POLICY BRIEF

Title: West Nile Virus: Risks of introduction from the Camargue by northward migrating passerines.

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1. KEY MESSAGE

The risk of introduction and spread of West Nile Virus (WNV) into Scotland by migrating passerines from the Camargue (should there be a recurrence of WNV in the Camargue), France is negligible. There is a low risk of introduction to Great Britain.

2. MAJOR FINDINGS

The risk of introduction and spread of West Nile Virus (WNV) *directly* into Scotland by migrating passerines from the Camargue, France is negligible. This is because of the long flight distances which prevent the majority of migrating passerines from reaching southern England during the 7 day viraemia of infected birds. The model estimates that one or more migrating passerines following the East Atlantic Flyway will travel to Great Britain carrying active infection from the Camargue in two out of every three years; following its arrival, an infected bird will have a median of 11 hours of active infection remaining. However, the latter is wholly contingent on an outbreak of WNV in the Camargue during the spring migration season for passerines (February – June). The remaining flight distance from southern England to Scotland almost entirely rules out the possibility of direct introduction into Scotland.

The likelihood of introduction into England would increase if the virus was circulating in the wetland areas in central or northern areas of France and the most likely area for introduction into Great Britain is the south-east coast of England. Following introduction to England, an *indirect* route of WNV introduction into Scotland may occur if the virus becomes established in England first and then spread north through movements of birds or vectors.

In order for WNV to become established in Great Britain, both a suitable vector population and temperatures above the threshold necessary for extrinsic incubation in the vector are required. The risk that a bird will be introduced from the Camargue into an area of suitable habitat for WNV bridging vectors is low - approximately once every five years. It is possible that the virus could subsequently be introduced to Scotland by movement of infected birds or movements and transport of infected vectors. However the risk of introduction into Scotland via this route is considered to be very low to negligible.

3. BACKGROUND

In 2000 and 2004 there were significant outbreaks of WNV in the Camargue wetlands on the Mediterranean coast of France. These outbreaks are believed to have been introduced by birds migrating from WNV endemic areas of Western Africa along the East Atlantic flyway. These incursions are facilitated by the presence of the Sahara that forces the migrating birds to pass over quickly in order to reach areas with available food resources. In this analysis we did not consider direct introduction from West Africa due to the distances involved which make this route very improbable.

Instead, we consider the possibility of introduction if there were an outbreak in the Camargue. Concern about the potential for WNV introduction into GB has been raised by the discovery of a highly competent WNV bridging vector in Kent. Potential WNV vector communities in the UK have been further characterised in a PhD thesis by Nick Golding.

4. METHODS

We developed a quantitative risk analysis model framework that considers the population of summer resident near-passerine birds that migrate north during spring along the East Atlantic flyway. Using ringing recovery data and habitat preference data we estimate a probability that these birds will stop in the Camargue regional park in France. Based upon seroprevalence data, we calculate the proportion of migrating birds that become infected in the Camargue, based upon the flight speeds of migratory birds calculate whether the infected bird will reach Britain during its period of infection. The arrival points of these birds in Great Britain is based upon the habitat preference and land cover data.

5. IMPORTANT ASSUMPTIONS AND LIMITATIONS

The model is underpinned by several assumptions:

1.Migratory flight speed and migratory stop off duration are assumed to be the same for all 25 passerine species considered in these analyses. There were insufficient species specific data available to carry this out at a species level.

2. All 25 migratory passerine species identified in these analyses are assumed to be equally likely to become infected with WNV. As above there are no species level data available on WNV infection in these species.

3. We assume that other migratory pathways (e.g. birds migrating across the Balkans and northern Italy) do not play a role in introducing WNV to Britain. The number of birds migrating along this pathway is far fewer and as with the East Atlantic flyway, the distances may prevent infection reaching Great Britain during the viraemic period of the birds.

6. POLICY IMPLICATIONS

Under the current circumstances (2014), the probability of introduction (by migrating passerines) of WNV into Scotland is negligible. If the situation changes and disease becomes perennially established in the Camargue or the north of France, vector surveillance for WNV may need to be considered as an emerging public health priority.

Other studies have demonstrated a risk of introduction via mosquitoes in aircraft from North America – a mean of 5.2 WNV infected mosquitoes are estimated to arrive into Heathrow airport each year. Given direct flights between Scotland and North America, this may be a route for introduction to Scotland

8. LINKS TO EXISTING PUBLICATIONS OR REPORTS

Brown EBE, Adkin A, Fooks AR, Stephenson B, Medlock JM, et al. (2012) Assessing the Risks of West Nile Virus–Infected Mosquitoes from Transatlantic Aircraft: Implications for Disease Emergence in the United Kingdom. Vector-Borne Zoonotic Dis 12: 310–320.

Golding N, Nunn MA, Medlock JM, Purse BV, Vaux AGC, et al. (2012) West Nile virus vector *Culex modestus* established in southern England. Parasit Vectors 5: 32.

Golding N (2013) PhD thesis: Mapping and understanding the distributions of potential vector mosquitoes in the UK: New methods and applications. University of Oxford. http://dx.doi.org/10.6084/m9.figshare.767289

Pradier S, Lecollinet S, Leblond A (2012) West Nile virus epidemiology and factors triggering change in its distribution in Europe. Rev Sci Tech 31: 829–844.