Antibodies to West Nile virus in Mexican pigs

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West Nile virus (WNV), a member of Flavivirus genus within the Flaviviridae family, is a mosquito-borne neurotropic viral pathogen maintained in an enzootic cycle between mosquitoes (vectors) and birds (natural hosts) with equids, humans, and other vertebrates acting as dead-end hosts¹. WNV was first detected in the Americas in New York in 1999, and since then, the virus has spread across the United States (US), north into Canada, and south into Mexico and central/south America. However, contrary to the high mortality among birds and horses, and the hundreds of human deaths reported in the US, very few veterinary or human cases have been described in Mexico.

The first evidence of WNV activity in Mexico, was reported in 2002, when antibodies to WNV were detected in horses in states border to the US, and, since then, viral activity has been observed in several domestic and wild fauna, and in humans across the country. The virus has been isolated from different birds, mosquitoes, and humans². Though, porcine production in the Mexico (with over 1.300 million tons of meat/yr) occupies the second place in central and south America, only behind Brazil, no serological studies have been conducted in pigs in Mexico. In fact, very few studies have addressed the worldwide prevalence of anti-WNV antibodies in swine. Here, data on the detection of antibodies against WNV in farmed pigs in Mexico are presented.

Swine serum samples (n = 683) were collected during 2010–13 from nine states in the central region of Mexico³. Samples included healthy pigs (>1 to 48 months of age) grown in farms from 48 municipalities. Written permission was obtained from the farm’s owners for sample collection and the study was conducted in accordance to all the applicable guidelines related to animal welfare. The study was approved by the Institutional Animal Care and Use Committee (IACUC) of the Centro Nacional de Investigación Disciplinaria en Microbiología Animal (No. approval: 001-2012), Mexico.

Anti-WNV IgG was detected using an inactivated WNV-based enzyme linked immunosorbent assay (ELISA) as described by Cordoba et al⁴. The positive/negative (P/N) value of each sample was calculated as the mean absorbance of positive antigen-containing wells divided by the mean absorbance of the negative antigen-containing wells. Samples with a P/N value >2 were considered positive. All positive samples and an equal number of negative samples were retested to confirm the results. The detection of neutralizing antibodies was undertaken by virus neutralization test (VNT) on Vero cells using two-fold serial dilutions of serum (starting form 1/20) and a cell culture passaged New York/1999 (NY99) WNV strain (GenBank acc.: KC407666)⁴–⁵. Titres were calculated as the serum dilution that completely inhibited cytopathic effect. All infectious virus manipulations were performed in biosafety level 3 (BSL-3) facilities. Statistical significance of the data was analyzed using the chi-square test.

In total, 4.5% (31/683) of the serum tested were positive for WNV antibodies by ELISA (average P/N = 3.13, range 2.10–5.98), of which 35.5% neutralized viral infectivity with VNT titres of 1/20. Although, similar studies are scarce, these figures are similar to that reported in Spain, where 3.4% swine serum samples were positive in ELISA⁶, and India, where prevalence ranged from 2.13 to 7.7%⁷, but lower than those from US⁸, where 22.6% positive samples were recorded. Likewise, and although the reasons are not clear yet, a discrepancy between the number of ELISA and VNT positive samples as that observed in this study, has also been documented previously in pigs around the world⁶–⁸.

The proportion of anti-WNV IgG positive animals was significantly higher among animals older than six months of age (11.7%, 23/197, p <0.0001), than among pigs under six months of age (1.7%, 8/478). These data agree with those reported previously for pigs in USA⁸ and probably reflect a higher exposure of older animals to the mosquito bites. Additionally, WNV antibodies were more prevalent in females (6.97%, p <0.0057) than in males.
(1.8%). No relationship was found between the WNV seropositivity observed in this study and that reported earlier for other viral infections in the same cohort. The prevalence of anti-WNV antibodies varied widely between states and municipalities (Table 1). Infected pigs were only found in four (San Luis Potosí, Puebla, Michoacán and Jalisco) of the nine states included in the study. Statistically significant differences were observed for the number of farms with positive animals (positive farms) among the states analyzed (p < 0.0008). The number of farms with positive animals was higher in Michoacán (50%) and Jalisco state (63.3%). Specifically, 19% of the total tested pigs resulted positive in Michoacán and 9.1% of the total tested pigs resulted positive in Jalisco. No appreciable geographical or climatic differences were observed with regard to the seroprevalence rates. For instance, farms from the same state showed uneven seroprevalence.

Even though, the role of pigs in the life cycle of WNV still has to be elucidated, the virus has been shown to replicate at low levels in experimentally infected pigs without clinical signs. Thus, contrary to the WNV-related flavivirus Japanese encephalitis virus, pigs are unlikely to play a role in WNV amplification in nature. Although, some reports have described the seroconversion of pigs pointing to its possible usefulness as sentinels, the experimental infection data and lower prevalence of anti-WNV antibodies found in this study, as well as in other regions of the world, suggests that pigs do not play significant role in WNV circulation, therefore, do not appear to be good sentinel candidates.

REFERENCES