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Emerging infections

A threat to the blood supply?

Definitions:-

- Prevalence - the total number of cases in the population at a point in time or over a period of time
- Incidence - the rate of new cases in the population over a period of time
- Emerging threat – newly reported activity which may need assessment – many ‘new’ infectious agents are known but have spread to new geographical locations which may change their threat level.
- Threat re-assessment – assessment of an existing threat to see if current safeguards are sufficient, need improving, or can be relaxed

How do we monitor?

- PHE, with other national groups horizon scans for new global threats.
- NHSBT and other UK transfusion services if threat may impact on blood donations.
- About 80 threats being monitored currently
- 1 new one a year, on average.

What kind of threat?



Blood and Transplant

- A threat to patient safety
- A threat to the blood supply
- A threat to staff
- A threat to the reputation of the Blood Services

What actions may be taken?

- None (watching brief)
- Donor deferral (permanent or temporary)
- Testing- full or selective
- Extra process to reduce risk (bacterial screening, pathogen reduction)
- Out-source products.

Who decides?

- Department of Health (EU)
- Standing Advisory committee on the microbiological safety of Blood, Tissues and Organs (SABTO)
- Standing Advisory Committee on Transfusion Transmitted Infections (SACTII)

HEV

NHS

Blood and Transplant



**It has
emerged!**

Pete Rogan, Regional Testing Manager

Caring Expert Quality

- Four strains or genotypes have been identified:-
- Genotypes 1 and 2 are human viruses and associated with outbreaks due to contaminated water. Associated with outbreaks in Africa and Asia
- Genotypes 3 and 4 are animal viruses which can be passed to humans.
- Humans infected with Genotypes 3 or 4 cannot pass on to other humans – except by transfusion or transplant.
- Genotype 3 is found globally, while genotype 4 is restricted to China and Japan.

- Virtually all non-travel associated cases reported to PHE and equivalent organisations have identified the cause as genotype 3.
- Genotype 3 is associated with pigs, game (especially venison and wild boar) and some shell fish.
- UK estimates for the rate of infection in pigs vary from 60 -90%
- The risk varies depending on the part of the animal, with offal presenting a higher risk than muscle.
- Risk is from under cooked pig and deer meat and processed products such as sausage and pies.

- HEV causes an acute, self-limiting infection with mild or no symptoms.
- Incubation period is about 40 days.
- Infection usually cleared by 4 weeks in immuno-competent patients.
- Immuno-suppressed patients may not be able to clear the virus which can then set up a persistent infection, leading in some cases to chronic liver disease.

SaBTO guidelines



Blood and Transplant

- Following recent guidelines NHSBT has introduced new systems to allow universal testing for all donations.
- From the beginning of May all cellular components and most frozen components are tested.
- There is an ongoing project to assess the impact of testing stem cell and tissue products provided by NHSBT or those for whom we provide a testing service
- Diet.

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Aedes aegypti

Aedes albopictus

Carriers of several flaviviruses

- Yellow fever
- West Nile virus (WNV)
- Dengue
- Chikungunya (CHIKV)
- Zika

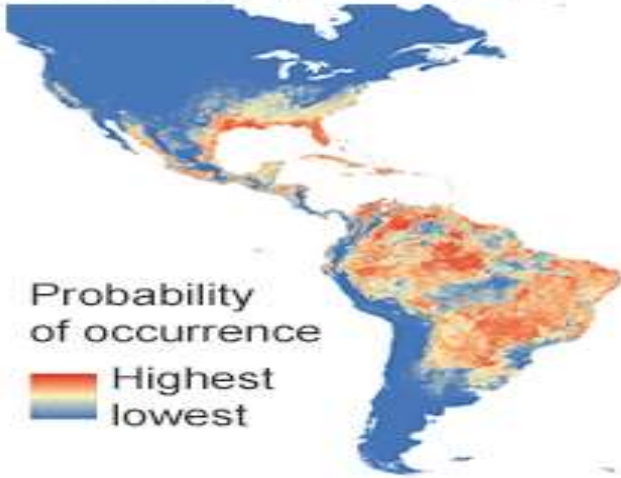
What they have in common:-

- All belong to the genus Flavivirus
- Short incubation (1-15 days)
- Acute resolving infection.
 - Testing must be by molecular methods.
- Symptoms usually mild
- Occasionally may be more serious, even life threatening.
- Not all affected by current pathogen inactivation methods.

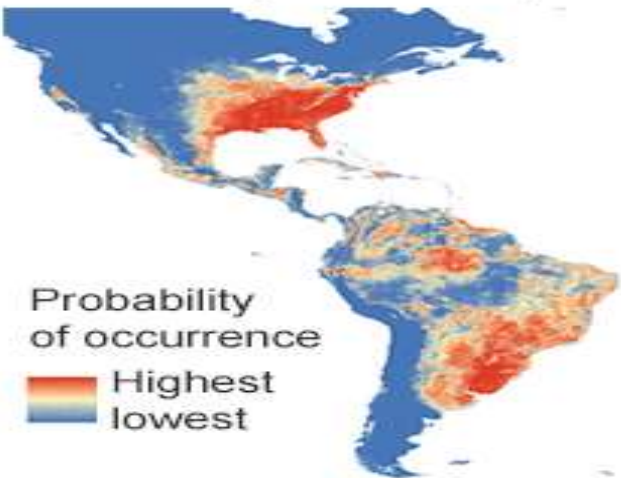
Global distribution of Aedes mosquitoes

Aedes aegypti and Aedes albopictus can spread the Zika virus if infected with it

Aedes aegypti mosquito



Aedes albopictus mosquito



Predicted global distribution of each species based on statistical distribution models

Source: ELife 2015

BBC

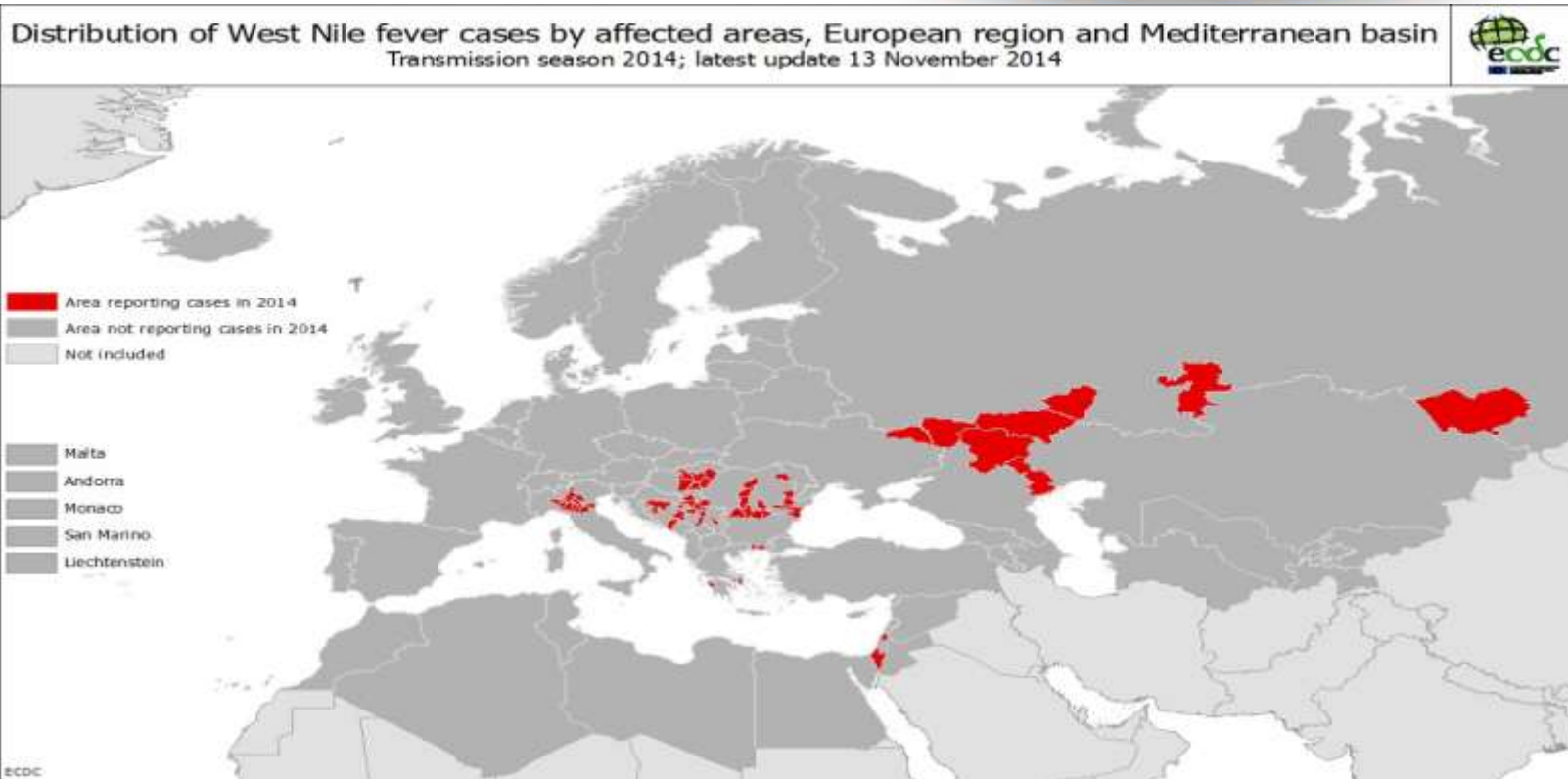
West Nile virus



Blood and Transplant

- Acute, resolving infection
- Endemic in continental north and central America
- Spreading in east and central Europe
- EU requires testing in endemic countries, deferral in non endemic countries (28 days) for travel exposure.
- UK tests donors with travel exposure. No reactivities found in testing of > 500,000 donations.

West Nile virus



Dengue

- Has spread from 9 to over 100 countries in 40 years.
- Now outside the malaria zone.
- 4 sero-types – DEN-1, DEN-2, DEN-3, DEN-4
- Infection with one type confers long term immunity against that type only.
- Symptoms are that of a severe flu-like illness with high temperatures (40°C).
- A small number of patients develop severe dengue fever (Dengue Haemorrhagic Fever) which has a high mortality
- The opportunity to spread to Europe exists because of the adaptability of *Aedes albopictus*.
- Vaccines are under development but must confer protection against all 4 serotypes.

- An acute viral infection with sudden onset of fever 2-4 days after exposure, accompanied by joint pain and rash.
- Fever lasts 2-7 days.
- Associated joint pain (arthralgia) is debilitating and can last for weeks or months, or in some cases, years.
- Mortality rate is 1/1000 – associated with patients with underlying medical conditions.

Zika virus

- Acute resolving illness.
- 2 lineages, African and Asian.
- 80% of sufferers are asymptomatic.
- 20% have mild symptoms, including mild fever, maculopapular rash, headache and arthralgia.
- Has been associated with a significant increase in cases of Gullian-Barré syndrome in south American states, notably Brazil. Cases outside the Americas now reported.
- Infection in pregnancy may lead to neurological damage of the foetus, leading to microcephaly, ocular and otic problems and foetal death.

- Latest evidence confirms that virus in vaginal secretions readily infects the foetus.
- Animal models show that within a couple of weeks of foetal infection, white matter of the brain stops growing virtually completely.
- Vertical transmission in infected mosquitoes is possible, so any pest control spraying must kill the eggs as well as the larva and adults to be completely effective.
- Recent work has shown that *Aedes Egyptii* mosquitoes may carry and transmit more than one viral agent
- The epidemic has been stood down in Brazil and Costa Rica with a reduction of new cases of about 95%

ZIKA and the USA



Blood and Transplant

- Non travel associated infection now proven in Dade county, Miami and is spreading to adjacent counties. Cases have also been reported in Texas.
- Virus carriage is now proven in mosquitoes from Miami Beach.
- Infected and surrounded areas instructed by FDA to cease blood/CD collection until testing by ID NAT or suitable pathogen reduction technology implemented.
- Permission to use an investigational test granted.
- Whole of USA including Hawaii must now screen using ID NAT. Pathogen inactivation (Intercept) of plasma and platelet products required in affected and adjacent areas.
- More than 4,000 cases now reported in USA and it is expected that it will spread to other parts of USA where Aedes is found.

Pete Rogan, Regional Testing Manager

Caring Expert Quality

UK Guidelines for travellers



Blood and Transplant

- Pregnant women – don't travel.
- Intending to become pregnant ? Use barrier protection during visit and for at least 1 month after return.
- Males – Use barrier protection for 6 months after return (evidence that the virus may persist in semen).

UK blood services view.



Blood and Transplant

- As Dengue, ChikV and Zika are closely related, differential diagnosis is challenging.
- Donors visiting risk areas within the malaria belt are not a threat as they will be caught in the malaria deferral period.
- Spread to non malarial areas is a challenge.
 - Cases now reported in Malaya, Indonesia, Singapore and most recently in India.
 - Zika is now reported in 75 countries.
- No commercial tests available.
- 28 day deferral covers all 3 virus incubation and recovery periods.

Ebola

- Serious haemorrhagic fever virus found in several parts of Africa.
- 5 strains.
- Mortality 25 – 90% depending on strain.
- Initial infection from infected animals.
- Human to human spread by body fluids of symptomatic patients.
- Incubation period 2 – 21 days so trapped by malarial deferral rules.
- What if the partner of a returnee donates?
- Recent outbreak in the Democratic Republic of Congo:- 29 cases, 3 deaths as at end of April.
- Trial vaccines have been used and the outbreak appears to be under control.

Malaria

- Already a defined risk – we already test.
- But what if its geographical spread changes due to global warming?
- Malaria cases are now being seen in Greece.