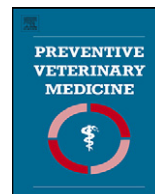




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## Risk factors for West Nile virus seropositivity of equids in Guadeloupe

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## ABSTRACT

In Guadeloupe, West Nile virus (WNV) activity was first observed in equids in 2002, and a high seroprevalence was found in 2003. The objective of our study was to determine individual and environmental factors associated with the risk of WNV seropositivity during 2002–2003. Fieldwork was conducted to retrospectively determine the location of equids at the time of virus circulation and to collect information regarding environmental and individual variables. Sera were collected from 369 equids out of an estimated total population of less than 500. Thirty-four environmental and individual variables were investigated. Equids had a higher risk ( $p < 0.001$ ) for WNV seropositivity if they lived within the proximity “distance less than 1.5 km” of marshes or swamp forests “a large freshwater formation behind mangroves” or if they remained outside after dusk. Equids living within the proximity of ouassous shrimp (*Macrobrachium rosenbergii*) basins or sugar cane fields had a lower risk ( $p < 0.001$ ) for WNV seropositivity. These results confirm that WNV circulation is more likely in the humid coastal areas of Guadeloupe. The identification of risk factors is useful for predicting future emergence sites of WNV in the archipelago and other Neotropical islands, and to better target sentinel surveillance in the region.

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## 1. Introduction

West Nile virus (WNV, family *Flaviviridae*, genus *Flavivirus*) was first isolated in 1937 in Uganda in the West Nile district (Smithburn et al., 1940). It circulated in tropical areas of Africa, in Asia and in Europe before it emerged in the New World in 1999, in the east coast of the United States (Lanciotti et al., 1999). WNV extended westward and southward to reach almost the whole of the United States (Petersen and Hayes, 2004), Central America and the Caribbean islands by 2002 (Fernandez-Salas et al., 2003; Komar and Clark, 2006), then South America by 2004

(Mattar et al., 2005; Morales et al., 2006; Pupo et al., 2006; Bosch et al., 2007). Since 2001, it also spread northward to five Canadian provinces (Kondro, 2006). The characteristics of WNV infections in the New World seem to differ from those in Europe and northern Africa because fatal nervous infections of wild birds and geese were observed together with encephalitis outbreaks in humans and equids.

WNV activity in the Guadeloupean archipelago, French West Indies, was first detected in 2002 in equine and avian populations and within six months seroconversions were observed in half of 136 equids sampled (Quirin et al., 2004). Serological investigations conducted in 2003 and 2004 on equine and domestic avian populations showed a high seroprevalence in equids, followed by a major decrease in exposure: no equine seroconversion occurred between

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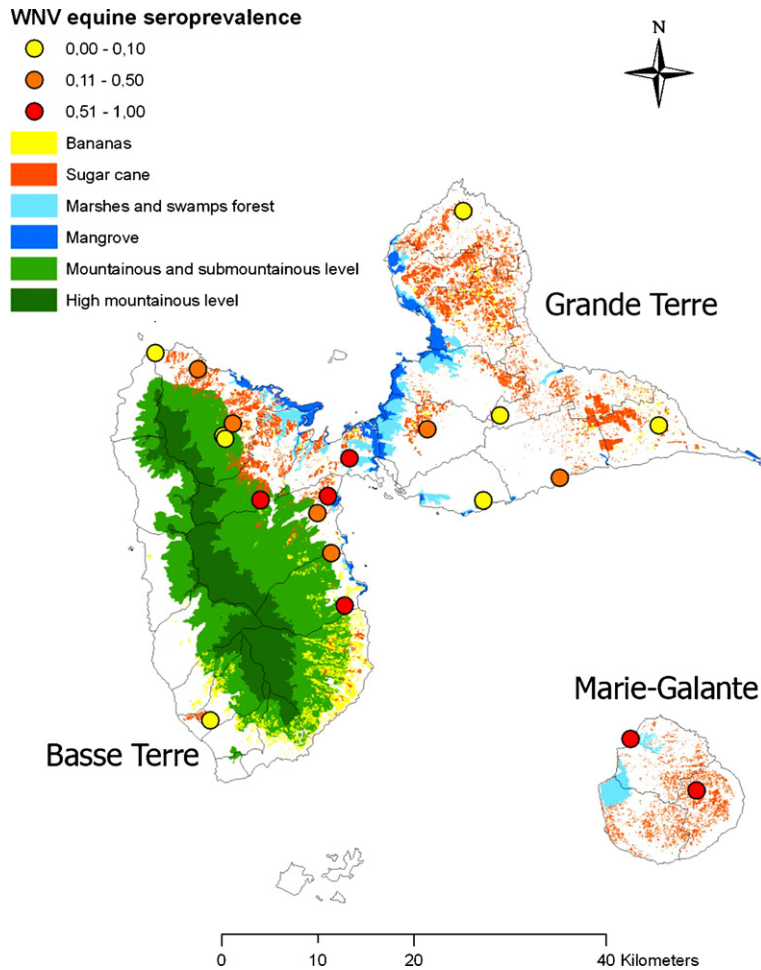


Fig. 1. Distribution and seroprevalence of 20 sites surveyed to test association between individual and environmental factors with *West Nile virus* seropositivity in equids in Guadeloupe.

January 2003 and August 2004 (Lefrançois et al., 2005). No virus activity, based on serological monitoring of immunologically naïve horses was subsequently observed, until 2007–2008, when WN disease reoccurred (Lefrançois et al., 2006; Promed, 2008 [Lefrançois]). The 2002 heterogeneous spatial distribution of WNV in Guadeloupe indicated that some areas had higher risk of infection than other areas. Most of the WNV seropositive equids were located in areas near tropical rain forests, mangroves and swamp forests which contain many species of wild birds and mosquitoes (Lefrançois et al., 2005).

Few studies have been conducted on WN disease risk factors for equids in the Neotropics. Some studies have been conducted to investigate environmental and individual risk factors in temperate areas, including the South of France (Leblond et al., 2005), Texas (Ward, 2009; Ward et al., 2009), North Dakota (Mongoh et al., 2007) and Canada (Epp et al., 2007).

The objective of this study was to determine risk factors associated with seropositivity in equids in Guadeloupe. Environmental and individual factors and those associated with herd management practices were investigated.

## 2. Materials and methods

### 2.1. Study area

Guadeloupe is an archipelago representing a total area of 1705 km<sup>2</sup>. It is located in the Lesser Antilles between 61°15'–61°30'W and 15°55'–16°15'N and is bordered by the Atlantic Ocean and the Caribbean Sea (Fig. 1). The Basse-Terre and the Grande-Terre islands, separated only by a salt water channel, constitute the Guadeloupean main island. The Marie Galante, La Désirade and Les Saintes islands are close to the main island, whereas St Martin and St Barthélémy are located about 250 km northward.

The climate in Guadeloupe is insular tropical and is characterized by the alternation of a dry and a hot humid season, which is location-specific. A dry season exists in the Grande-Terre island and on the west coast of the Basse-Terre island. The dry season progressively weakens and disappears with increasing elevation. The mean annual temperature at sea level is around 27°C and the relative humidity is often above 80%. The total amount of rainfall depends mainly on elevation and easterly wind exposure, resulting in a great variety of ecosystems (Rousteau, 1996).

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