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Monitoring of West Nile virus, Usutu virus and Meaban virus in waterfowl used as decoys and wild raptors in southern Spain

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ABSTRACT

In the last decade, the number of emerging flaviviruses described worldwide has increased considerably, with wild birds acting as the main reservoir hosts of these viruses. We carried out an epidemiological survey to determine the seroprevalence of antigenically related flaviviruses, particularly West Nile virus (WNV), Usutu virus (USUV) and Meaban virus (MBV), in waterfowl used as decoys and wild raptors in Andalusia (southern Spain), the region considered to have the highest risk of flaviviruses circulation in Spain. The overall flaviviruses seroprevalence according to bELISA was 13.0% in both in decoys (n = 1052) and wild raptors (n = 123). Specific antibodies against WNV, USUV and MBV were confirmed by micro virus neutralization tests in 12, 38 and 4 of the seropositive decoys, respectively. This is the first study on WNV and USUV infections in decoys and the first report of MBV infections in waterfowl and raptors. Moreover we report the first description of WNV infections in short-toed snake eagle (*Circaetus gallicus*) and Montagu's harrier (*Circus pygargus*). The seropositivity obtained indicates widespread but not homogeneous distribution of WNV and USUV in Andalusia. The results also confirm endemic circulation of WNV, USUV and MBV in both decoys and wild raptors in southern Spain. Our results highlight the need to implement surveillance and control programs not only for WNV but also for other related flaviviruses. Further research is needed to determine the eco-epidemiological role that waterfowl and wild raptors play in the transmission of emerging flaviviruses, especially in decoys, given their close interactions with humans.

1. Introduction

During the last decade, the spread of many flaviviruses (Genus *Flavivirus*) has been reported, representing an emerging threat for both animal and human health [1]. Most of these viruses are transmitted within an enzootic cycle involving ornithophilic mosquitoes or ticks as competent vectors, and wild birds that play a central role in flavivirus epidemiology as they represent the main amplifying hosts in the wild and may contribute to their dispersion through their migratory behavior [2]. Mammal species including humans are considered dead-end or incidental hosts, because they can get infected but are not thought to be able to transmit the viruses [3]. In humans, other routes of flavivirus transmission such as blood transfusion, organ transplantation, intrauterine transmission, handling of infected carcasses and breast feeding, have been also described [4]. Even though infections by flaviviruses are generally asymptomatic or result in mild illness, they can potentially cause fever, encephalitis and mortality both in birds and in other vertebrate species, including humans [5].

Encephalitis and mortality associated with West Nile virus (WNV), Usutu virus (USUV), Bagaza virus (BAGV), tick-borne encephalitis virus (TBEV) and Louping ill virus (LIV) have been reported in humans (WNV, TBEV), wild birds (WNV, USUV, BAGV), horses (WNV, TBEV) and small ruminants (LIV) in Europe in the last few years [6–12]. Additionally, Meaban virus (MBV) infections have been identified in wild birds and ticks in several European countries

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