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SCIENCE DIRECT
Virus Research 110 (2005) 111–118
Virus Research
www.elsevier.com/locate/virusres

Phylogenetic analysis of classical swine fever virus (CSFV) field isolates from outbreaks in South and Central America

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Received 23 August 2004; received in revised form 25 January 2005; accepted 25 January 2005
Available online 5 March 2005

Abstract

To date, there is little information concerning the epidemiological situation of classical swine fever (CSF) in the Americas. Besides summarizing the available data, genotyping of isolates from outbreaks in domestic pigs in several countries of South and Central America was performed. For this, a 190 base fragment of the E2 envelope glycoprotein gene was used. European strains and isolates, and historical isolates from the United States (US) were included for comparison. In contrast to the situation in most parts of Europe, where group 2 isolates predominate, it was found that all the isolates from the American continent analyzed belonged to group 1 and were further resolved into three subgroups. The Cuban isolates clustered in subgroup 1.2, whereas the isolates from Honduras and Guatemala clustered in subgroup 1.3. The remaining isolates from Argentina, Brazil, Colombia and Mexico generated four poorly resolved clusters in subgroup 1.1, together with the vaccine strains, with historical European and US isolates, and with a recent Russian isolate. While the vaccine strains and the historical European isolates formed a relatively distinct cluster, one of the US isolates clustered together with the Mexican, and another one with Colombian isolates. Historically, CSF (hog cholera) was observed almost simultaneously in the US and in Europe in the first half of the 19th century, and its origin remains a matter of discussion. Our results showed that the US isolates are closely related to isolates from South America, while appearance of isolates in Cuba on one hand and in Honduras and Guatemala on the other hand, seems to have been due to unrelated events. This allows to speculate that at least in the American continent, CSF virus may have appeared independently in several regions, and spreading may have been a secondary effect.

Keywords: Classical swine fever; South America; Central America; Genotype; Epidemiology

1. Introduction

Classical swine fever (CSF) virus, a *Flavivirus*, is the causative agent of an economically important disease of pigs world-wide. CSF has been classified as an OIE list A disease and most countries have control and eradication programs for the disease (Paton and Greiser-Wilke, 2003).

There exists relatively little information concerning the situation of CSF in the Americas. The data available for the year 2003 are summarized in Fig. 1 (Anonymous, 2004a). Only Canada and USA are internationally considered to be free of the disease. The disease is present in many other American countries, causing economically devastating outbreaks like in Cuba between 1993 and 1997 (Frias-Lepoureau, 2002)

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0168-1702/$ – see front matter © 2005 Elsevier B.V. All rights reserved.
doi:10.1016/j.virusres.2005.01.011

Fig. 1. Compilation of the occurrence of CSF in the Americas in 1993 (Anonymous, 2004a): (0000) disease never reported; (NR) disease not reported (date of last outbreak not known); (month/year) date of the last reported occurrence of the disease in previous years; (+) reported present or known to be present; (Z) disease limited to specific zones. The names of the countries appearing in italics and bold are from which isolates were included in this study.

and 2002–2004 (Anonymous, 2004b), and in the Dominican Republic since 1996 (Lubroth, 1999; Teran et al., 2004). On the contrary, there are several countries where the disease has never been reported, and others which did not report to the OIE. The data available for 2004 are still incomplete, yet more than 86 outbreaks of CSF were reported from Cuba, 27 from Peru, and one each from Brazil and Nicaragua, respectively (Anonymous, 2004c).

Remarkable strides have been made in controlling CSF in Mexico (Frias-Lepoureau and Greiser-Wilke, 2002), in Colombia and in certain countries of the Southern cone of South America. Uruguay has not reported cases of CSF since 1991 and stopped vaccination in 1995, whereas Chile has reported the last outbreak in 1996 and forbidden vaccination in 1997. Control programs based on vaccination, laboratory testing, stamping out (depopulation), quarantine, control of transit and import restrictions implemented in Argentina and Brazil reduced the number of outbreaks significantly. The last outbreak in Brazil was reported to the OIE in June 2004, in the State of Ceará (in the north-eastern part of the country) (Anonymous, 2004c). Currently, the Southern states of Brazil and Argentina, being free of the disease, have stopped vaccination against CSF. The Mercosur Trade Alliance, where Argentina, Brazil, Uruguay and Paraguay are in the process of