West Nile Virus Surveillance in mosquito vectors (*Culex pipiens*)

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The virus

- West Nile Virus belongs to the Flaviviridae family, genus Flavivirus, a member of the Japanese encephalitis serocomplex (Japanese encephalitis virus, St. Louis encephalitis virus, Rocio virus, and Murray Valley encephalitis virus).
- Like all flaviviruses, WNV has a single stranded RNA genome, meaning that it is prone to rapid change and great diversification.
- It was first discovered in Uganda in 1937 and subsequently has been found in several areas in Africa, Asia, the Middle East and Oceania.
- In 1999, it was first reported in the western hemisphere, when it caused an outbreak of human disease in New York.
- Nowadays it was found in Americas, from Canada to Argentina.
- More recently, it has emerged in temperate climates of Europe - caused large outbreaks in Romania, Russia, Israel and Greece.
Worldwide distribution of West Nile Virus lineages

From: Vector-Virus Interactions and Transmission Dynamics of WNV. Alexander T. Ciota and Laura D. Kramer
West Nile Virus transmission cycle

From: Martin Pfeffer & Gerhard Dobler. Emergence of zoonotic arboviruses by animal trade and migration. 2010. Parasites & Vectors 3(1):35
Symptoms of WNV infection in humans

CLINICAL FEATURES AND SEQUELAE

- Most human infections are asymptomatic.

- Most clinical cases of WNV infections are mild, i.e., with flu-like symptoms and resolve in 3–6 days.

- In more severe cases, there may be signs of encephalitis, meningoencephalitis or meningitis. It is estimated that one in 140-320 infections results in meningitis or encephalitis.

- Fatality rate in patients with neuro-invasive illnesses ranges from 4% to 14%. In patients over 70, it can reach 15%–29%. Concurrent diseases such as diabetes or immuno-suppression can increase the risk of death.

- Seriously ill patients may suffer substantial long-term morbidity after recovery.
WNV surveillance in Serbia

- In 1972., first finding of WNV antibodies in humans (serological testing).

- Serological findings throughout 2005-2009 showed that WNV is probably longtime present in province of Vojvodina.

- A deeper investigation on the presence of WNV antibodies was carried out 2008-2012 and confirmed the presence of WNV antibodies in dogs, horses and humans in different regions of Serbia.

- Surveillance in birds, horses and mosquitoes has been conducted 2010-2015.

- WNV infected mosquitoes were found in province of Vojvodina (Novi Sad) for the first time in 2010.
Current situation in Europe

Distribution of West Nile fever cases by affected areas, European region and Mediterranean basin.
Transmission season 2015 and previous transmission seasons; latest data update 19 Nov 2015.

- Current season
- Previous season
- Earlier seasons
- No reported cases
- Not included
The main migratory routes of birds
Africa – Europe

(Source: SE European Birds Migration Network)
Outbreak of WNV fever in Serbia during 2012
Cities chosen for surveillance 2013-2015

- Cities monitored every year (26)
- Cities with human cases of WNV (24)
Setting traps
Mosquitoes collection sites
Seasonal dynamic of *C. pipiens* during three year period, 2013-2015

![Bar chart showing the number of captured mosquitoes by month from April to September over three years. The highest number of mosquitoes is captured in July, followed by August and June, with significantly lower numbers in April and May.]
Combined distribution of WNV positive mosquitoes and human WNV cases detected in 2013.

- Red circles represent human cases of WNV infection.
- Blue circles represent WNV positive mosquitoes locations.
Seasonal dynamic of WNV infected mosquitoes and humans (data pooled over three years)
Dynamic of WNV human cases and WNV positive mosquitoes pools in three year period
WNV positive habitats by categories and level of WNV infection risk
Conclusions

- Frequent entomological monitoring and RT-PCR analyses of *C. pipiens* samples in the beginning of transmission season turned out to be valuable tools for early detection of WNV circulation.

- According to our results, locations with the highest risk of WNV infection are settlements with channel and settlements on river banks in the period from mid July to September.

- Also, it seems necessary to warn citizens off keeping small water reservoirs such as flower vases usually found at cemeteries, as they pose serious risk for WNV infection.

- Given that the Lineage 2 of WNV was found circulating Serbia, inclusion of widespread ornithological investigation would be very important for better understanding of WNV dynamics in Serbia.
Thank you for your attention!