

CHARACTERIZATION OF WEST NILE VIRUS OUTBREAKS IN HUNGARY

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Summary

The occurrence of the West Nile virus (WNV) in Hungary was first reported on the basis of serological studies on geese in 1969. However, clinical manifestation of the virus infection has never been observed in the country until 2003. In that year an outbreak of encephalitis occurred in a goose flock at the southern region of Hungary. A lineage 1 WNV strain was detected in the brain of the affected birds. One year later an exotic, lineage 2 strain of WNV emerged in south-eastern Hungary. This virus strain differed from the strains distributed in Europe, Asia, America and Australia; its closest relatives were isolated in the sub-Saharan region of Africa. It is likely that migratory birds introduced the strain to Hungary from their African wintering places. The first neurological and lethal cases were observed in goshawks (*Accipiter gentilis*) in 2004, and the virus was subsequently detected in 2005 in diseased or dead goshawks, sparrow-hawks (*Accipiter nisus*) and in a sheep. The cases were observed in a close geographic proximity (approx. 30 km distance from each other). In 2007 we detected WNV infections in three goshawk and three red-footed falcon (*Falco vespertinus*) samples collected in the territories of the Körös-Maros National Park and the Hortobágy National Park. A moderate geographic spread of the virus was observed (approximately 80 km distance from the location of the year 2004-2005 cases). An unexpected and explosive geographic spread of the virus strain was detected in 2008. We found 25 WNV positive wild bird cases. Goshawks were the most seriously involved (17 diagnosed cases) but other species, mainly birds of prey were also found WNV infected. The virus strain emerged in the central and western regions of Hungary and in the eastern part of Austria. In 2009 we detected WNV in 16 wild bird specimens. The highest number of cases was again diagnosed in goshawks, but small songbirds were also found positive. Cases were distributed over the whole territory of Hungary and in the eastern regions of Austria. In 2010, a lower intensity of WNV activity was observed in Hungary, compared to the previous two years. Three wild bird samples were found positive for WNV. In 2011 further four WNV infections were diagnosed in wild birds. Genetic comparisons of the viruses detected between 2004 and 2011 revealed a high level of genetic relatedness of the strains, which indicate that the previously exotic WNV

strain, which was introduced to Hungary around 2004, established itself in the country and became a resident pathogen.

Besides wild birds, WNV-associated central nervous illnesses were diagnosed in horses (2007: 1 case, 2008: 12 cases, 2009: 5 cases, 2010: 5 cases, 2011: 4 cases, and 2012: 3 cases. Many of these horses died due to encephalomyelitis), and in humans (2008: 19 cases, 2009: 7 cases, 2010: 19 cases, 2011: 6 cases, 2012: 7 cases. One case in 2010 was fatal). We have also detected the virus in mosquito vectors. Serological investigations were made on serum samples of wild birds and horses for the detection of anti-WNV antibodies, in order to estimate the frequencies of subclinical infections. Antibodies were detected in 10-40% of the serum samples, which indicate a relatively high infection rate. The frequent and widespread subclinical infection is a possible explanation for the reduced number of clinical cases in Hungary in 2010, 2011, and 2012, compared to 2008 and 2009. Nevertheless, the WNV strain emerged in 2010 in the north-eastern part of Greece and caused a serious outbreak in people with several encephalitic cases and a high fatality rate. The same virus strain was also detected in a human case in Italy in 2011, as well as in Serbia in 2011 (in mosquitoes) and in 2012 (in horses and in humans). Our genetic investigations demonstrated that the strain is practically identical with the one that emerged in Hungary and which has been circulating in the country since.

Keywords: West Nile virus; Hungary; horses; wild birds.

Sažetak

Osobitosti infekcije virusom Zapadnog Nila u Mađarskoj

Pojava virusa zapadnog Nila (VZN) u Mađarskoj prvi je put bila zabilježena na osnovi seroloških istraživanja u gusaka 1969. godine. Međutim kliničko očitovanje zaraze nije bilo ustanovljeno sve do 2003. Te se godine pojavio encefalitis u jatu gusaka u južnom dijelu Mađarske. U tkivu mozga zaraženih gusaka ustanovljena je linija 1 virusa Zapadnog Nila. Sljedeće godine pojavila se egzotična linija 2 VZN-a u jugoistočnom dijelu Mađarske. Taj soj bio je različit od sojeva virusa koji su kružili u Europi, Aziji, Americi i Australiji. Njegovi najbliži srodnici bili su izdvojeni u supsaharskom području Afrike. Soj su u Mađarsku vjerojatno prenijele ptice selice iz afričkih područja gdje one prezimljuju. Prvi neurološki slučajevi i uginuća zapaženi su u jastreba (*Accipiter gentilis*) 2004., a virus je bio dokazan i 2005. u oboljelih ili uginulih jastrebova, kobaca (*Accipiter nisus*) te u ovaca. Svi slučajevi bili su ustanovljeni na uskom geografskom području (u razmaku oko 30 km jedan od drugoga). Godine 2007. infekcija VZN-om bila je dokazana u tri jastreba i tri sokola (*Falco vespertinus*) na području Nacionalnog parka Körös-Maros i Nacionalnog parka Hortobágy. Tada je primijećena velika geografska proširenost virusa (na udaljenosti oko 80 km od mjesta gdje su bili utvrđeni slučajevi 2004. i 2005.). Neočekivano i eksplozivno širenje virusa ustanovljeno je 2008. Virus je tada bio dokazan u 25 divljih ptica. Najčešće se bolest javljala u jastrebova (17 dijagnosticiranih slučajeva), ali su bile zahvaćene i druge vrste, pretežito grabljivice.

Virus se pojavio u središnjim i zapadnim područjima Mađarske te istočnom dijelu Austrije. Godine 2009. VZN je bio dokazan u 16 uzoraka divljih ptica. Najviše slučajeva ponovo je bilo dokazano u jastrebova, ali i u malih ptica pjevica. Zaraza se proširila na cijelo područje Mađarske i na istočni dio Austrije. Godine 2010. ustanovljena je smanjena aktivnost VZN-a u odnosu na prijašnje godine. Svega tri uzorka divljih ptica bila su pozitivna na virus. Godine 2011. virus je bio dokazan u daljnja četiri slučaja. Usporedba genetskih svojstava sojeva dokazanih od 2004. do 2011. pokazala je njihovu veliku genetsku srodnost, što upućuje na zaključak da se prethodno egzotični virusni soj, koji je bio unesen u Mađarsku oko 2004., tu udomaćio i postao prirodan mađarskom području.

Osim u divljih ptica VZN je bio povezan i s dijagnosticiranim poremećajima središnjeg živčanog sustava u konja (2007.: jedan oboljeli, 2008.: dvanaest oboljelih, 2009.: pet oboljelih, 2010.: pet oboljelih, 2011.: četiri oboljela i 2012.: tri oboljela). Mnogi od tih konja uginuli su pod znakovima encefalomijelitisa. Infekcija je bila dijagnosticirana i u ljudi (2008.: 19 oboljelih, 2009.: 7 oboljelih, 2010.: 19 oboljelih, 2011.: 6 oboljelih, 2012.: 7 oboljelih. Godine 2010. jedan je pacijent umro.).

U Mađarskoj je virus bio dokazan i u komaraca, njegovih prenositelja. Poduzeta su bila i serološka istraživanja u divljih ptica i konja na prisutnost specifičnih protutijela radi procjene učestalosti supkliničkih infekcija. Protutijela su bila dokazana u 10 – 40% pretraženih uzoraka seruma, što govori o relativno visokoj stopi infekcije. Sve većom učestalošću i proširenošću supkliničke infekcije mogao bi se objasniti smanjeni broj kliničkih slučajeva u Mađarskoj 2010., 2011. i 2012. godine u odnosu na 2008. i 2009. Soj VZN-a koji se 2010. pojavio u sjeveroistočnom dijelu Grčke uzrokovao je teški oblik encefalitisa s visokom smrtnošću u ljudi. Isti virus bio je dokazan i u ljudi u Italiji 2011., zatim u Srbiji 2011. (u komaraca) i 2012. u konja i ljudi. Naša genetska istraživanja pokazala su da je taj soj zapravo identičan soju koji je bio dokazan u Mađarskoj, a sada kruži cijelom zemljom.

Ključne riječi: virus Zapadnog Nila; Mađarska; konji; divlje ptice.

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