Update on the epidemiological situation and surveillance of WNV in Italy

Luisa Barzon
One Health approach for integrated WNV/USUV surveillance in Italy

- **Entomological monitoring** based on active mosquito collection in selected sites (May-October);

- **Animal surveillance** targeting migratory and resident wild birds, equids and poultry; active surveillance in target species (corvids); syndromic surveillance in equids (March-November)

- **Human surveillance system** active requesting clinicians to report all possible, probable and confirmed WNV/USUV cases (all year).
Entomological surveillance of WNV and USUV

Sites of mosquito sampling

Veneto, Italy
57 sites
57 CDC-CO$_2$ + 8 Gravidtrap

Friuli Venezia Giulia, Italy
19 sites
19 CDC-CO$_2$ + 1 Gravidtrap

**Period:** from mid May to mid October, beweekly overnight capture

Luisa Barzon
# Laboratory diagnosis of WNV/USUV infection in humans

<table>
<thead>
<tr>
<th>CASE DEFINITION: WEST NILE VIRUS (WNV) AND USUTU VIRUS (USUV)</th>
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<tr>
<td><strong>Probable</strong></td>
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| **Confirmed** | At least one of the following laboratory criteria for a confirmed case:  
  - **Isolation in cell culture** of WNV/USUV from serum and other biological samples  
  - Detection of **WNV/USUV RNA** in blood, urine and/or other biological specimens  
  - Detection of WNV/USUV-specific **IgM antibodies in CSF**  
  - High titer of anti-WNV/USUV IgM antibodies AND anti-WNV/USUV IgG antibodies is serum AND confirmation by a **neutralisation test** |

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**Luisa Barzon**
West Nile virus in Europe, human infections, 2023

Distribution of human West Nile virus infections in NUTS 3 or GAUL 1 regions of the EU/EEA and neighbouring countries during 2013–2022, as of 04 of October 2023

- Human infections reported, current season (2023)
- Human infections reported, 2022
- Human infections reported, 2013–2021
- No data reported
- No infections reported
- Not included

Countries not visible in the main map extent
- Malta
- Liechtenstein

**EU/EEA countries, n = 599**
- Italy 295
- Greece 153
- Romania 68
- France 33
- Hungary 28
Human cases of WNV infection in European countries, 2012-2022

EU/EEA countries, n = 4,723
Italy 41%
Greece 28%
Romania 14%
Hungary 8%
Detection of WNV in animals in European countries, 2012-2022

Distribution of human West Nile virus infections in NUTS 3 or GAUL 1 regions of the EU/EEA and neighbouring countries during the 2022 season, as of 31 May 2023.

- Outbreaks among equids and birds
- Outbreaks among equids
- Outbreaks among birds
- No outbreaks reported
- Not included

WNV detected in animals, EU/EEA, 2012-2022

- mosquitoes
- wild birds
- equids
Usutu virus detection in EU/EEA countries, 2012-2021

Angeloni et al., Euro Surveill 2023
Rapid increase in neuroinvasive West Nile virus infections in humans, Italy, July 2022

B. WNND by month

Geographical distribution of West Nile virus human infections in regions with at least one human case with onset or diagnosis up to 31 July, by affected municipality and degree of urbanisation, Italy, 2018 vs 2022

Cases

Degree of urbanisation

Data updated 24 August 2022.
Early start of seasonal transmission and co-circulation of West Nile virus lineage 2 and a newly introduced lineage 1 strain, northern Italy, June 2022
WNV lineage 1 and 2, Veneto Region, as of August 12, 2022

Barzon et al. J Travel Med 2022
Number of tested and WNV-positive *Cx. Pipiens* pools per province on a bi-weekly basis; the dashed line indicates the total number of tested mosquitoes (right axis).

Bi-weekly MLE for WNV-1, and WNV-2 mosquito infection rate per province; vertical lines represent 95% CI.

*as of August 12, 2022*
WNV in wild birds, Veneto Region, 2022*

Number of tested and WNV-positive wild birds per province on a bi-weekly basis

*as of August 12, 2022

Barzon et al. J Travel Med 2022
Temporal distribution of human cases of WNV infection according to WNV lineage, province, week (aggregated on a biweekly basis) of symptom onset and diagnosis (WNND, WNF, blood donors).

*as of August 12, 2022

* p=0.0043, Chi-square test for trend.

Barzon et al. J Travel Med 2022
Results of WNV surveillance, Veneto Region, 2022

Mosquitoes (n = 103,611 tested)
- WNV-1 = 51 pools (43%)
- WNV-2 = 68 pools (57%)
- USUV = 18 pools

Equids
- WNV-1 = 3 horses (1 death), 1 donkey (100%)
- WNV IgM = 8 horses, 1 donkey

Wild birds (n = 2,149 tested)
- WNV-1 = 127 (68%)
- WNV-2 = 59 (32%)
- WNV-1/2 = 4
- USUV = 22

Humans (n = 1,949 tested)
- WNV (serology) = 133
- WNV-1 = 181 (69%)
- WNV-2 = 82 (31%)

Blood donors (n = 100,000)
- WNV (serology) = 9
- WNV-1 = 18 (54.5%)
- WNV-2 = 15 (45.5%)
- USUV (serology) = 0

Chi square for trend, p=0.01
Climate change and the emergence of vector-borne viral infections

Climate parameters, mosquito density and WNV/USUV outbreaks, Veneto Region, Italy, 2009-2022
WNV infection in humans and animals, Veneto Region, 2023

First positive mosquito pool: July 13, 2023
Trigger for SoHO donor screening

First human case: Symptom onset July 13; WNND, WNV-2, Verona.

**WNV lineage 1**
**WNV lineage 2**
WNV lineage not defined

- human
- bird
- equids
- mosquito

Human cases: 19 WNND, 32 WNF, 4 blood donors

In Italy, n = 298 human cases (172 with WNND, 61 with WNF, 65 blood donors); **WNV-1 detected in Veneto, Emilia-Romagna, Sicilia, and Campania**
Phylogenetic and phylogeographic analysis of WNV lineage 1, Veneto Region, 2021-2023

Mediterranean subtype

Eastern European subtype

Clade 1a

N=107 full genomes

No clustering according to species or geographical area

Diversity <99.89%

I Monne, E Quaranta, A Fusaro, B Zecchin, C Terregino, G Capelli, 2022
### Amino acid changes in WNV-1 IT2022 vs France/2015-1A

vs. West Nile virus strain Akela/France/2015-1A

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<tr>
<th>prM</th>
<th>NS1</th>
<th>NS2A</th>
<th>NS2B</th>
<th>NS3</th>
<th>NS4A</th>
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**Veneto e FVG 2021-2022**

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<td>(4%)</td>
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<td>(7%)</td>
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<td>(5%)</td>
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Acknowledgements