Paramyxoviruses were isolated from Magellanic penguins on the Espírito Santo state coast, approximately 4000 km from their breeding colonies, although influenza viruses were not detected. Among the paramyxoviruses, five *Avulavirus* isolates belonging to serotype APMV-2 and the serotype APMV-10, which was proposed by Miller et al. (2010), were identified. These results highlight the risks associated with the spread of paramyxoviruses between natural to non-natural habitats by birds exhibiting unusual migration patterns, and they document for the first time the presence of the APMV-2 and APMV-10 serotypes on penguins in Brazil. The local avifauna may become infected with these viruses through close contact between migratory and resident birds. Continued surveillance of virus incidence in these migratory populations of penguins is necessary to detect and prevent the potential risks associated with these unusual migration patterns.

1. Introduction

Wild birds play a major role in the dissemination of various microorganisms, especially paramyxoviruses and orthomyxoviruses (Olsen et al., 2006). Orthomyxoviruses are pleomorphic and enveloped structures, and their capsids contain segmented negative-sense, single-stranded RNA genomes; paramyxoviruses exhibit many similar characteristics but have non-segmented RNA genomes. Both types of these viruses have caused diseases in humans and animals for centuries, and several new viruses have been identified in recent decades. Serotypes APMV-1 to APMV-10 of the *Avulavirus* genus (*Paramyxoviridae* family, subfamily *Paramyxovirinae*) are able to infect a variety of wild and domestic birds worldwide (Miller et al., 2010). Their genomes encode at least six open reading frames (ORFs NP, P, M, F, HN and L), and the L (polymerase) gene is a useful target for molecular

---

[☆] The sequences described here were deposited in GenBank under the following accession numbers: ES-02 – HQ687899, ES-03 – HQ687900, ES-05 – HQ687901 and ES-06 – HQ687902.

[*] Corresponding author at: Laboratório de Virologia Molecular I, Depto. Virologia, Instituto de Microbiologia, Universidade Federal do Rio de Janeiro, Centro de Ciências da Saúde, Bloco I, Cidade Universitária, Ilha do Fundão, Rio de Janeiro, RJ 21941-590, Brazil. Tel.: +55 2125608344 167; fax: +55 2133960701.

E-mail address: luzalbaf@micro.ufrj.br (Luz Alba M.G. Fornells).

0378-1135/$ – see front matter © 2011 Elsevier B.V. All rights reserved.
doi:10.1016/j.vetmic.2011.11.026

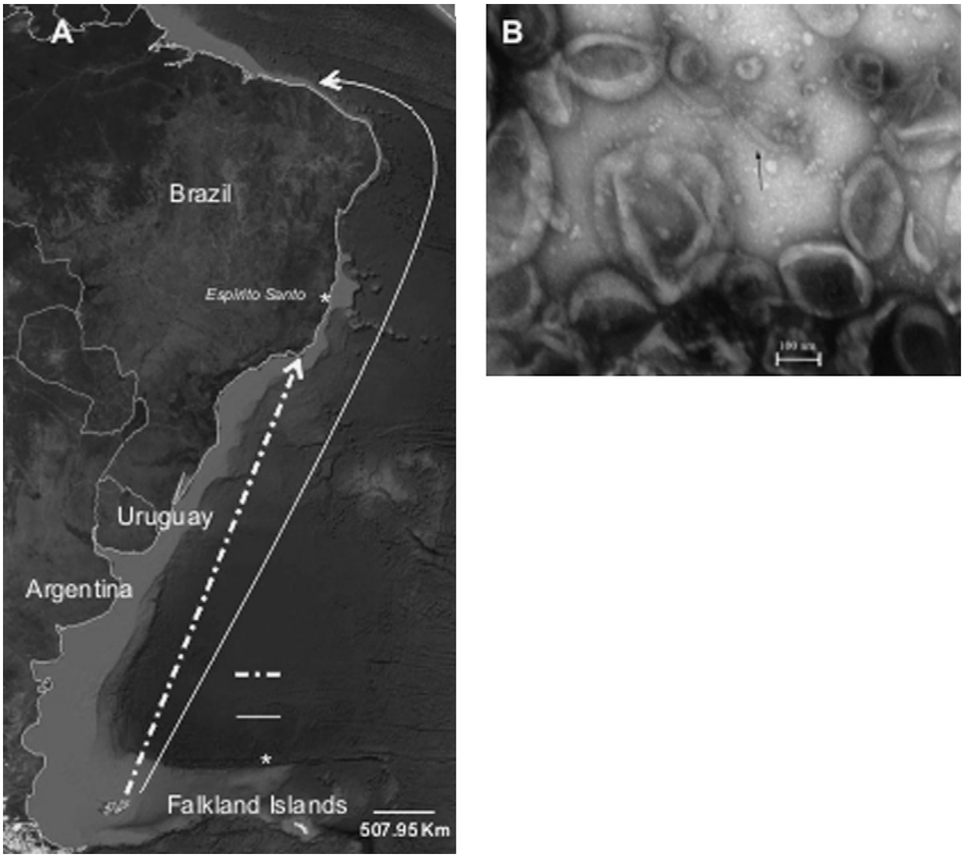

Fig. 1. (A) A map of the South American Atlantic coast (http://earth.google.com/intl/pt/) showing usual and exceptional (2008) migratory routes of the Magellanic penguin (*Spheniscus magellanicus*). Samples collection site is indicated by a star. (B) An electron microscopic image of ES-03 virus isolate, showing enveloped pleomorphic structures. The arrow indicates a viral capsid negatively stained with 4% phosphotungstic acid. Scale bar = 100 nm.

detection of these viruses. In contrast, influenza A viruses from the *Orthomyxoviridae* family are classified based on their hemagglutinin (H1 to H16) and neuraminidase (N1 to N9) subtypes and identified by RT-PCR for using their matrix protein (M) as universal target for identification (Fouchier et al., 2000; Ellis and Zambon, 2001).

Serological surveys have shown that ortho- and paramyxoviruses circulate among Antarctic and sub-Antarctic penguins. Although no influenza virus A has been isolated from these birds, serum antibodies to the H7 and H10 subtypes have been previously reported in Adélie (*Pygoscelis adeliae*) and other penguin species by Morgan et al. (1981), Austin and Webster (1993), Wallensten et al. (2006), and others. APMV-2 paramyxoviruses have been detected in Adélie and Humboldt penguins, APMV-1, also called Newcastle disease virus (NDV), in Antarctic penguins as well unclassified APMV serotypes in king (*Aptenodytes patagonicus*), royal (*Eudyptes schlegeli*), and Adélie penguins from Antarctica and little blue penguins (*Eudyptula minor*) from Australia (Morgan et al., 1981; Alexander et al., 1989; Austin and Webster, 1993; Wallensten et al., 2006; Smith et al., 2008). Recently, a new Avulavirus serotype, APMV-10, was identified in rockhopper penguins (*Eudyptes chrysocome*) from the Falkland Islands (Miller et al., 2010).

Penguins usually live on the Antarctic continent and in the coldest regions of South America, with some species exhibiting annual migrations. Magellanic penguins, *Spheniscus magellanicus* are distributed along the southernmost shores of South America, with breeding colonies extending from the coast of Chile to the Valdez Peninsula region in Argentina and on the Falkland Islands. From these breeding colonies, the birds migrate to winter habitats up to the southern coast of Brazil (Stokes et al., 1998). Garcia-Borboroglu et al. (2010) detected a severe alteration in the distributional pattern of Magellanic penguins along the eastern coast of South America in 2008 (Fig. 1A), when these birds were observed near the equator in Ceará, Brazil (≅3S).

To check the possible presence of paramyxovirus and/or influenza A virus infections among migratory penguins, we analyzed 73 cloacal samples collected from penguins captured on the coast of Espírito Santo state, Brazil, during the 2008 migration period. Serological and molecular assays showed the presence of APMV-2 and APMV-10 paramyxovirus in some of these birds.

2. Materials and methods

2.1. Virus isolation, purification and electron microscopy

Cloacal swabs were collected from 73 Magellanic penguins (*Spheniscus magellanicus*) at the ORCA Institute