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West Nile Virus

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Introduction

West Nile Virus (WNV) is a mosquito-borne virus of the *Flaviviridae* family within the genus *Flavivirus*. Other Flaviviruses include [dengue fever](#), [Japanese encephalitis](#) and [yellow fever](#).

Epidemiology

Global Epidemiology

WNV was first isolated from a febrile woman in the West Nile district of Uganda in 1937 [1]. The disease is indigenous to Africa, the Middle East, Asia and Australia. Outbreaks and sporadic cases have also occurred in Europe. In 1999 the virus was first reported in New York and spread rapidly throughout the United States and subsequently to Canada, Mexico, Central America and the West Indies.

WNV is now endemic in the USA and Canada: 3,576 human cases and 115 fatalities were reported in the USA in 2007 [2]. This compares to 4,269 cases with 177 fatalities reported in 2006, 3,000 cases with 119 fatalities in 2005 and 2,539 cases, with 100 fatalities, in 2004 [2]. On the basis of extrapolations from past sero-surveys, the US Centers for Disease Control and Prevention (CDC) estimates that 41,750 cases of WNV occurred in 2006 [3]. Deaths from WNV are usually associated with neuroinvasive forms of the infection.

In Canada 2,353 clinical cases of WNV were reported in 2007 (as of 24 November 2007). This is the highest number of reported clinical cases in Canada since Canada's first documented case in 2002. In 2006, the Public Health Agency of Canada reported 151 clinical cases, 225 cases in 2005, 25 in 2004, 1,481 in 2003 and 414 in 2002 [4].

Outbreaks and intermittent cases of human WNV infection have occurred in Europe since the 1950s. Countries involved include Albania, Austria, Belarus, Bosnia, Bulgaria, Croatia, the Czech Republic, France, Greece, Hungary, Italy, Kosovo, Moldova, Montenegro, Portugal, Romania, Russia, Serbia, Slovakia, Spain and the Ukraine [5]. Four locally-acquired human infections were reported in the south of France in 2003 [6].

In February 2005, three human cases were confirmed in central Cuba [7].

Notable outbreaks include:

Southern Russia 1999 - 826 cases with (183 serologically confirmed) and 40 deaths [8].

Romania 1996 - 393 serologically confirmed cases and 17 deaths [9].



Israel 2000 - 417 confirmed cases and 35 deaths reported [10].

Other countries with serologically confirmed human infections include Algeria, Azerbaijan, Central African Republic, Democratic Republic of the Congo, Egypt, Ethiopia, India, Madagascar, Nigeria, Pakistan, Senegal, South Africa and Uganda [5]. Evidence of WNV transmission has also been reported in Belize, the Cayman Islands, the Dominican Republic, El Salvador, Guadeloupe, Jamaica, Mexico and Puerto Rico [11]. A serologically confirmed outbreak occurred in a remote region of southern central Sudan in 2002. This outbreak was unique as the disease solely affected children and was characterised by serious neurological involvement [12].

Epidemiology of WNV in European travellers

WNV infection is rarely reported in travellers. Most of those infected are asymptomatic or have mild symptoms. It may therefore be under-recognised.

In 2002, an 82-year old Frenchman was diagnosed with WNV in France on his return from Atlanta, Georgia, USA [13]. In the Netherlands, three cases of WNV infection were reported in travellers who had visited endemic areas in 2002 and 2003 [14-16]. In July 2004, two tourists from the Republic of Ireland (ROI) contracted the virus while on holiday in the Algarve region of Portugal [17]. In 2005 another tourist from ROI acquired WNV during a trip to New York [18].

In 2002, the United Kingdom (UK) Health Protection Agency (HPA) commenced an annual enhanced surveillance scheme for WNV. More information about the scheme can be found at: http://www.hpa.org.uk/infections/topics_az/west_nile/surveillance.htm.

In 2006 and 2007 there was one case each year of imported WNV infection in UK travellers who had visited Canada [19]. There were no UK cases reported in 2004 or 2005 [19].

Risk for travellers

There is a very low risk of contracting WNV during travel to areas with WNV activity. The risk is determined by destination, season, length of exposure, and the intensity of WNV transmission at time of travel. Certain groups, including the immunocompromised, those over 50 years of age and individuals with pre-existing medical conditions, are at increased risk of severe illness.

Travellers to areas where there is WNV activity should be aware of the risk and take appropriate mosquito [bite avoidance measures](#).

Transmission

The main hosts of WNV are birds and the principle vectors are mosquitoes. WNV has been isolated from 43 species of mosquito and is predominantly transmitted by mosquitoes of the genus *Culex*, most commonly *C. pipiens*, *C. restuans* and *C. salinarius* [5]. The virus is maintained in a mosquito-bird-mosquito cycle. However, humans become infected when environmental conditions are favourable for mosquitoes and there are sufficient numbers of bird hosts.

Culex spp. mosquitoes feed mainly during the hours between dusk and dawn. Humans, horses and occasionally other animals, become accidental hosts when bitten by an infected mosquito. Humans and animals serve as dead-end hosts. There is no person-to-person transmission.

There have been isolated reports of non-mosquito borne transmission occurring in the USA. An outbreak of WNV amongst turkey farm employees raised the possibility of aerosol spread,



and transmission has followed occupational exposure in laboratory workers. Transmission during blood transfusion and organ transplantation has also been documented. Transfusion related transmission in the USA has been reduced following the implementation of screening of donated blood for WNV. Cases of intrauterine transmission and a single probable case of lactation-associated transmission have been described. Exposure to infected mosquitoes remains the predominant risk factor for acquiring WNV [11].

The peak transmission season in temperate regions such as Russia, North America and Canada, is late summer to early autumn when there is high mosquito activity. In tropical countries transmission is year round.

In the UK, although both bird hosts and *Culex* spp. mosquitoes are present, WNV has not been detected in birds, animals or humans [20]. It is unlikely to become established in the UK mosquito population [21]. The risk of human cases is considered low because there are not thought to be sufficient numbers of *Culex* spp. mosquitoes in the UK to sustain human transmission [22].

Signs & Symptoms

The incubation period is 1-6 days. Most cases (80%) of WNV are asymptomatic or very mild and go unreported. Less than 20% will experience a mild, self-limiting flu-like illness characterised by fever, headache, myalgia and a maculopapular rash. About 1 in every 150 cases progresses to a more serious neurological illness of meningitis and/or encephalitis. Patients with neurologic disease may have headache, neck stiffness, disorientation, muscle weakness, seizures, flaccid paralysis or coma. In these situations, the case fatality ranges from 4-14% [23, 24], but may be as high as 15-29% in the elderly [25].

Persistent neurologic sequelae have been observed in individuals who survived acute West Nile Encephalitis (WNE). Long-term movement disorders, cognitive complaints, and functional disability have been reported. WNE can result in an acute flaccid paralysis with a wide range of symptoms and degrees of limb weakness. These can range from mild monoplegia to flaccid quadriplegia and acute neuromuscular respiratory failure. Facial nerve palsy has also been observed [26].

Extreme fatigue is common following both WNV and WNE. 96% patients in one survey described post WNV fatigue which lasted a median of 36 days [25]. Depression and personality changes have also been observed. Depression after encephalitis, regardless of etiology, is not unusual: 31% of post WNV patients reported depression post acute illness [27].

Treatment

There is no specific anti-viral treatment, but rather supportive intervention.

Healthcare professionals should be aware of the signs and symptoms of WNV and be sure to include a travel history when interviewing patients. Specialist advice must be sought when persons suspected of having WNV infection are evaluated. Specific testing should be undertaken (see the HPA link below for guidelines on arranging testing).

Prevention

Prevention is by surveillance, mosquito control, and mosquito [bite avoidance](#).

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Reading list

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Links

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