


Does *West Nile virus* pose a threat to the UK?

Ernest Gould

Since its emergence less than 20 years ago, WNV has circulated relatively harmlessly in Africa amongst mosquitoes and birds. Mosquitoes become infected when they feed on infected birds. They then reproduce and subsequently transmit the virus to other uninfected birds during the feeding process. These mosquitoes may infect humans or other vertebrates if they inadvertently feed on them, but human to human transmission is virtually unknown. Therefore, humans are dead-end hosts. Nevertheless, the presence of WNV-specific antibodies in humans, birds and horses throughout Europe, southern Asia

Recent reports that antibodies to *West Nile virus* have been found in UK birds have caused concern. What are the risks of this potentially fatal disease to humans in Britain?

 *West Nile virus* (WNV) appeared for the first time in North America in 1999, stimulating renewed interest in arthropod-borne diseases. The virus caused 62 human cases of encephalitis and six fatalities within a few months of its emergence in the New York area. Within 3 years, thousands of birds, horses and other wildlife species, including alligators and nearly 300 humans had died as the result of infection by WNV. The virus had also spread to Canada, the Caribbean and South America by early 2003. The perceived risk to humans increased when it was realized that the virus can be transmitted through blood transfusions, organ transplantations and even breast milk.

It is therefore not surprising that there was a significant reaction from the press and media when it was recently reported in the *Journal of General Virology* that scientists from CEH Oxford and Monkswood had found WNV-specific neutralizing antibodies in the sera of resident and migrant birds captured in Cambridgeshire, Dorset and South Wales. These results imply that the virus is circulating amongst the UK bird population. Ironically, evidence of the circulation of a non-pathogenic relative of WNV, *Usutu virus*, and another arthropod-borne virus, *Sindbis virus*, that causes polyarthritis in humans in Scandinavia, has been almost totally ignored by the press.

● WNV before 1999

To put this into perspective we need to consider the history of the evolution, epidemiology and dispersal of WNV prior to 1999.

and Australasia demonstrates the extent to which the virus has dispersed out of Africa, presumably carried by migratory birds which may have developed resistance to the virus. WNV has also been isolated from ticks, but their significance in its epidemiology has never been adequately investigated. Ticks could act as a secondary mechanism for survival of the virus through periods of low mosquito activity.

WNV is related to several other pathogenic viruses, including *Japanese encephalitis virus*, *St Louis encephalitis virus*, *Dengue virus* and *Yellow fever virus*, but prior to its emergence in North America in 1999, it was considered to be less important. However, with hindsight the observed bird die-off in Israel and the significance of outbreaks of West Nile encephalitis in Romania in 1996 and Russia in 1999/2000, involving several hundred human fatalities, were possibly underestimated. Recent evidence suggests that WNV in North America may be more virulent than some Old World strains due to mutational changes, but this remains to be confirmed. Regardless of this, it is now becoming clear that the combination of high-density human populations in rural and semi-urban areas, together with climatic and ecological conditions that favour mosquito breeding and bird conservation, provide ideal conditions for the efficient dispersal of viruses such as WNV.

● Symptoms of the infection

The great majority of infections are asymptomatic, nevertheless roughly 20% result in the development of West Nile fever which has an incubation period of 2–6

ABOVE:
Coloured transmission electron micrograph of a group of *West Nile viruses*.
DR LINDA STANNARD, UCT / SCIENCE PHOTO LIBRARY

OPPOSITE PAGE:
A shop sign showing that the Canadians are doing their best to reduce the risk of exposure to mosquitoes!
PHOTO E. A. GOULD

Websites on infectious diseases of wildlife

Tony Nash

days. Many patients experience a sudden onset of high fever with chills, malaise, headache, backache and pains in the joints, muscles and eyes when moved. A variety of other non-specific features such as anorexia, nausea, diarrhoea, coughing and sore throat may also occur. In some cases patients have a flushed face. A rash which appears 2–5 days after the onset of symptoms is seen in about 50 % of cases and is more common in children. The clinical symptoms of West Nile encephalitis, which is seen in less than 0.1 % of all infections, include aseptic meningitis, encephalitis, myelitis or combinations of the three. Only a small proportion of encephalitic cases are fatal and this is generally in old people.

● Future risks

What are the risks of exposure to WNV of humans in the UK? Although infectious WNV has never been isolated from birds in the UK, there is convincing serological evidence that it circulates amongst birds in the UK, Portugal, Spain, France and Poland. Moreover, infectious WNV has been isolated from horses in the Camargue region of France and also Italy. There is no record of birds dying from WNV infections in the UK. How can we explain this? First, since WNV is of relatively low virulence for humans even in epidemic situations, the disease may not be recognized in the UK where epidemics do not appear to occur. This is relevant because UK Public Health Laboratory Service figures show that 60 % of fatal encephalitic cases in the UK are undiagnosed! Second, the likelihood of exposure to the bite of a mosquito in the UK is significantly lower than in warmer parts of Europe. Third, the risk of infection would be highest amongst forestry workers, farm-workers, bird watchers, cross-country hikers, etc. Thus, the potential level of exposure to the bite of a WNV-infected mosquito for most individuals in the UK is extremely low. In summary, even if WNV is circulating annually amongst birds in the UK, the current risk to humans of developing West Nile encephalitis appears to be very low and since future prospects for vaccination against this virus appear promising, we probably do not need to live in fear of it in the UK.

Further reading

Buckley, A., Dawson, A., Moss, S., Hinsley, S.A., Bellamy, P.E. & Gould, E.A. (2003). Serological evidence of *West Nile virus*, *Usutu virus* and *Sindbis virus* infection of birds in the UK. *J Gen Virol* 84, 2807–2817.

Gould, E. A. (2003). Implications for Northern Europe of the emergence of *West Nile virus* in the USA. *Epidemiol Infect* 131, 583–589.

Mackenzie, J.M., Barrett A.D.T. & Deubel, V. (2002). Japanese encephalitis and West Nile viruses. *Curr Top Microbiol Immunol* 267, 1–10.

One of the leading centres for information on wildlife diseases is the National Wildlife Health Center (NWHC), an agency of the US Geological Survey, based in Madison, Wisconsin. This agency acts as a repository of information on wildlife diseases in North America. The NWHC hosts an excellent website (www.nwhc.usgs.gov) containing a comprehensive data base on wildlife diseases dating back to 1975 and features online publications and datasheets. You can download an entire *Field Manual of Wildlife Diseases*, a 51 chapter compendium dealing with diseases of birds or access current reports on emerging diseases, including the mysterious agent(s) associated with malformation of frogs and toads.

The NWHC site contains a wealth of information on two of the more recent threats to American wildlife, namely *West Nile virus* and Chronic Wasting Disease of deer and elk – a neurological disease related to BSE (see reports in this issue of *Microbiology Today*). The reader can find background information on these diseases and access more up-to-date epidemiological data charting the course of infection in the United States and, in the case of *West Nile virus*, the diversity of American wildlife infected.

In the UK the Veterinary Laboratories Agency (VLA) has responsibility for wildlife diseases. The VLA regional laboratories are responsible for investigating unusual wildlife mortality and have over the years a successful track record in identifying new diseases such as rabbit haemorrhagic disease, TB in badgers and red squirrel parapoxvirus infection. More details of the activities of the VLA can be found at www.defra.gov.uk/corporate/vla.

Additional information about wildlife issues can be found at the Defra website dealing with Wildlife and Countryside which lists the Government's programmes on wildlife and habitat conservation (www.defra.gov.uk/wildlife-countryside/index).

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