MEETING REPORT

Expert consultation on West Nile virus infection

Stockholm, 21–22 April 2009

1 Executive summary

The knowledge about West Nile virus (WNV) infection epidemiology in Europe is changing, with outbreaks of neuro-invasive disease in humans reported from three European countries in 2008 and the recent appearance of another lineage of the virus.

Preparedness for WNV infection is multi-sectoral and includes aspects on human and veterinary public health, entomological surveillance, ornithology, and blood, tissue and organ safety. Coordination of all of these aspects is important at local, national and European levels for effective preparedness strengthening and response capacity. An increase in bird mortality and horse morbidity and mortality may provide an early warning for virus circulation in an affected area and signal the existence of human infections. Surveillance in equines and birds is considered an effective tool in detecting viral circulation early. Mosquito surveillance is considered useful for viral isolation and may help to determine the extent of viral circulation, but not as an early warning tool. The implementation of vector control measures should be guided by expert entomological and epidemiological assessment.

It was recommended that a multi-sectoral preparedness and response tool—combining all aspects of birds, horses, humans, mosquitoes and blood—be developed. Also, further support to Member States for assessing the risk of outbreaks of communicable diseases, such as WNV infection on blood, tissue and organ safety, was recommended.

Enhancing preparedness in Europe for WNV infection will allow Member States to plan and respond in a timelier and more appropriate manner to potential outbreaks of this disease in humans.

Stockholm, August 2009

2 Introduction

The founding regulation[1] establishing the European Centre for Disease Prevention and Control (ECDC) gives ECDC a mandate to strengthen the capacity of the European Union (EU) regarding the prevention and control of infectious diseases.

West Nile virus (WNV) infection was reported as a major outbreak in humans for the first time in Europe in 1996 from Romania. Since then, there have been some sporadic human cases from various EU countries and increasing reports of WNV infection in horses and birds, as well as detection in mosquitoes.

ECDC undertook its first threat assessment for the EU with regard to WNV infection after human cases were reported from Romania (two cases), Italy (three) and Hungary (14) between August and September of 2008. This threat assessment highlighted the need for multidisciplinary approaches for risk analysis and preparedness related to clinical awareness, different case definitions, existing diagnostic capacities, the risk for further spread in the EU and the potential impact on blood supplies.

In order to provide an overview of the current situation regarding WNV infection in the EU and to address gaps in the current knowledge, ECDC organized an expert consultation for WNV infection in April 2009. The meeting brought together a multidisciplinary group of experts on WNV from Member States (MS), the European Commission and international experts from the World Health Organisation (WHO), Israel and the United States Centers for Disease Control and Prevention (US CDC).

3 Objectives of the consultation

The objectives of the consultation were:

- to review current knowledge on WNV infection in the European Union, with specific regard to its epidemiology and to the surveillance and control of the vector;
- to identify gaps in preparedness at the European level; and
- to identify the role for ECDC in order to strengthen preparedness and response at the European level.

This report summarises the presentations and discussions held during the two-day meeting. A complete agenda of the expert consultation can be found in Annex 2.

4 West Nile virus infection overview

WNV infection is a vector-borne disease caused by an enveloped RNA virus from the *Flaviviridae* family, genus *Flavivirus*, which was identified in the West Nile province in Uganda in 1937. The natural transmission cycle involves birds and mosquitoes, mainly from the *Culex* genus. Humans and horses are sensitive to the virus but are considered as dead-end hosts. The majority of infections are asymptomatic. Approximately 20% of human infections will result in a mild febrile illness (West Nile fever) while severe neuro-invasive disease (WNND) is reported in less than 1% of all infected persons. The case fatality in this group of patients is around 10%. Risk factors for this form of the disease include age greater than 50 years and immuno-compromised status. Long-term sequelae exist in persons with serious disease and might include memory loss, depression, difficulty walking and weakness. The incubation period of West Nile fever is between three and 14 days.

Outbreaks in humans and horses have been reported from Africa, the Middle East, Europe, Australia, Asia and, since 1999, the Americas. In Israel, human cases are reported every year during a long lasting potential transmission period from summer to fall. In the United States, where the virus emerged in 1999, more than 11,000 cases of neuro-invasive illness, including 1092 deaths, have been diagnosed in the last ten years. Outbreaks in humans have also been reported in Canada. The disease is present in the Caribbean and Central and South America without major impact in humans. In Europe, a few sporadic cases in humans have been identified in recent years in Portugal, Spain, France, Italy, Czech Republic, Romania and Hungary, mostly between the end of July to the end of September. Since 2008, the observed epidemiological picture of WNV infection in Europe

[1] Regulation 851/2004 of the European Parliament and of the Council

appears to be changing. In that year, clusters of human cases of WNND were reported in Italy, Hungary and Romania. This was the first time that outbreaks with human cases were reported simultaneously from several European countries. Human cases of WNV infection are also imported into Europe. Studies in Europe have shown that mostly viruses from lineages 1 and 2 circulate; lineage 2 was identified in Hungary in 2005 and in Austria in 2008 for the first time.

Treatment of WNV illness is based on supportive care. Prevention of WNV infection in humans is based on avoiding mosquito bites and increasing blood, tissue and organ safety.

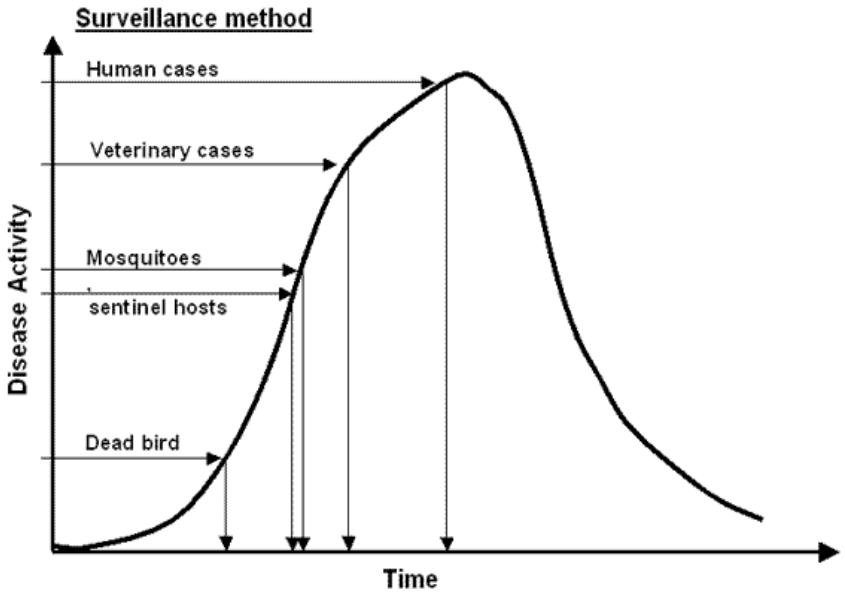
5 West Nile virus surveillance in humans

WNV infection is a notifiable disease at the EU level through Commission decision No 2007/875/EC. Since 2008, a standardized case definition for WNV infection for the reporting of human cases at the EU level has been in existence (see Annex 1). All countries where WNV has been a public health problem in horses or humans (France, Portugal, Spain, Romania, Italy and Hungary) have mandatory notification of WNV cases and some of them have a specific plan for surveillance and control.

The challenge for surveillance of WNV lies in identifying virus circulation early in any given area. The presence of active transmission of the virus is most likely to be identified first in birds (sentinel or dead), horses and other animals, and finally through human infection occurring at the peak of the disease activity (see Figure 1). Mosquito surveillance may also be useful, when available. In at-risk areas, most of the neuro-invasive cases are expected to be investigated for WNV aetiology, unlike the mild cases which present with unspecific symptoms. Strengthening of national surveillance systems would therefore require clinicians to have access to diagnostic algorithms which include WNV infection.

Laboratory diagnosis is based on the detection of WNV specific IgM antibodies in blood or cerebrospinal fluid (CSF) with confirmation by another assay, such as a neutralization test. The virus can be directly detected in tissue samples at autopsy by PCR or other methods, sometimes in blood or CSF, in very early infection. Testing paired serum samples to detect an increase in WNV antibody titres is also commonly used. Recent advances include the use of highly sensitive nucleic acid amplification tests (NATs) for screening of blood donors. In Austria and Hungary, in order to ensure rapid detection of WNV infections, the diagnostic panel for samples of patients with neuro-invasive disease automatically includes WNV testing.

Figure 1: Detection of surveillance events during a hypothetical WNV outbreak. The actual timing of surveillance events may vary depending on local ecological conditions.



Source: United States Centers for Disease Control and Prevention, US CDC

6 WNV surveillance in birds

Birds, particularly migratory birds, are the natural reservoir of the virus and thus play a major role in the introduction or re-introduction of the virus in any given area. The majority of WNV transmission between birds probably occurs through mosquito bites. However, oral transmission should not be discounted and suggestions for this route of transmission have been found in birds of prey in Spain, Hungary, Israel and North America. In the United States and Canada, bird mortality is one of the first indications that WNV is circulating in a given area. In comparison, birds outside of the Americas, including the tropics and Europe, are susceptible to WNV infection but the disease is usually undetectable and the mortality is low or goes unnoticed.

Active surveillance of sentinel birds in France between 2002 and 2007 proved to be a positive experience in that it encouraged collaboration among various stakeholders. However, the results from the surveillance were limited compared to the human and financial resources invested in the system. Because of this, France has moved to surveillance of dead birds only for WNV and other avian infections, such as avian influenza (H5N1).

When implementing bird surveillance activities as part of WNV preparedness plans, experts raised some considerations:

- active surveillance for sick/dead birds is time consuming and costly;
- active surveillance targeting certain bird species might maximise such a programme;
- the integration of active surveillance of bird populations for various diseases such as WNV, avian influenza etc. would reduce resources and costs;
- as dead birds can be one of the first signs in an area that WNV is circulating, the focus on determining cause of death in passively found dead birds might be opportune.

7 WNV surveillance in horses

WNV infection in horses is clinically characterised by encephalomyelitis with symptoms including depression, loss of appetite, fever, staggering gait, paralysis and sometimes coma. In Italy in 2008, more than 500 horses were infected, including only 33 clinical cases (6.5%) with five deaths. Laboratory diagnosis for sick horses is similar to that used for diagnosis in humans. In the EU, any type of equine encephalomyelitis has to be notified at the national level and to the Animal Disease Notification System (ADNS). WNV infection is also notifiable to the World Organisation for Animal Health (OIE) under the Terrestrial Animal Health Code.

As horses are also dead-end hosts, clinical cases of WNV infection in horses will usually appear shortly before or in parallel with human cases. The appearance of WNV in equine populations could serve as an early warning signal for enhanced surveillance for humans with neuro-invasive disease. As such it would also be able to trigger the implementation of emergency preventive measures, such as mosquito control in affected areas. The collaboration between veterinary and public health authorities for this purpose is therefore important.

8 Surveillance in mosquitoes

The role that mosquito vectors play in the dynamics of WNV transmission in Europe requires further study. European mosquitoes that have been determined to have high vectorial capacity for WNV are *Culex* (*Cx.*) *pipiens* and *Cx. modestus*. *Aedes albopictus* demonstrates only moderate vector competence. Climate change and other factors linked to human activities would potentially modify the transmission of WNV in Europe and vector activity. Therefore, vectorial capacity and vector competence should continue to be closely monitored.

Three countries that have experience with vector surveillance for WNV are Israel, France and Spain. Israel monitored vectors for several years and concluded that the vector surveillance is of little value in terms of an early warning tool. In Spain, it was found that vector surveillance was very labour intensive with limited output. In France, vector surveillance activities are only intensified when the alert level for WNV outbreaks increases.

Based on this experience, vector surveillance continues to be a crucial part of integrated preparedness for WNV but might not serve as an effective early warning tool for its transmission to humans. Indicators on vector abundance, vector species, vector behaviour and viral detection in mosquitoes (through rapid RNA tests) in areas with WNV transmission are crucial variables in terms of public health risk assessment. This information can inform decisions on where the geographical limits of an affected area are, on where and how to implement human surveillance

activities, where to implement vector control activities and what vector control activities to implement. Considering the known human resource restrictions in many countries within the EU for entomological activities, security of new mosquito entomologists in countries with WNV transmission should be considered in order to improve preparedness for this disease.

Traditional vector control measures for mosquitoes in the prevention of WNV transmission focused on reducing vector capacity. Different methods exist for reducing larval and adult abundance. Presently at the European level, however, there are no specific recommendations on the types of methods of vector control for WNV and the triggers for implementation of such measures. Factors for consideration for the implementation of mosquito control (entomological assessment) for WNV prevention would need to include:

- the season and time of year;
- mosquito abundance and biting activity, which can be established by ongoing surveillance programmes, or timely and targeted entomological surveys;
- whether the transmission is occurring in a rural or an urban area;
- whether the affected area is 'special', i.e. nature reserve etc., as this would limit the type of control measures to be implemented;
- the abundance of birds in the affected area;
- the activities being undertaken by horses and humans in the affected areas; and
- what other prevention methods are being implemented in the affected area.

Such an entomological assessment would only be possible by establishing clear and strong collaborative links between the veterinary, entomology and public health representatives for the affected region. There is currently limited evidence of the public health impact that vector control measures have on WNV transmission in the EU.

9 WNV surveillance and preparedness plans

Specific preparedness plans responding to WNV outbreaks in birds, horses and humans were presented by France, Israel and the United States. Such plans cover various aspects including human surveillance, bird surveillance, horse surveillance, entomological surveillance, laboratory diagnostics, and communication and collaboration mechanisms.

France

The objectives of the preparedness plan are to timely detect WNV activity, to implement timely control measures in order to prevent further spread of human and domestic animal infections and to coordinate all actions for surveillance and response. The plan is activated each year in the period between June 1 and October 31. Three levels of alert exist:

- Alert level 1: avian mortality linked to WNV infection;
- Alert level 2: autochthonous equine cases of WNV infection detected;
- Alert level 3: autochthonous human cases of WNV infection detected.

Each phase would elicit a different response measure including: strengthening surveillance; initiating public education campaigns; conducting entomological surveys and risk assessments; conducting serological survey amongst humans and horses; implementing vector control measures; and securing blood and organ supplies. Coordination of the implementation plan is done by all stakeholders involved in WNV prevention and response and includes national and local representatives of public health authorities, veterinary authorities, pest control authorities, and blood, tissue and organ safety authorities.

Israel

The preparedness plan for WNV in Israel is based on an integrated surveillance framework which includes stakeholders from the Ministry of Health, Ministry of Agriculture, Ministry of Environment Protection, and Public Relations. WNV infection in Israel is a notifiable disease. Public health measures for this disease currently include:

- mosquito surveillance and source identification;
- monitoring of human cases;
- public awareness and information campaigns;
- online updates about virus activity;
- mosquito extermination;

- domesticated poultry vaccination; and
- treatment of highly complicated human cases based on high doses of intravenous immunoglobulins (IVIG) from Israeli plasma donations that are constituted of specific anti-WNV antibodies.

United States

In the United States, WN disease has been notifiable since 2000. An electronic and web based system, Arbonet (which includes also other arboviral diseases), integrates surveillance data from human disease cases, presumptive viraemic donors through routine blood screening, equine cases, avian cases, and sentinels and vector sectors on a weekly basis by state. Response activities include surveillance, laboratory strengthening and public health campaigns. Mosquito control activities are conducted and funded at the local level only.

10 Experiences of WNV and blood, tissue and organ safety

Blood, tissue and organ safety has become an important topic in relation to WNV infection following several reports of contaminated blood supplies and organs during the large WNV outbreak in the United States.

The options for ensuring blood, tissue and organ safety include:

- deferral of donations from infected or potentially exposed persons;
- implementation of laboratory screening methods, such as nucleic acid testing (NAT), for blood, tissue and organ supplies and the use of viral inactivation techniques; and
- asking donors to report any symptoms after donation.

Deferral of blood donations from affected areas and from potentially exposed individuals is required at the European level through the Blood Directive 2004/33/EC. The deferral procedures should be consistent with the type of epidemiological situation present and should be notified by the national Competent Authority to the European Commission with a view of Community action. Specifically for WNV, any person who has been in an area with ongoing transmission of WNV to humans should be deferred from donation for 28 days after having left the area.

Nucleic acid testing screening procedures are universally used in the United States and Canada for screening pools of blood donations. For all pools that are NAT positive for WNV, each individual donation is tested. In France at present, the use of NAT screening is used to determine the safety of stored blood products before an alert is issued for WNV transmission in the identified at-risk area. Its use for screening of potentially exposed donors is only recommended if the affected area is determined to be of such a large size that deferrals from that area would have a national impact on the availability of blood supplies. Depending on the geographic spread of the viral transmission, viral inactivation procedures would be implemented on the donor platelet concentrate. Similarly in Italy, NAT screening techniques on blood supplies were initiated during the 2008 outbreak in order to offset the reduced blood donations available at the national level. In Israel, NAT screening was considered but not implemented due to financial limitations. Deferral procedures for ill persons continue to be implemented in Israel, but so far, no post-transfusion WNV infection was identified.

In both France and Italy, crisis management teams have been set up with a single agency as the main coordinating body to deal specifically with blood, tissue and organ questions in the event of WNV outbreaks. They discuss the relevant epidemiological data, the quantitative risk assessment of the situation in terms of public health, what deferral and screening measures can be implemented, and what the impact on blood supplies will be based on the measures implemented.

The impact of the EC Blood Directive on national blood supplies was significant in Italy during the WNV outbreak in 2008 when blood donations needed to be deferred from the region of Emilia Romagna, which provides a substantial amount of blood for the rest of the country. In Hungary during the 2008 WNV outbreak, 19 WNND cases were reported from 12 counties. With the application of the EC blood Directive to this outbreak, blood donations would be deferred from the majority of the country.

Even though the true risk to blood, tissue and organ supplies from WNV remains low in the EU at present, political and media attention to this disease are high and it therefore remains important that public health and blood authorities have clear communication strategies to explain the risk, both to the public and policy makers.

11 Working group: Triggers for alerts for human WNV outbreaks

The working group focused on being able to define indicators for WNV transmission, alerts, and criteria for defining geographically affected areas with viral transmission.

The conclusions of the working groups suggested that conditions needed for indicating the presence of WNV transmission in an area would include:

- presence of the virus (introduction of virus through migratory birds or having the virus established in overwintering mosquito populations);
- presence of ornithophilic and competent mosquito vector population;
- suitable conditions for the maintenance of these mosquito vectors, such as breeding sites, climatic conditions etc;
- presence of susceptible and receptive vertebrate hosts (naïve birds) for viral amplification; and
- suitable conditions allowing viraemic birds, bridge mosquito vectors and susceptible hosts to share the same environment; this could include wetlands etc.

In an area with established WNV transmission, the passage to humans would require the presence of mosquito bridge vectors (with ornithophilic and anthropophilic biting habits), proximity of humans or an increased human density in the area, with transmission favouring mosquito diversion from birds to humans.

The main trigger for an alert for potential human WNV infection would be the evidence of WNV transmission in birds (through dead bird surveillance or serosurveys) and clinical manifestations in horses with laboratory confirmation.

Once an alert for a human outbreak of WNV infection is triggered, defining the geographical limit of the 'affected area' or 'zone at risk' is very difficult as factors that determine the geographical spread of transmission zones are unknown. It was agreed that each potential outbreak needs to be studied independently. No fixed criteria for the transmission zones can be established. However, the following factors would need to be considered:

- the use of administrative levels or natural barriers as boundaries of transmission zones facilitating logistical arrangements for all public health measures during an outbreak;
- risk assessments should be conducted in neighbouring areas to determine if the same conditions for WNV transmission (presence of vectors, infected birds, human density, etc.) exist, as this would indicate how far one would need to extend the transmission zone; and
- the use of a radius around sick/dead birds, sick horses or human cases would be feasible if one would take into consideration the vector's flight distance. But this is only feasible if it is known if the birds, horses or humans were really infected in that location.

The decision to declare a transmission zone free of further viral transmission (the end of the alert for the human WNV outbreak) would depend on in-depth risk assessments carried out at the local level. No standardised criteria can be defined. However, the following components could be considered in the risk assessment:

- The biology and behaviour of the mosquito vector: time of the year, reduction of mosquito activity, and end of period for biting humans. There is evidence in some EU countries that some mosquito vectors of WNV are active all year round. The risk assessment in these areas would therefore differ.
- If no new horse or human cases have been reported in a specific period of time (i.e. 28 days or two incubation periods of WNV), the alert for further human cases could be reduced.

12 Working group: West Nile alert and blood, tissue and organ safety

The question of how to handle blood, tissue and organ safety regarding WNV outbreaks is highly sensitive. Deferral measures that are implemented following WNV outbreaks can have significant impacts on blood supply in a country. Moreover, it requires the attention of a multi-sectoral group of stakeholders both at the national level and at the local level where the outbreak is occurring. At the national level, this would include public health authorities (national and local), blood/plasma/tissue/organ collection authorities and companies (national and local), clinical

laboratories, veterinary authorities, blood donors, blood and tissue/organ recipients and the food and drug authorities. At the European level, this would include DG SANCO, ECDC and the European Blood Alliance.

Before and during the implementation of control measures to ensure blood, tissue and organ safety, the following issues should be considered in the assessment:

- the potential number of donors lost due to deferral;
- the potential number of contaminated units following the outbreak;
- the cost of implementing measures, including screening of blood supplies, training of laboratory staff and importing blood products;
- the geographical delineation of the affected area;
- the impact on tourism in terms of blood donations lost from returning travellers;
- the need for adequate communication and information to the general population, the blood donors and the recipients of the products;
- whether high-risk recipients should receive selective blood/tissue products that are ensured to be free of contamination;
- a continued balance between the supply of blood, tissues and cells for patients against the impact of safety measures; and
- the need for communication at the European level to other national authorities for blood, tissue and organ safety, so that they may conduct their own risk assessments;

However, the decision to implement any control measures should depend on a thorough and continuous risk assessment of the epidemiological situation.

13 Conclusion

In Europe, WNV has gained increasing interest from the public health community following the recent outbreaks of neuro-invasive disease in 2008 in Italy, Hungary and Romania. Additionally, the detection of another lineage of the WNV means that the knowledge of the epidemiology of this disease in Europe is changing. For this reason it is important to enhance preparedness through planning and specific tools at national and local levels in the Member States for this disease in the near future.

At the European level, continued use of existing structures and mechanisms for communication between national authorities was reinforced in order to share information and data on planned and implemented measures in the context of WNV disease and infection, including outbreaks. This would include the Early Warning and Response System (EWRS) under the current EU legislation, and for blood, tissue and organ safety using the rapid alert system for this network. Additionally, the multi-sectoral nature of WNV infection was recognized, not only at the local and national level, but at the European level. Continued efforts should therefore be made to strengthen the multi-disciplinary approach and collaboration for preparedness for WNV infection as this has been shown to be beneficial in countries with experience in outbreaks of this disease.

Gaps do exists for preparedness for WNV infection in terms of risk assessments for blood, tissue and organ safety and linking all aspects of a multi-sectoral approach to WNV outbreak control. ECDC was asked to assist Member States in the development of a tool for decision making for WNV infection preparedness and control, which would allow countries to be guided through the complexities of responding to any alerts or outbreaks of this disease. Also, guidance should be developed for Member States on how to assess the risk to blood supplies from communicable disease outbreaks, such as WNV infection, and how to develop thresholds of acceptable risk. ECDC's assistance for this guidance was also determined to be of use.

Annex 1: EU case definition for West Nile virus infection (WNV)

Clinical criteria

Any person with fever OR at least one of the following two:

- encephalitis;
- meningitis.

Laboratory criteria

- Laboratory test for case confirmation (at least one of the following four):
  – isolation of WNV from blood or CSF;
  – detection of WNV nucleic acid in blood or CSF;
  – WNV specific antibody response (IgM) in CSF; or
  – WNV IgM high titre AND detection of WNV IgG, AND confirmation by neutralisation
- Laboratory test for a probable case:
  – WNV specific antibody response in serum.

Laboratory results need to be interpreted according to flavivirus vaccination status.

Epidemiological criteria

At least one of the following two epidemiological links:

- animal-to-human transmission (residing, having visited or having been exposed to mosquito bites in an area where WNV is endemic in horses or birds); or
- human-to-human transmission (vertical transmission, blood transfusion, transplants).

Case classification

A. Possible case:
N/A

B. Probable case:
Any person meeting the clinical criteria AND with at least one of the following two:

- an epidemiological link; or
- a laboratory test for a probable case.

C. Confirmed case:
Any person meeting the laboratory criteria for case confirmation.

Annex 2: Agenda of the meeting

DAY 1 – 21 April, 2009

08:30 – 08:45	Registration
08:45 – 09:00	Welcome and introduction Massimo Ciotti, Deputy Head of Unit, Preparedness and Response (PRU)
09:00 – 09:45	Overview of WNV infection at the European level: • Overview from ECDC perspective Hervé Zeller (ECDC) • Overview of recent scientific developments in West Nile from EDEN project Paul Reiter (EDEN PROJECT)
09:45 – 10:15	Human clinical, surveillance and laboratory aspects Neus Cardeñosa, Luisa P Sanchez, Antonio Tenorio (Spain)
10:15 – 10:30	*Coffee Break*
10:30 – 11:00	Equine surveillance and possible alternatives Ramunas Freigofas (EC SANCO D1)
11:00 – 11:15	Bird surveillance Norbert Nowotny (Austria) and Ramon Soriguer (Spain)
11:15 – 11:30	Entomological surveillance and control Zdenek Hubálek (Czech Republic) and Gregory L'Ambert (France)
11:30 – 12:00	WNV preparedness plan in France and lessons learnt from recent outbreaks Henriette de Valk, Stéphan Zientara, Pierre Gallian (France)
12:00 – 12:30	Lessons learnt and experiences from recent WNV • Italy, Caterina Rizzo • Hungary, Emöke Ferenczi • Romania, Roxana Serban
12:30 – 13:30	*Lunch*
13:30 – 13:40	WN fever, why should this disease be confronted at the European level? Paolo Guglielmetti (SANCO C3)
13:40 – 13:55	Introduction to group work Evelyn Depoortere (ECDC)
13:55 – 14:10	*Coffee break*
14:10 – 15:30	Group work – Parallel groups to discuss both topics
15:30 – 15:45	Time for groups to summarize conclusions
15:45 – 16:45	Presentation of summary and conclusions of group work
19:00	Dinner (all participants) – at Hotel Reisen

DAY 2 – 22 April, 2009

08:45 – 09:00	Summary and conclusions from Day 1 Herve Zeller (ECDC)
09:00 – 09:45	Integrated surveillance and lessons learnt from WNV infection in Israel Hanna Bin (Israel)
09:45 – 10:15	WNV surveillance and blood supply management in the United States Lyle Petersen (US)
10:15 – 10:30	Introduction to working group on blood donations Paolo Guglielmetti (SANCO C3 with inputs from SANCO C6)
10:30 – 10:45	*Coffee Break*
10:45 – 12:15	Working group on blood donations
12:15 – 13:15	*Lunch*
13:15 – 14:00	Summary and conclusions of group work
14:00 – 15:00	Next steps and conclusions

Annex 3: Participants

External participants (in alphabetical order)

Name	Organisation	Country
Daniela Aleksieva	National Center of Infectious and Parasitic Diseases	Bulgaria
Maria João Pereira Figueira Alves	CEVDI/ INSA, National Institute of Health, Lisbon	Portugal
Gregory L'Ambert	Entente Départementale pour la Démoustication du littoral méditerranéen (EID Méditerrané)	France
Hanna Bin	Arbovirus and Haemorrhagic Disease Laboratory, Sheba Medical Center	Israel
Antra Bormane	State Public Health Agency	Latvia
Maria Rosaria Capobianchi	Director Laboratory for Virology, National Institute for Infectious Diseases, Rome	Italy
Neus Cardeñosa Marín	Servei de Vigilància Epidemiològica, Departament de Salut, Barcelona	Spain
Cornelia Svetlana Ceianu	Cantacuzino Institute, Bucharest	Romania
Károly Erdélyi	Domestic Mammal Pathology and Wildlife Disease Unit, Central Veterinary Institute, Budapest	Hungary
Emőke Genoveva Ferenczi	National Center for Epidemiology	Hungary
Alba Carola Finarelli	Servizio di Sanità Pubblica Regione, Emilia-Romagna	Italy
Anders Fomsgaard	Department of Virology, Statens Serum Institut	Denmark
Pierre Gaillan	Etablissement Français du sang (EFS)	France
Giuliano Grazzini	National Blood Centre, Rome	Italy
Ned Hayes	Barcelona Centre for International Health Research (CRESIB)	Spain
Zdenek Hubalek	Faculty of Science Department of Experimental Biology, Brno	Czech Republic
Nikolay Kalvatcjev	National Center of Infectious and Parasitic Diseases	Bulgaria
Sylvie Lecollinet	French Agency of Food Safety (Afssa)	France
Åke Lundkvist	Swedish Institute for Infectious Disease Control (SMI), Stockholm	Sweden
Fabio Magurano	Istituto Superiore di Sanita, Rome	Italy
Matthias Niedrig	Robert Koch-Institut, Centre for Biological safety	Germany
Norbert Nowotny	Zoonoses and Emerging Infections Group, Clinical Virology, Clinical Department of Diagnostic imaging, Infectious Diseases and Clinical Pathology, University of Veterinary Medicine, Vienna	Austria

Micha Nubling	Divisions of Virology and of Haematology/Transfusion Medicine, Paul-Ehrlich-Institut, Langen	Germany
Hugo Costa Osório	Center for Vectors and Infectious Diseases Research, National Institute of Health	Portugal
Lyle Petersen	Arboviral Diseases Branch, Center for Disease Prevention and Control (CDC)	United States of America
Claudio Po	Servizio di Sanità Pubblica, Regione Emilia-Romagna	Italy
Cees van der Poel	Sanquin Blood Supply Foundation, Dept. Medical Affairs	The Netherlands
Paul Reiter	Institut Pasteur, Coordinator EDEN project	France
Sandra Revilla Fernandez	AGES-Institut für Veterinärmedizinische Untersuchungen	Autstria
Caterina Rizzo	Istituto Superiore di Sanita, Rome	Italy
Luisa Pilar Sanchez Serrano	Centro Nacional de Epidemiología, Instituto de Salud Carlos III, Madrid	Spain
Roxana Serban	Institute of Public Health, Bucharest	Romania
Ramon Casimiro-Soriguer	Department of Wetland Ecology, Estación Biológica de Doñana-CSIC	Spain
Evgeniya Taseva	National Center of Infectious and Parasitic Diseases	Bulgaria
Antonio Tenorio	Arbovirus and Imported Viral Disease Unit, Centro Nacional de Microbiologia	Spain
Henriette de Valk	Institut de veille sanitaire	France
Hana Zelana	National Reference Laboratory for Arboviruses, Institute of Public Health in Ostrava	Czech Republic
Stephan Zientara	French Agency of Food Safety (Afssa)	France
Viktor Zöldi	National Center for Epidemiology	Hungary

World Health Organization

Name	Organisation	Country
Roberta Andraghetti	Regional Office for the European Region, Copenhagen	Denmark

European Commission and other agencies

Name	Organisation	Country
Ramunas Freigofas	European Commission, DG SANCO D1, Animal Health and Standing Committees	
Paolo Guglielmetti	European Commission, DG SANCO C3	
Per Have	European Food Safety Agency (EFSA), Parma	Italy

ECDC participants (in alphabetical order)

Name	Department
Alessandro Cassini	Scientific Officer, Scientific Advice Unit
Denis Coulombier	Head of Unit, Preparedness and Response Unit
Evelyn Depoortere	Senior Expert for Outbreak Response, Preparedness and Response Unit
Isabelle Deveaux	Expert, Surveillance Unit
Celine Gossner	Programme Officer Emerging and Vector Borne Diseases, Preparedness and Response Unit
Piotr Kramarz	Deputy Head of Unit, Scientific Advice Unit
Katrin Leitmeyer	Senior Expert, Preparedness and Response Unit
Annick Lenglet	Expert, Preparedness and Response Unit
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