West Nile fever, also known as West Nile virus (WNV) infection, is caused by an arbovirus transmitted by haematophagous arthropods. The epidemiological cycle of the disease involves ornithophilous mosquitoes, principally of the genus *Culex*, which transmit the virus to avian hosts where it then replicates. Some mammals can also be affected by the disease but are usually dead-end hosts. In humans and horses the virus notably causes severe encephalitis.

West Nile virus was detected in metropolitan France in the years 1962–1963, but did not reappear until 2000, when it affected horses in the Camargue. The epizootic remained confined to the Camargue region (in the south of the country), involving the departments of Gard, Hérault and Bouches-du-Rhône. A total of 76 horses were affected, 21 of which died.

Following the equine epizootic in 2000, France instigated active human, veterinary (equids and avifauna) and entomological surveillance aimed at early detection of any virus circulation. The surveillance system involves both human health and animal health professionals and is organised by the General Directorate for Food, the Directorate General for Health, the National Institute for Public Health Surveillance, the French Food Safety Agency, the National Arbovirus Reference Centre, the Interdepartmental Mosquito Eradication Programme for the Mediterranean Coast and the French National Hunting and Wildlife Authority.

**Presentation of the French surveillance system for West Nile virus**

The aim of surveillance is to detect any virus circulation as early as possible through the rapid reporting of any suspected and/or confirmed cases of WNV infection in humans or animals. Detection will allow the rapid implementation of protection measures for humans and animals.

The French WNV surveillance system is based on three complementary components:

- National surveillance for human cases by the National Arbovirus Reference Centre, intensified in the Mediterranean region during the risk period. Intensified surveillance involves the reporting of suspected cases of encephalitis, meningitis, polyradiculoneuritis, and acute flaccid paralysis by hospital laboratories. The target population comprises adults (≥ 15 years) hospitalised in any of the departments in the Mediterranean region between 1 June and 31 October, presenting with fever (fever ≥ 38.5°C), clinical signs and clear cerebrospinal fluid.
– Surveillance of avifauna, comprising early detection of virus circulation by testing sentinel birds for seroconversion in the south of France and identification of strains responsible for deaths of wild birds anywhere in the country.
– Clinical surveillance of cases of equine encephalitis. Suspected cases of encephalitis occurring anywhere in France are compulsorily notifiable to the Departmental Directorates of the Veterinary Services by Veterinary Health Inspectors. Biological samples are sent to the AFSSA Veterinary Reference Laboratory (Maisons-Alfort) for confirmation or to the National Arbovirus Reference Centre (Pasteur Institute, Lyons) for virological analysis of brain samples.

In 2001 and 2002 this multidisciplinary surveillance system detected only a very low level of WNV circulation in the Camargue with evidence of avian seroconversion in 2001 and in 2002. No human or equine cases were detected in the Camargue. In 2003, however, the national surveillance system detected virus circulation outside the Camargue, in the Var department: a cluster of seven indigenous human cases and four equine cases were confirmed in this department. Entomological investigations were unable to identify the local vector of the virus.

An analysis of the human and equine cases that occurred in 2003 taken in conjunction with international data led to the existing surveillance and protection measures being stepped up in 2004. In terms of equine surveillance, the veterinary surveillance network was reactivated throughout the country by producing an information leaflet for accredited private veterinarians and by updating the regulations to ensure notification of all equine cases. For avifauna, serological testing of sentinel birds was carried out in six Mediterranean departments compared to only three during the previous years.

Results of surveillance in 2004

Equine epizootic
At the end of August 2004, three suspected cases of West Nile encephalitis in horses were reported by accredited private veterinarians in the Bouches-du-Rhône department. Confirmation of WNV infection was obtained by the AFSSA Veterinary Reference Laboratory (Maisons-Alfort) on 13 September 2004. With regard to the protection of the exposed population, information of the detection of WNV circulation in the south of France and on protection measures for individuals was distributed throughout the country.

During the months of August, September and October 2004, 57 clinical suspicions in equids were declared in the Camargue in the departments of Gard, Hérault and Bouches-du-Rhône; 32 cases were confirmed either by serology
testing for IgM) or PCR (polymerase chain reaction) on brain samples, and in 7 of these cases the infection was either fatal or resulted in the affected horses having to be euthanised.

Avifauna surveillance

In conjunction with the equine epizootic, the serological surveillance of sentinel birds conducted by ONCFS also provided evidence of WNV circulation in the Camargue. The first confirmation of virus circulation by the National Arbovirus Reference Centre at the Pasteur Institute in Lyon was obtained in August 2004. Out of 300 sentinel birds distributed throughout the departments in the Mediterranean region, 13 seroconversions were confirmed in the departments of Gard, Hérault and Bouches-du-Rhône.

With regard to surveillance of avian mortality, no abnormal phenomena were observed and no deaths could be ascribed to WNV.
Human surveillance

No suspected indigenous cases in humans were confirmed as West Nile virus infection by the National Arbovirus Reference Centre.

Conclusion

In 2004, the French West Nile fever surveillance system detected an equine epizootic similar to, though smaller than, the one observed in the same area in 2000. This episode demonstrates the importance and effectiveness of the veterinary surveillance network which combines livestock producers, accredited private veterinarians, national reference laboratories, the ONCFS and the official Veterinary Services.

Collaboration between human and animal health professionals has also helped to keep the exposed population informed and raise the awareness of healthcare establishments.

It should be emphasised that, unlike the epizootics described in North America, the WNV infections observed in France are characterised by a fairly small number of cases (32 equine cases in 2004, and no human cases) and a geographical distribution confined to the departments of the Mediterranean region.