



## Venezuelan equine encephalitis: How likely are we to see the next epidemic?



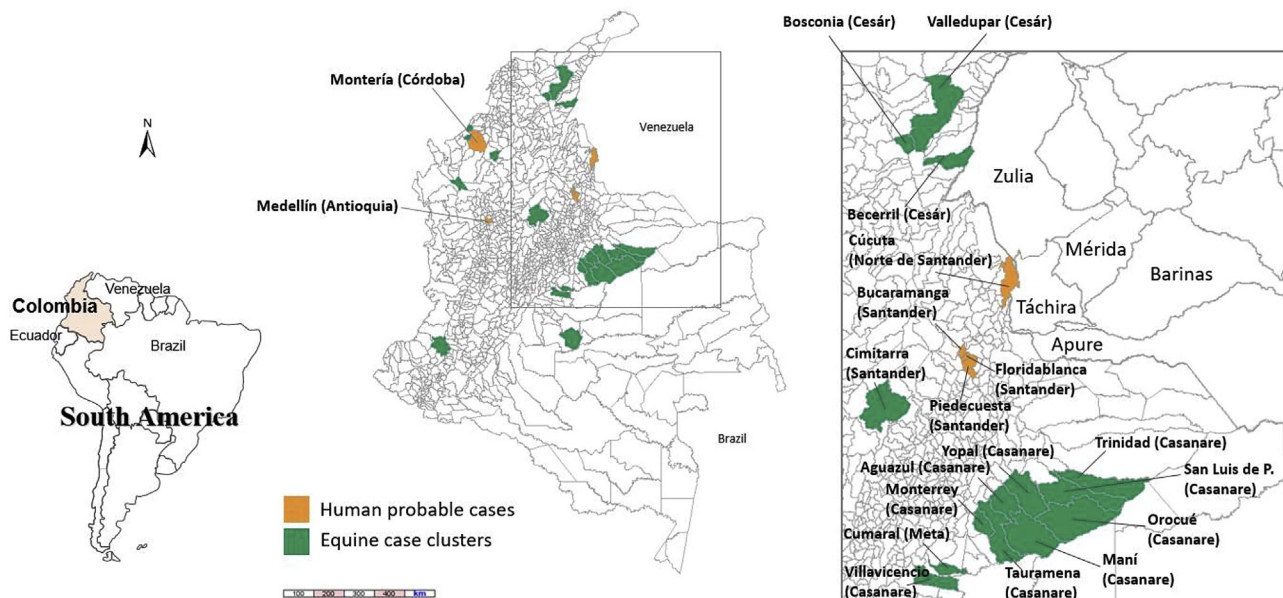
Dear Editor

Several mosquito-borne viruses have recently emerged in the Americas, with Zika (ZIKV) being the most recent player in the ongoing epidemic [1]. Chikungunya (CHIKV), Dengue (DENV), Mayaro (MAYV) and West Nile Virus (WNV) have continued to persist endemically in Latin America behind the shadows of the current ZIKV epidemic [2].

Venezuelan equine encephalitis virus (VEEV) (Alphavirus: *Togaviridae*), is a potentially important player in the epidemic of febrile illness that is currently occurring, particularly in Venezuela and Colombia. Clinical symptoms of VEEV infection in humans include a mild flu-like febrile illness, mild to severe encephalitis (particularly in children) and as with ZIKV infections during pregnancy, severe neurological birth defects and anomalies due to fetal encephalitis and placental injury [1–3]. A reduction in equine

vaccination campaigns in Venezuela, coupled with the fact that equids are the amplifying hosts of this virus, sets the stage for an epizootic phase of VEEV in northern South America.

When VEEV was first described in Colombia in 1934 it was referred to as “the mad plague of beasts” [3,4], due to the striking neurological signs seen in affected equids. But it was not until 1938 that the virus was first isolated and fully characterized in the brains of affected horses during an epizootic outbreak in Venezuela [3,4]. The VEEV complex can be subdivided into six different subtypes (I to VI) with type I further divided into other antigenic variants [3,4]. They are enzootic (endemic) in Venezuela, with epizootic (epidemic) cycles occurring mostly in tropical and subtropical forest areas during rainy seasons [3–5]. VEE subtypes IAB and/or IC have also been isolated in Belize, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Peru and the United States (Texas) [1,2,4,5].



**Fig. 1.** Map of municipalities across Colombia, where human probable cases and equine VEEV case clusters have been notified (up to Nov. 19, 2016), highlighting the Venezuelan border area.

Even though the ZIKV epidemic has steadily started to decline, cases are still being reported throughout Venezuela, Colombia and other countries in the Americas, especially in geographic areas known to be also endemic for VEEV, such as the north-eastern states adjacent to the Colombian border (Fig. 1). This is important to consider, since diagnosis between both of these vector-borne infections may be a very difficult task on clinical grounds alone [2,3].

In addition, vector usage seems to constitute another important overlapping feature between ZIKV and epizootic strains of VEEV. To date, ZIKV has been detected in *Aedes*, *Anopheles*, and *Mansonia* [1–5], while VEEV has been isolated in at least 10 mosquito species including also *Aedes*, *Mansonia* as well as *Culex*, *Psorophora*, and *Deinocerites* [5,6]. In regards to enzootic strains, which are distributed throughout the Americas from Florida to Argentina, these are usually maintained in nature by their mosquito vector in transmission cycles that usually involve small sylvatic mammals [4–6].

Recent reports (2016) from the Colombian Agricultural Institute (ICA) have confirmed circulation of VEEV in equines in 55 geographical clusters (Fig. 1), including the Departments of Cesar, Santander and Casanare, but also the National Institute of Health of Bogotá (INS), has notified 13 human probable cases in 6 municipalities, included in the Departments of Santander and Norte de Santander, all these territories which are neighboring areas with Venezuela (Fig. 1) [5]. This is particularly important considering the humanitarian crisis that is occurring in Venezuela, where vector borne disease surveillance, livestock health monitoring, and vaccination campaigns have all but halted.

Although to date, five major epidemic outbreaks in Venezuela have been recorded (1938, 1962, 1969, 1973 and 1995) [3–5], inter-epizootic maintenance of viral strains (IAB and IC) has been reported [1–3]. In addition, post-epizootic persistence of VEEV IC [6], and more recently post-epizootic circulation of type IAB VEEV strains, five and eight years after their apparent outbreaks have been recorded; signaling a potential threat and a close timing for a major equine-amplified outbreak in the region.

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## Conflict of interest

None of the authors report conflict of interests.

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