Emerging horse diseases - Why?

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Italian National Reference Centre for Equine Infectious Anaemia

OIE Reference Laboratory for Equine Infectious Anaemia

Transboundary and Emerging Diseases

Transboundary and Emerging Diseases

REVIEW ARTICLE

Risks of Emerging Infectious Diseases: Evolving Threats in a Changing Area, the Mediterranean Basin

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Resources, namely safe drinking water and animal products.

Socio-economic factors including health inequalities within countries and poor sanitary conditions linked to ongoing conflicts.

Movements of people and goods that are reshaped by current changes and are intimately linked to the risk of disease proliferation.

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African Horse Sickness - AHS

Non-contagious infectious viral disease affecting horses, donkeys, mules and zebras, domestic and wild;

9 antigenically different serotypes but some cross-immunity has been observed between 1 and 2, 3 and 7, 5 and 8 and 6 and 9, but not with other orbivirus - Relevant for vaccination.

Distribution related to *Culicoides spp.* vectors same as Blue tongue.
Other Arthropods may spread the virus as mechanical vectors.

- *Aedes aegypti, Anopheles sephensi, Culex Pipiens*
- *Hyalomma dromedarii, Ripicephalus sanguineus*

The virus moves best in moist, mild conditions
and travels long distances on the wind-borne vectors.

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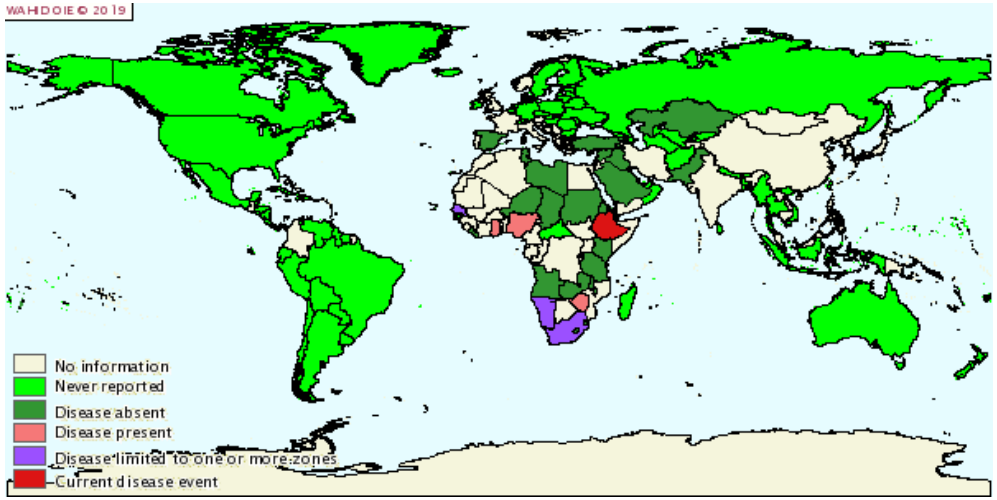
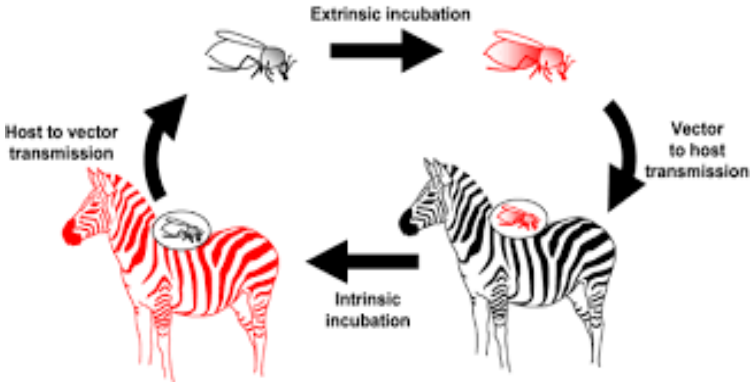
AHS epidemiological situation



http://www.oie.int/wahis_2/resource/maps/tmp/5d039aa9_3f68_6.png

All serotypes occur in eastern and southern Africa reflecting the geographic pattern of zebra, probable asymptomatic virus reservoir.

Periodically, spread beyond sub-Saharan Africa - major epizootics extending as far as Pakistan and India in the east and Morocco, Spain and Portugal in the West. (cited from presentation by Jeffrey Musser, DVM, PhD, DABVP, Suzanne Burnham, DVM, 2006).



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Diagnosis and control measures

Table 1. *Test methods available for the diagnosis of African horse sickness and their purpose*

Method	Purpose					
	Population freedom from infection	Individual animal freedom from infection prior to movement	Contribute to eradication policies	Confirmation of clinical cases	Prevalence of infection – surveillance	Immune status in individual animals or populations post-vaccination
Agent identification[1]						
Real-time RT-PCR	+	+++	+	+++	++	–
Agarose gel-based RT-PCR	–	+	+	++	+	–
Virus isolation	–	++	–	+++	–	–
Detection of immune response						
ELISA (serogroup specific based on VP7)	+++	++	++	++	+++	++
CFT	+	+	+	+	+	+
VN	+	+	–	+	+	+++

Key: +++ = recommended method; ++ = suitable method; + = may be used in some situations, but cost, reliability, or other factors severely limits its application; – = not appropriate for this purpose; n/a = not applicable.
Although not all of the tests listed as category +++ or ++ have undergone formal validation, their routine nature and the fact that they have been used widely without dubious results, makes them acceptable.
RT-PCR = reverse-transcription polymerase chain reaction; ELISA = enzyme-linked immunosorbent assay; VN = virus neutralisation; CFT = complement fixation test.

- Movement restriction
- Vector control
- Test and slaughter
- Vaccination:

MLV

Inactivated virus

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Equine infectious anemia

Center for Food Security and Public Health, Iowa State University, 2013

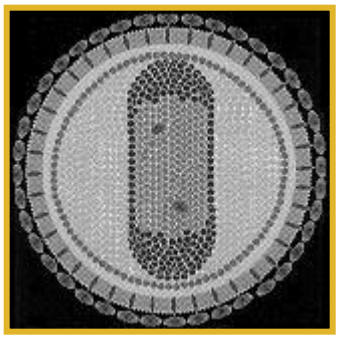
Equine infectious anemia virus, Family Retroviridae
Genus *Lentivirus* of horses, donkeys, mules and zebras*;*

Found nearly worldwide, may be absent from Iceland, Japan;

Infection rate varies according to the environment (humid, swampy);

Morbidity and mortality affected by virus strain and dose and health of the animal;

Infections often go unnoticed.



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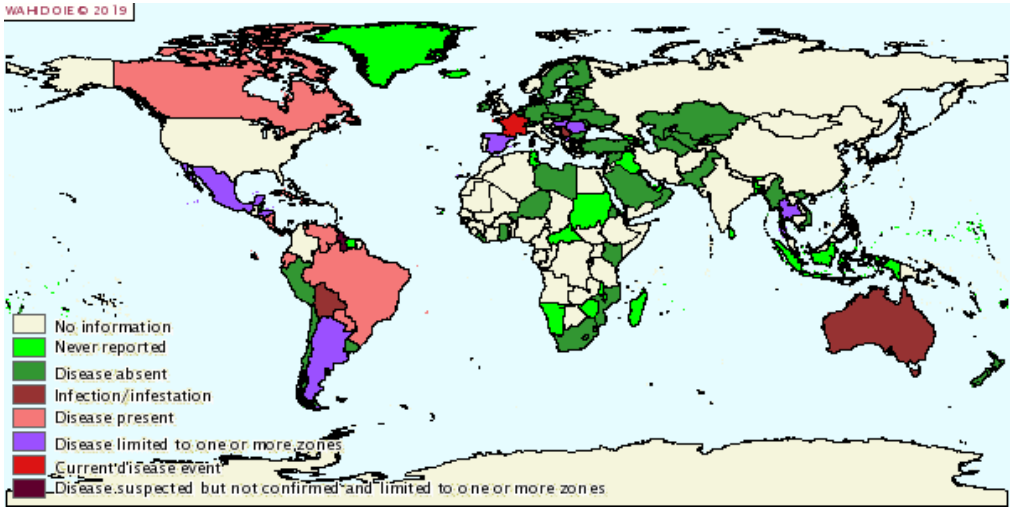
EIA epidemiological situation



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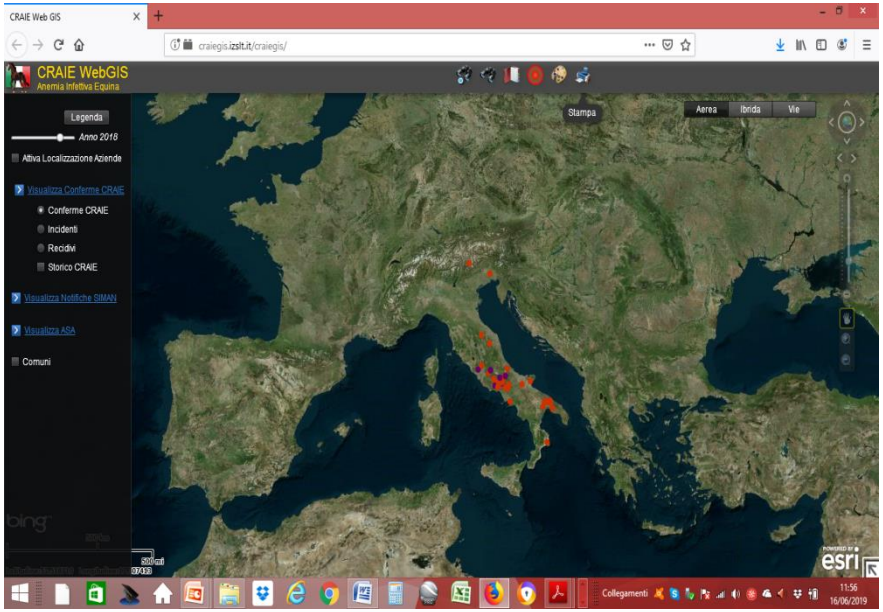

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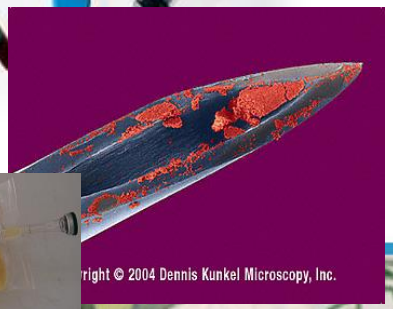
Transmission

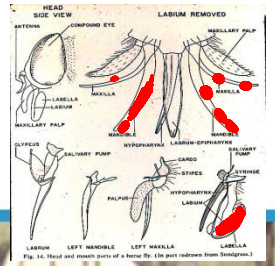
- mechanical transmission by large biting flies (tabanid species) or stable flies *(stomoxys calcitrans)* Adult flies are transmitting the virus.

- from the use of heamoderivates infected with EIA virus and contaminated equipment (by blood, milk or placental fluid), veterinary instruments

- saliva, nasal secretions, feces, semen, ova and embryos (acute infection)

- pregnant mares may pass the disease to their foals via placenta or rarely via virus contaminated colostrum





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Clinical signs and diagnosis

- Clinical signs often nonspecific
  - Fever, weakness, depression
  - Jaundice, tachypnea, tachycardia
  - Ventral pitting edema
  - Petechiae, epistaxis
  - Anemia (chronically infected animals)
- Most recover and become carriers
  - Infections may become symptomatic again during times of stress

Table 1. *Test methods available for the diagnosis of equine infectious anaemia and their purpose*

Method	Purpose					
	Population freedom from infection	Individual animal freedom from infection prior to movement	Contribute to eradication policies	Confirmation of clinical cases	Prevalence of infection – surveillance	Immune status in individual animals or populations post-vaccination
Agent identification[1]						
PCR	–	+/–	–	+/–	–	n/a
Virus isolation	–	–	–	+	–	n/a
Detection of immune response						
AGID	++	++	++	++	++	n/a
ELISA	++	++	++	+	+	n/a
Immunoblot	–	++	++	++	–	n/a

Veterinary Microbiology 165 (2013) 123–134

Contents lists available at SciVerse ScienceDirect

Veterinary Microbiology

journal homepage: www.elsevier.com/locate/vetmic

Is a diagnostic system based exclusively on agar gel immunodiffusion adequate for controlling the spread of equine infectious anaemia?

Maria Teresa Scicluna[a,*], Charles J. Issel[b], Frank R. Cook[b], Giuseppe Manna[a], Antonella Cersini[a], Francesca Rosone[a], Raffaele Frontoso[a], Andrea Caprioli[a], Valeria Antonetti[a], Gian Luca Autorino[a]

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Control measures

Control programs - Most require testing
- Before entry of horses into the stable
- Before participation in organized activities
- Before sale of horse

No vaccine available

Lifelong carriers
- Must be permanently isolated (≥200m perimeter) or euthanized
- Reactors must be marked
- Transport limited

Asymptomatic mares - foals may become infected

Vector control
- Spray
- Insect repellent
- Insect-proofing stables

Clean and disinfect

Herd declared free following the removal of cases and two consecutive negative tests carried out at an interval of 90 days

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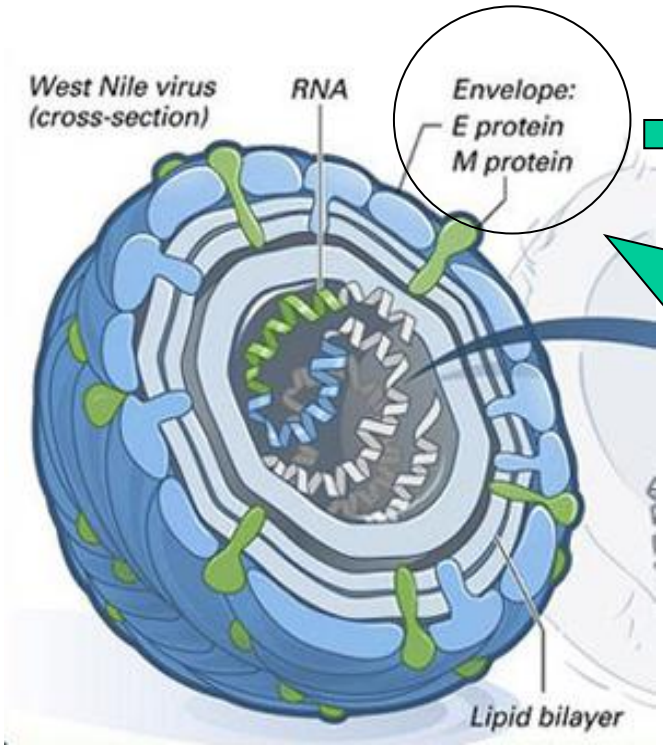
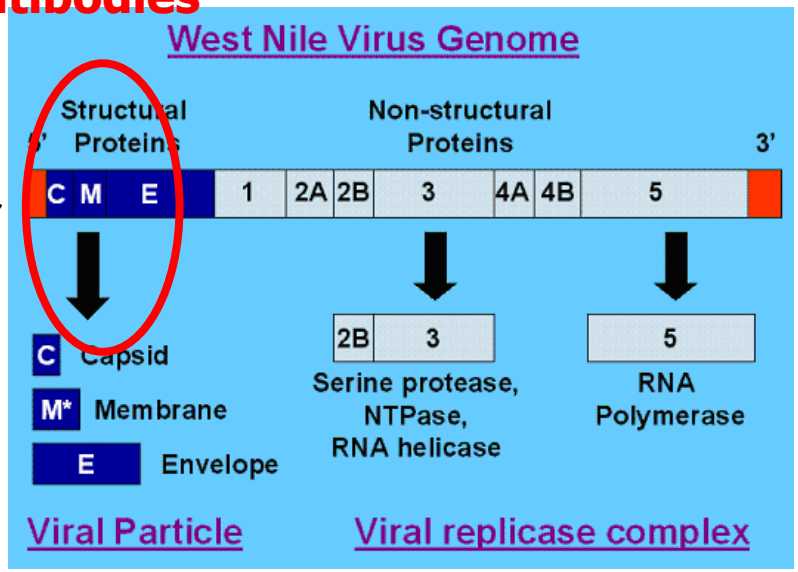
West Nile Virus - WNV



Induce the formation of neutralizing antibodies



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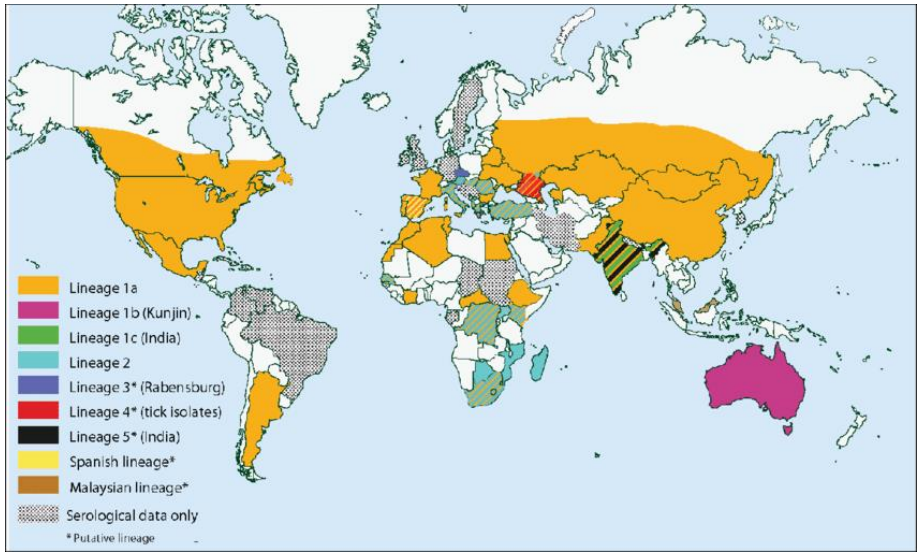
WNV: lineages and epidemiological situation

Fam. *FLAVIVIRIDAE* Gen. *Flavivirus* - ***Arbovirus*** *responsible for encephalitis in man and horse.*



Lineage 1
Classe A: Europa, Africa, Medio Oriente, North America (6 clusters)
Classe B: Australia (Kunjin)
Classe C: India

Lineage 2: B 956, Africa Subsahariana e Madagascar. Hungary (2004), Russia (2007), Romania e Grecia (2010), Italia (2011-2014)

Lineage 3: Rabensburg virus (from mosquitoes in the Czech Republic 1997)

Lineage 4: Caucasus region (1988 from tick)

Lineage 5: India

Lineage 6: Sarawak Kunjin (Australia)

Lineage 7: Koutango virus (Africa)

Lineage 8 ?: Spain

WND Evolution and Life Cycle

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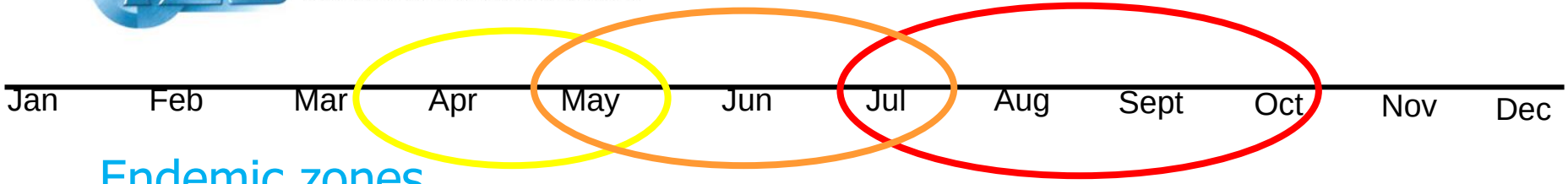
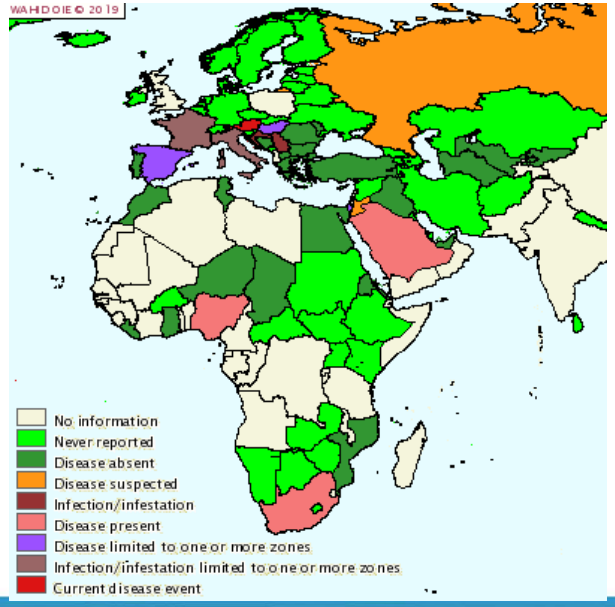
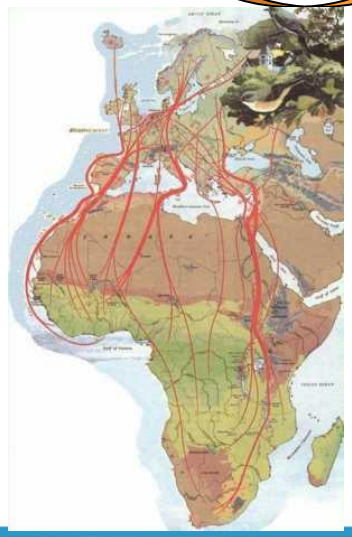


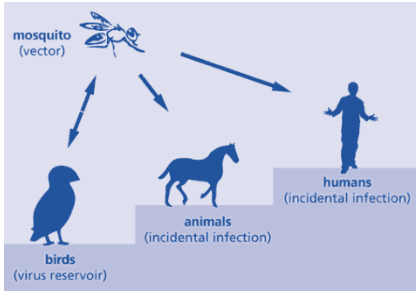
Endemic zones (AFRICA)

MIGRATORY BIRDS → VECTORS (mosquito) → RESIDENT BIRDS

DEAD END HOSTS (horse, man)







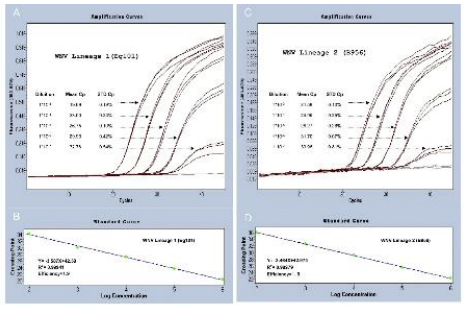
Clinical signs and diagnosis

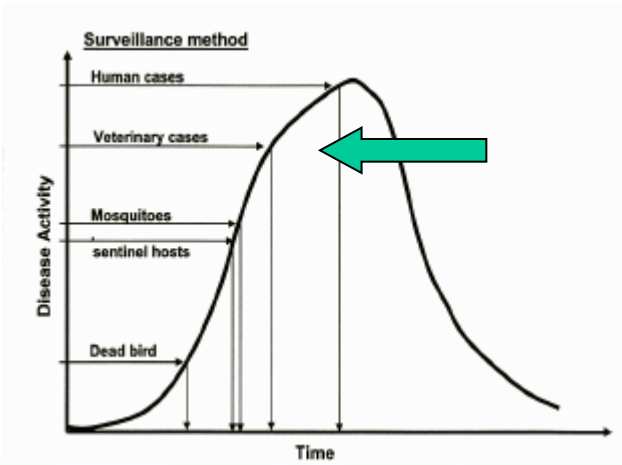
- paralysis/paresis in the limbs
- proprioceptive deficits
- ptosis of the lower lip

Elisa test (serum)

Real Time PCR

(unclotted blood, tissue and organs)





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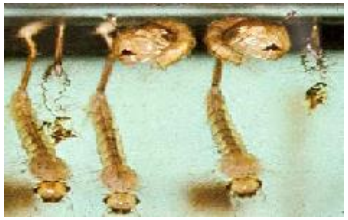
Control measures

Vaccination – available, inactivated/recombinant vaccines

Reduction of places of vector replication:

- Removal of reproductive and larval sites (any situation with water stagnant for more than 4 days);
- Sanitary education.



Vector chemical control: insecticides, repellents

- Disinfestation of vehicles and environment

Limiting exposure insect proof nets, animal shelter during hours of increased vector activity;

It is not necessary to restrict the handling of the horses (dead end

Additional actions: Information and education of animal carerers.

REMEMBER WND IS A ZOONOSIS WHERE HORSES ARE NOT THE SOURCE!

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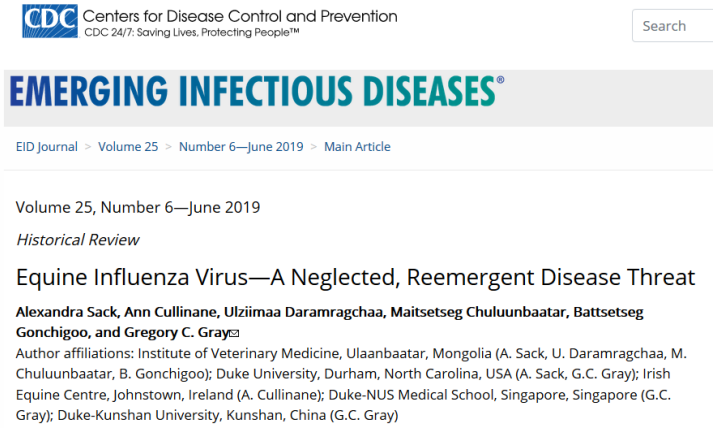
Equine influenza - EI

EI is caused by two viral subtypes: H3N8 and H7N7 and the only subtype that causes infections since the 1970s is H3N8.

For many years, EIV circulating in the US belonged to the Florida-1 clade (FC1) sublineage while EIV in Europe to the Florida 2 clade (FC2) of the American lineage of H3N8.

These clades separated in 2003 with the circulation of FC2 that ceased in the USA in 2005, while from 2010 there was no evidence of circulation of FC1 in Europe.

In Africa and Middle East, little is known which EIVs are circulating – possible source of new variants.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EID Journal > Volume 25 > Number 6—June 2019 > Main Article

Volume 25, Number 6—June 2019

Historical Review

Equine Influenza Virus—A Neglected, Reemergent Disease Threat

Alexandra Sack, Ann Cullinane, Ulziimaa Daramragchaa, Maitsetseg Chuluunbaatar, Battsetseg Gonchigoo, and Gregory C. Gray

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EI epidemiological situation

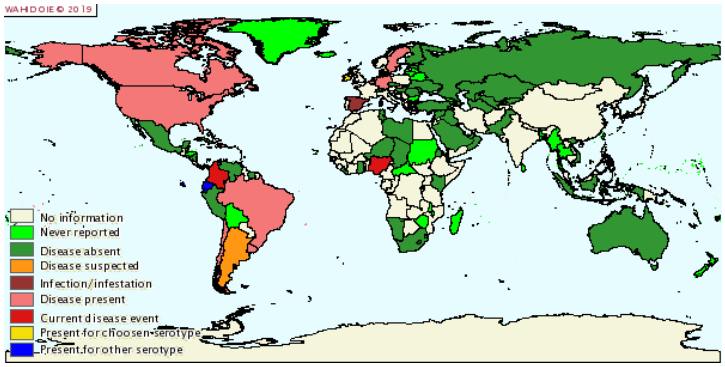
http://www.oie.int/animal-health-in-the-world/the-world-animal-health-information-system/data-after-2004-wahis-interface/

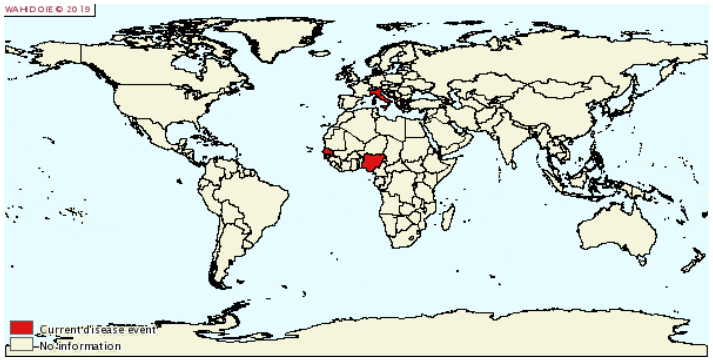
Recently viral circulation has undergone a strong increase in the USA, Europe and Africa (Nigeria and Senegal in particular).

Even South America was interested, with the infection reported in Colombia, Uruguay and Ecuador.

In Nigeria and Senegal, IE outbreaks have seriously affected the donkey population.

In 2018-2019, numerous outbreaks were reported in France, Belgium, Holland, Germany, Ireland and the United Kingdom (new reports in the last few days).





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Clinical Signs and diagnosis

- Respiratory transmission (most common)
- Indirect transmission can be an important means of spread through fomites.
- Incubation period is as short as 24 hours and may be up to 3 days.
- Fever up 41.1°C, depression, anorexia, muscle pain/weakness;
- Dry, harsh cough (sometimes paroxysmal) usually precedes fever;
- Nasal discharge is initially serous, and secondary bacterial infections are very common in influenza affected horses.

Table 1. *Test methods available for the diagnosis of* equine influenza

Method	Purpose					
	Population freedom from infection	Individual animal freedom from infection prior to movement	Contribution to eradication policies	Confirmation of clinical cases	Prevalence of infection – surveillance	Immune status in individual animals or populations post-vaccination
Agent identification[1]						
Virus isolation	–	+	–	++	–	–
Real-time RT-PCR	–	+++	+++	+++	+++	–
RAD	–	+	–	++	+	–
Antigen-capture ELISA	–	++	++	+++	++	–
Detection of immune response						
HI	++	++[a]	–	+++[a]	+++	++
SRH	++	++[a]	–	+++[a]	+++	+++
ELISA	++	+	++[b]	+[a]	+++	+

Key: +++ = recommended method; ++ = suitable method; + = may be used in some situations, but cost, reliability, or other factors severely limits its application; – = not appropriate for this purpose.
Although not all of the tests listed as category +++ or ++ have undergone formal validation, their routine nature and the fact that they have been used widely without dubious results, makes them acceptable.
RT-PCR = reverse-transcription polymerase chain reaction; RAD = rapid antigen detection;
HI = haemagglutination inhibition; SRH = single radial haemolysis; ELISA = enzyme-linked immunosorbent assay.
[a]Testing of paired samples required;
[b]May be useful for DIVA (detection of infection in vaccinated animals) when used with appropriate vaccines.

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Control measures

Vaccinate - carry out complete protocols including boosters dose - http://www.oie.int/scientific-expertise/specific-information-and-recommendations/equine-influenza/.

Isolate - suspect cases

Investigate - if your horse has participated in a sporting event, make sure the institution organizer implements all necessary biosecurity policies. If in doubt, do not participate event

Communicate – veterinarians and owners must communicate the presence of disease to minimize the risk of spread of the infection

Mitigate the risk - do not handle horses from stables / farms / racetracks where other horses show respiratory symptoms or participate in sporting events (competitions, races) except with animals regularly vaccinated according to the circulating strains.

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Thank you for your attention

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