World Organisation for Animal Health

Federica Monaco - - ITALY

WOAH Reference Laboratory Reports Activities 2024

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LABORATORY INFORMATION

***Name of disease (or topic) for which you are a designated WOAH Reference Laboratory:**	West Nile fever
***Address of laboratory:**	campo boario
***Tel:**	+39 0861 33.22.05
***E-mail address:**	f.monaco@izs.it
Website:	www.izs.it
***Name (including Title) of Head of Laboratory (Responsible Official):**	Nicola D'Alterio, General Director, Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise, "G. Caporale"
***Name (including Title and Position) of WOAH Reference Expert:**	Federica Monaco, Head of the diagnosis and surveillance of exotic viral diseases of animals laboratory Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale"
***Which of the following defines your laboratory? Check all that apply:**	Governmental

TOR1: DIAGNOSTIC METHODS

1. Did your laboratory perform diagnostic tests for the specified disease/topic for purposes such as disease diagnosis, screening of animals for export, surveillance, etc.? (Not for quality control, proficiency testing or staff training)

Yes

Diagnostic Test	Indicated in WOAH Manual (Yes/No)	Total number of test performed last year	
Indirect diagnostic tests		Nationally	Internationally
c-ELISA - IgG	Yes	182	0
ELISA - IgM	Yes	182	0
Virus Neutralization (microtitre)	Yes	116	0
Direct diagnostic tests		Nationally	Internationally

Virus isolation (C6/36 and Vero cells)	Yes	341	0
Real-time RT-PCR WNV lineage 1 and Lineage 2	Yes	3474	1
Whole genome sequencing	No	75	0

TOR2: REFERENCE MATERIAL

2. Did your laboratory produce or supply imported standard reference reagents officially recognised by WOAH?

No

3. Did your laboratory supply standard reference reagents (nonWOAH-approved) and/or other diagnostic reagents to WOAH Members?

Yes

Type of reagent available	Related diagnostic test	Produced/ provide	Amount supplied nationally (ml, mg)	Amount supplied internationally (ml, mg)	No. of recipient WOAH Member Countries	Country of recipients
WNV lineage 1 reference strain Eg101	Real time RT-PCR	Produced	74 ml	0	1	ITALY,
WNV lineage 1 reference strain Eg101	Real time RT-PCR	Provided	22 ml	0	1	ITALY,
WNV lineage 2 reference strain B956	Real time RT-PCR	Produced	83 ml	0	1	ITALY,
WNV lineage 2 reference strain B956	Real time RT-PCR	Provided	22 ml	0	1	ITALY,
Non purified MoAb vs WNV	Immunofluorescence, ELISA	Produced	1900 ml	0	1	ITALY,
Purified MoAb vs WNV	Immunofluorescence, ELISA	Produced	10 ml	0	1	ITALY,

4. Did your laboratory produce vaccines?

No

5. Did your laboratory supply vaccines to WOAH Members?

No

TOR3: NEW PROCEDURES

6. Did your laboratory develop new diagnostic methods for the designated pathogen or disease?

No

7. Did your laboratory validate diagnostic methods according to WOAH Standards for the designated pathogen or disease?

No

8. Did your laboratory develop new vaccines for the designated pathogen or disease?

No

9. Did your laboratory validate vaccines according to WOAH Standards for the designated pathogen or disease?

No

TOR4: DIAGNOSTIC TESTING FACILITIES

10. Did your laboratory carry out diagnostic testing for other WOAH Members?

Yes

Name of WOAH Member Country seeking assistance	Date	Which diagnostic test used	No. samples received for provision of diagnostic support	No. samples received for provision of confirmatory diagnoses
TUNISIA	2024-11-24	Real time RT-PCR	1	0

11. Did your laboratory provide expert advice in technical consultancies on the request of an WOAH Member?

Yes

Name of the WOAH Member Country receiving a technical consultancy	Purpose	How the advice was provided
ITALY	In the framework of the national surveillance plan for WNV and Usutu virus for 2024, the laboratory has been in charge for: - defining the surveillance activities in animals and vectors; - harmonizing and assessing the diagnostic capabilities of the regional laboratories network through proficiency tests; - the collection and management of the data generated by the surveillance activities in animals and vectors.	In loco and remote assistance

TOR5: COLLABORATIVE SCIENTIFIC AND TECHNICAL STUDIES

12. Did your laboratory participate in international scientific studies in collaboration with WOAH Members other than the own?

Yes

Title of the study	Duration	Purpose of the study	Partners (Institutions)	WOAH Member Countries involved other than your country
European network of medical and veterinary entomology (VectorNet)	5 years	Developing a network of medical and veterinary experts and organisations to maintain a common database on the presence and distribution of vectors and pathogens in vectors	ECDC EFSA Experts and organisations from the medical and veterinary domains	ITALY

		across Europe and the Mediterranean basin		
Ecology of Wild-life, Livestock, huMan and Infectious Diseases in changing environments — WiLiMan-ID	5 years	The main objective of WiLiMan- ID is to identify key factors allowing five animal infectious diseases to spread and persist, in changing environments. The five diseases are: Avian influenza, African swine fever, West-Nile fever, African horse sickness and Chronic wasting disease	Austria-Biofaction Belgium- Sciensano Denmark-The University of Copenhagen France-ANSES France-Ecole Nationale Vétérinaire (ENVT) France-National Research Institute for Agriculture, Food and Environment (INRAE) Germany-Friedrich-Loeffler- Institut (FLI) Morocco-The Hassan II Agronomic and Veterinary Institute (IAV) Norway-The Norwegian Veterinary Institute (vetinst) Spain-The Central Veterinary Laboratory of the Spanish Ministry of Agriculture, Fisheries and Food. Sweden-Swedish Veterinary Agency (SVA) The Netherlands-Wageningen University & Research (WUR)	AUSTRIA BELGIUM DENMARK FRANCE GERMANY MOROCCO NORWAY SPAIN SWEDEN THE NETHERLANDS
EU4H-2022-DGA-MS-IBA3 - Direct grants to Member States' authorities: setting up a coordinated surveillance system under the One Health approach for cross-border pathogens that threaten the Union	3 years	The EcoSurv project proposes integrated, comprehensive and holistic surveillance activities on selected (re)emergent and at-risk of introduction zoonoses. It takes into account the whole spectrum of animal species in a given ecosystem (zoocenosis) having a possible role in the maintenance, persistence and/or transmission to humans of these diseases, proposing innovative surveillance and diagnostic approaches, targeting the disease hosts, the vectors and the	Italian MoH (Affiliated Entity) The Department of Infectious Diseases (DID) ISS (Affiliated Entity) IZSVe (Affiliated Entity) Veterinary services of Libya Veterinary services of Mauritania FAO sub-regional office for North Africa	LIBYA MAURITANIA

		environment.		

13. In exercising your activities, have you identified any regulatory research needs* relevant for WOAH?

No

TOR6: EPIZOOLOGICAL DATA

14. Did your Laboratory collect epidemiological data relevant to international disease control?

Yes

If the answer is yes, please provide details of the data collected:

• Italian data are collected from the Sistema Informativo Nazionale Malattie Animali (SIMAN) https://www.vetinfo.it/(Italy)
• Data about human outbreaks in EU Member States and EU neighbouring countries are collected from the European Surveillance System (TESSy) database while worldwide animal data are collected through the Animal Disease Information System (ADIS) of the European Commission and the World Animal Health Information System (WAHIS) database. https://wahis.woah.org/#/home
• Outbreak data referred to human cases in Greece are retrieved from the National Public Health Organization (NPHO) Report_WNV_20220906_ENG.pdf (eody.gov.gr)

15. Did your laboratory disseminate epidemiological data that had been processed and analysed?

Yes

If the answer is yes, please provide details of the data collected:

A Web Geographic Information System application has been developed to collect and disseminate disease data, and full genome sequences of selected isolated strains of WNV. The tool (Disease Monitoring Dashboard) compiles multiple datasets through user-friendly web tools for epidemiological analysis (https://netmed.izs.it/networkMediterraneo/)
WNV data are disseminated through a public web site (www.izs.it) where information and data on WN is continuously updated in order to have:
• weekly bulletins summarizing the current (2024) epidemiological situations in Italy and Mediterranean Basin;
• maps on entomological, virological and serological surveillance activities;
• the past epidemiological situations in Italy (2008-2023) and the Mediterranean Basin (2010-2023);
• the latest on the Italian and European Regulations;
• scientific documents on-line.

Since 2018 surveillance activities are summarized in the interactive Story Maps available on the public web site and provide a description of the disease and the complete data from the human, animal and entomological surveillance activities (https://westnile.izs.it/j6_wnd/home).
A predictive model to identify area at risk for WNV circulation has been developed and is freely accessible (https://mapserver.izs.it/gis_wn_predictions/#). The model uses EO data with the WNV detection in mosquitoes, birds and horses since 2017 to train an Extreme Gradient Boosting model to automatically predict in space and time WNV circulation

16. What method of dissemination of information is most often used by your laboratory? (Indicate in the appropriate box the number by category and list the details in the box)

a) Articles published in peer-reviewed journals:

7

- *Ben-Mostafa KK., Savini G, Di Gennaro A, Teodori L, Leone A, Monaco F, Alaoqib MMA, Rayes AA., Dayhum A, Eldaghayes I. 2024. Evidence of West Nile Virus Circulation in Horses and Dogs in Libya. Pathogens, 13(1) doi:10.3390/pathogens13010041*
- *Secondini B, Di Lollo V, Teodori L, Leone A, Puglia I, Gaye A, Sall AA., Loucoubar C, Rosà R, DialloM., Monaco F, Faye O, Cammà C, Rizzoli A, Savini G. 2024. An amplicon-based sequencing approach for Usutu virus characterization. Virology Journal, 21(1) doi:10.1186/s12985-024-02426-7*
- *Vouillon A, Barthelemy J, Lebeau L, Nisole S, Savini G, Lévêque N, Simonin Y, Garcia M, Bodet, C. 2024. Skin tropism during Usutu virus and West Nile virus infection: an amplifying and immunological role. Journal of Virology, 98(1) doi:10.1128/jvi.01830-23*
- *Ndione MHD, Diagne MM., Mencattelli G, Diallo A, Ndiaye EH, Di Domenico M, Diallo D, Kane M, Curini V, Top NM, Marcacci M, Sankhe S, Ancora M, Secondini B, Di Lollo V, Teodori L, Leone A, Puglia I, Gaye A, Sall AA, Loucoubar C, Rosà R, Diallo M, Monaco F, Faye O, Cammà C, Rizzoli A Savini G., Faye O. 2024. An amplicon-based sequencing approach for Usutu virus characterization. Virology Journal, 21 (1), art. no. 163.DOI: 10.1186/s12985-024-02426-7*
- *Rusenova N, Rusenov A, Monaco F. 2024. A Retrospective Study on the Seroprevalence of West Nile Virus Among Donkeys and Mules in Bulgaria. Vector Borne Zoonotic Dis. 2024 May;24(5):274-277. doi: 10.1089/vbz.2023.0095. Epub 2024 Jan 30*
- *Zuddas C, Piras S, Cappai S, Loi F, Murgia G, Puggioni G, Savini G, Monaco F, Polci A, Valleriani F, Amatori G, Curini V, Marcacci M, Orrù G, Ledda A, Poma E, Cappai R, Coghe F. 2024. First Detection of West Nile Virus by Nasopharyngeal Swab, Followed by Phylogenetic Analysis. Pathogens. 2024 Nov 20;13(11):1023. doi: 10.3390/pathogens13111023*
- *Silverj A, Mencattelli G, Monaco F, Iapaolo F, Teodori L, Leone A, Polci A, Curini V, Di Domenico M, Secondini B, Di Lollo V, Ancora M, Di Gennaro A, Morelli D, Perrotta MG, Marini G, Rosà R, Segata N, Rota-Stabelli O, Rizzoli A, Savini G, West Nile Virus Working Group. 2024. Origin and evolution of West Nile virus lineage 1 in Italy. Epidemiol Infect. 2024 Dec 2;152:e150. doi: 10.1017/S0950268824001420.PMID:39620707*

b) International conferences:

2

- *Lorusso, A. Moderator for the Session: Role of Vectors in the Emergence of Emerging and Zoonotic Infectious. 9th International Conference on Emerging Zoonoses (Palermo, Italy). 9-12 june 2024.*
- *Monaco F. "West Nile fever". WOAH Regional Workshop on Vector Borne Diseases in Asia and the Pacific. Oral presentation. 19-20 September 2024. Webinar.*

c) National conferences:

12

- *De Ascentis M. "Ecologia degli artropodi: zanzare autoctone e invasive in Italia". 51° AMCLI conference. Rimini, 8-11 march 2024.*
- *Iapaolo F. "Zoonosi emergenti e riemergenti lungo le rotte degli uccelli migratori. Il ruolo del birds migration network nella dinamica di trasmissione del West Nile Virus in Italia". The results of the research in IZS-Teramo, 29 May 2024.*
- *Morelli D. "Il ruolo del CESME per gli aspetti veterinari, tra sorveglianza e ricerca". Sorveglianza delle arbovirosi per una maggiore integrazione tra le diverse competenze, Cagliari, 11 july 2024.*
- *Morelli D. "Cambiamenti climatici e donazione di sangue: il ruolo dell'Istituto Zooprofilattico Sperimentale". Convegno Obiettivo 2040. Il Volontario, la Scienza e le nuove sfide. Torino, 26 september 2024.*
- *Morelli D. "Modello One Health: arbovirosi e cambiamenti climatici, come i cambiamenti climatici possono causare spillover; virus emergenti dal punto di vista veterinario; West Nile e FEV (CCH)". Emergenze infettive che richiedono alto isolamento. Strategie di allerta da adottare in caso di epidemie. Rome, 18 october 2024.*
- *D'Alessio S.G. "Ecologia dei vettori". Le arbovirosi: prevenzione e controllo. Teramo, 28 october 2024.*
- *D'Alessio S.G. "La sorveglianza entomologica in Abruzzo: attività e risultati". Le arbovirosi: prevenzione e controllo. Teramo, 28 october*

2024.
- *De Ascentis M. "I metodi di campionamento delle zanzare". Le arbovirosi: prevenzione e controllo. Teramo, 28 october 2024.*
- *De Ascentis M. "Esercitazione pratica sui metodi di cattura e sulla gestione del campione entomologico". Le arbovirosi: prevenzione e controllo. Teramo, 28 october 2024.*
- *Goffredo M. "La sorveglianza entomologica e le attività previste dal PNA" Le arbovirosi: prevenzione e controllo. Teramo, 28 october 2024.*
- *Iapaolo F. "West Nile Disease e Usutu: la malattia, la sorveglianza e i provvedimenti in caso di positività" nell' ambito dell'evento ". Le arbovirosi: prevenzione e controllo. Teramo, 28 october 2024.*
- *Morelli D. "Piano Nazionale di Prevenzione delle Arbovirosi (PNA): focus sulla sorveglianza dei virus West Nile e Dengue". Comunicazione e formazione su tematiche relative all'interconnessione ambiente – salute. L'Aquila, 13 november 2024 (1st ed.) and Chieti, 28 november 2024 (2nd ed.)*

d) Other (Provide website address or link to appropriate information):

Please refer to the answer provided for the question n.15 for the details related to the links listed below:
Epidemiological situation in Italy and the Mediterranean region: www.izs.it
Disease Monitoring Dashboard: https://netmed.izs.it/networkMediterraneo/
StoryMaps 2018-2021: https://westnile.izs.it/j6_wnd/home
WNV predictive model: https://mapserver.izs.it/gis_wn_predictions/#

TOR7: SCIENTIFIC AND TECHNICAL TRAINING

17. Did your laboratory provide scientific and technical training to laboratory personnel from other WOAH Members?

Yes

a) Technical visit : 2

b) Seminars : 2

c) Hands-on training courses: 1

d) Internships (>1 month) 0

Type of technical training provided (a, b, c or d)	Country of origin of the expert(s) provided with training	No. participants from the corresponding country
C	SLOVENIA	1
A	ARGENTINA	3
A	NORTH MACEDONIA (REP. OF)	2
B	ARGENTINA	3
B	NORTH MACEDONIA (REP. OF)	2

TOR8: QUALITY ASSURANCE

18. Does your laboratory have a Quality Management System?

Yes

Quality management system adopted	Certificate scan (PDF, JPG, PNG format)	

ISO 17025	Accreditation Certificate	Accredia Certificate.pdf

19. Is your quality management system accredited?

Yes

Test for which your laboratory is accredited	Accreditation body
i-ELISA - IgG	ACCREDIA
c-ELISA - IgG	ACCREDIA
ELISA - IgM	ACCREDIA
Plaque Reduction neutralization test (PRNT)	ACCREDIA
Virus neutralization (microtitre format)	ACCREDIA
Real-time RT-PCR WNV lineage 1 and lineage 2	ACCREDIA

20. Does your laboratory maintain a "biorisk management system" for the pathogen and the disease concerned?

Yes

The biosecurity policy integrates aspects related to safety, security and environment, in fact risks associated with all our activities are assessed and managed to ensure the safety of workers and of the environment in accordance with international standards. In particular, IZS-Teramo has developed its biosecurity manual in accordance with the WHO standards (The WHO Laboratory Biosafety Manual (LBM) 4th ed.) as well as the specific procedures for safe handling and containment of infectious microorganisms and hazardous biological material. Furthermore, to reduce or eliminate the exposure of the environment (air, water, soil) to potentially infectious or hazardous agents IZS-Teramo obtained the certification according to the ISO 14001. Lastly, a rigorous management of biologicals, chemicals and their associated waste is in place and information and communication to personnel updated on a routine bases. To ensure the safety handling and movement of goods, the IZS-Teramo has developed protocols and procedures according to the World Health Organization standards (WHO/WHE/CPI/2019.20 Guidance on regulations for the Transport of infectious Substances"- 2019-2020; pag.1-29.). The laboratory is officially authorised by the Italian Ministry of Health to import biological materials and biological reagents of any origin through the airports of Rome (Fiumicino) and Milan (Malpensa). Transport by air of biological materials considered as infectious substances is done according to the international regulations guidelines developed by IATA (Infectious Substances Shipping Guidelines- 1 January 2006- 7th Edition p.1-41). The IZS-Teramo also complies with ADR (European Agreement concerning the International Carriage of Dangerous Goods by Road and Directive 2014/103/UE) regulations to guarantee the safe road transportation of dangerous goods and owns vehicles properly equipped for the purpose. Traceability of biological material for research purposes is provided by the use of MTA and dispatch and receipt are regulated by Standard Operating Procedures.

TOR9: SCIENTIFIC MEETINGS

21. Did your laboratory organise scientific meetings related to the pathogen in question on behalf of WOAH?

No

22. Did your laboratory participate in scientific meetings related to the pathogen in question on behalf of WOAH?

Yes

Title of event	Date	location	Role (speaker, presenting poster, short communications)	Title of the work presented

WOAH Regional Workshop on Vector Borne diseases in Asia and the Pacific	2024-09-18	Tokyo, Japan	Speaker	West Nile Fever

TOR10: NETWORK WITH WOAH REFERENCE LABORATORIES

23. Did your laboratory exchange information with other WOAH Reference Laboratories designated for the same pathogen or disease?

No

24. Do you network (collaborate or share information) with other WOAH Reference Laboratories designated for the same pathogen?

No

25. Did you organise or participate in inter-laboratory proficiency tests with WOAH Reference Laboratories designated for the same pathogen during the past 2 years?

No

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26. Did your laboratory collaborate with other WOAH Reference Laboratories for the same disease on scientific research projects for the diagnosis or control of the pathogen of interest?

No

TOR11: OTHER INTERLABORATORY PROFICIENCY TESTING

27. Did your laboratory organise or participate in inter-laboratory proficiency tests with laboratories other than WOAH Reference Laboratories for the same pathogen during the past 2 years?

Yes

Purpose for inter-laboratory test comparisons1	Role of your reference laboratory (organizer/participant)	No. participating laboratories	Name of the test	WOAH Member Countries
Determining a laboratory's capability to conduct molecular assays for WNV and USUV detection and WNV Lineage identification (2024)	Organizer	13	Real time RT-PCR	ITALY,
Determining a laboratory's capability to conduct serological assays to detect WNV and USUV infection (2024)	Organizer	11	ELISA IgG, ELISA IgM	ITALY,

Molecular diagnostic tools for equine infections by arthropodborne encephalitis viruses (WNV, JEV, EEEV, WEEV and VEEV) (2023)	Participant	23	Real time RT-PCR	AUSTRIA, BELGIUM, BULGARIA, CROATIA, CYPRUS, DENMARK, FINLAND, FRANCE, GERMANY, GREECE, HUNGARY, IRELAND, ITALY, LATVIA, POLAND, PORTUGAL, ROMANIA, SLOVAKIA, SLOVENIA, SPAIN, SWEDEN, THE NETHERLANDS,
Serology of equine infections by arthropod-borne encephalitis viruses (WNV, JEV, EEEV, WEEV and VEEV) (2023)	Participant	23	ELISA IgG, ELISA IgM	AUSTRIA, BELGIUM, BULGARIA, CROATIA, CYPRUS, DENMARK, FINLAND, FRANCE, GERMANY, GREECE, HUNGARY, IRELAND, ITALY, LATVIA, POLAND, PORTUGAL, ROMANIA, SLOVAKIA, SLOVENIA, SPAIN, SWEDEN, THE NETHERLANDS,
Molecular assays for WNV and USUV detection and WNV Lineage identification (2023)	Organizer	14	Real time RT-PCR	ITALY, SERBIA,
Serological assays to detect WNV and USUV infection (2023)	Organizer	11	ELISA IgG, ELISA IgM	ITALY,

TOR12: EXPERT CONSULTANTS

28. Did your laboratory place expert consultants at the disposal of WOAH?

Yes

Kind of consultancy	Location	Subject (facultative)
Overview of WNV distribution, evolution, and diagnosis with emphasys on surveillance strategies	on line	WOAH Regional Workshop on Vector Borne Diseases in Asia and the Pacific.

29. Additional comments regarding your report: