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Experimental infection of house sparrows (*Passer domesticus*) with West Nile virus isolates of Euro-Mediterranean and North American origins

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Abstract

West Nile virus (WNV) is a zoonotic arboviral pathogen transmitted by mosquitoes in a cycle involving wild birds as reservoir hosts. The virus has recently emerged in North America and re-emerged in Europe. North American WNV outbreaks are often accompanied by high mortality in wild birds, a feature that is uncommon in Europe. The reason for this difference is unknown, but the intrinsic virulence of the viruses circulating in each continent and/or the susceptibility to the disease of Palearctic as opposed to Nearctic wild bird species could play a role. To assess this question, experimental inoculations with four lineage 1 WNV strains, three from southern Europe (Italy/2008, Italy/2009 and Spain/2007) and one from North America (NY99) were performed on house sparrows (*Passer domesticus*), a wild passerine common in both continents. Non-significant differences which ranged from 0% to 25% were observed in mortality for the different WNV strains. Viremias lasted from 1 to 5–6 days post-inoculation (dpi) in all cases; individuals inoculated with NY99 had significantly higher titres than those inoculated with any of the Euro-Mediterranean strains. Remarkably, host competence was found to be higher for NY99 than for the other strains. Consequently, albeit being pathogenic for house sparrows, some Euro-Mediterranean strains had reduced capacity for replication in -and transmission from- this host, as compared to the NY99 strain. If applicable also to other wild bird host species, this relatively reduced transmission capacity of the Euro-Mediterranean strains could explain the lower incidence of this disease in wild birds in the Euro-Mediterranean area.

Introduction

West Nile virus (WNV, *Flaviviridae* family, *Flavivirus* genus) is an arthropod-borne pathogen of humans, horses and some birds [1]. In recent years WNV has expanded its geographical range dramatically and is now considered to be one of the most widespread arboviruses in the world [2-4]. In North America, since its introduction in 1999, WNV has provoked thousands of cases in humans and animals, and has caused extensive mortality in wild birds [5]. By contrast, in Europe, where the disease is re-emerging, WNV only causes sporadic clinical cases and self-limited outbreaks, with no (or only very limited) wild bird mortality [4,5]. The reason for these observed differences in wild bird mortality is unknown but could be

related either to the relative intrinsic virulence of the WNV strains circulating in each continent and/or to a different susceptibility to WNV infection in Palearctic as opposed to Nearctic wild bird species, given that the former have co-evolved with this pathogen while the latter are naïve in this regard.

A useful approach for investigating this issue is the performance of experimental infections in avian hosts with strains of different origins [6]. The virulence of the North American WNV prototype strain (NY99) in different avian species has been assessed experimentally in a number of studies [7-13] from which it is apparent that this strain is highly pathogenic for certain species of birds, notably – but not exclusively – Nearctic corvids [7]. The house sparrow (*Passer domesticus*) (HoSp hereafter), an abundant and ubiquitous passerine, has also been shown to be susceptible to WNV disease after experimental inoculation with the NY99 strain, with mortality rates

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