Human Animal Infections and Risk Surveillance (HAIRS) group

Qualitative assessment of the risk that Zika virus presents to the UK population
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Published: February 2017
First published: February 2016
PHE publications gateway number: 2015697
About the Human Animal Infections and Risk Surveillance group

This document was prepared by Public Health England (PHE) on behalf of the joint Human Animal Infections and Risk Surveillance (HAIRS) group.

This cross-government group is chaired by the PHE Emerging and Zoonotic Infections section. The HAIRS group acts as a forum to identify and discuss infections with potential for interspecies transfer (particularly zoonotic infections).

Qualitative risk assessment for Zika virus in the UK population

<table>
<thead>
<tr>
<th>Date of this assessment</th>
<th>20 February 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
<td>4.0</td>
</tr>
<tr>
<td>Reason for update</td>
<td>First detection of <em>Aedes albopictus</em> eggs in the UK</td>
</tr>
<tr>
<td>Completed by</td>
<td>HAIRS scientific secretariat and members</td>
</tr>
<tr>
<td>Date of previous risk assessment</td>
<td>20 July 2016</td>
</tr>
<tr>
<td>Date of initial risk assessment</td>
<td>16 February 2016</td>
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</tbody>
</table>

Information on the risk assessment processes used by the HAIRS group can be found at https://www.gov.uk/government/publications/hairs-risk-assessment-process
SUMMARY OF RISK ASSESSMENT FOR ZIKA VIRUS IN THE UK POPULATION

Note: This risk assessment was completed to assess the current risk that Zika virus presents to the UK population

Overview

Zika virus (ZIKV) was first isolated from a sentinel Rhesus monkey in Uganda in 1947 and has circulated in many countries since then, although its detailed epidemiology is not certain. Outbreaks outside of Africa and Asia have been reported in parts of the Pacific region in 2007 and 2013. Cases occurred on Easter Island in February 2014, and in May 2015, the first locally acquired cases of ZIKV were confirmed in Brazil. Since then, the geographical range of Zika virus has expanded to many countries in North, South and Central America and the Caribbean.

ZIKV generally causes a mild infection. However, an unusual increase in the number of babies born with microcephaly in Brazil (8,451 suspect cases between 22 October 2015 and 9 July 2016 compared to the annually expected 150-200 cases) was proposed by the Brazilian ministry of health to be associated with the ZIKV outbreak. In addition, in a retrospective analysis, health authorities in French Polynesia reported an increase in central nervous system malformations in foetuses and new-borns following a ZIKV outbreak in 2013-2014. A number of countries, including Brazil, French Polynesia and El Salvador have reported cases of Guillain-Barré Syndrome (GBS) in individuals with a history of symptoms consistent with ZIKV infection.

There is now an international scientific consensus that Zika virus is a cause of microcephaly and other congenital anomalies (also referred to as congenital Zika syndrome) and GBS.

In the UK, the vast majority of diagnosed cases are in travellers returning from areas with active Zika virus transmission. Sexual transmission of infection is very rarely reported. As the UK lacks established populations of Aedes spp., no cases of Zika virus infection as a result of vector borne transmission have been reported. The risk to the UK population is predominantly related to travel to affected areas. On average, almost 1.4 million UK residents travelled to South and Central America and the Caribbean each year between 2010 and 2014, of whom 25% were women of child bearing age.

<table>
<thead>
<tr>
<th>Assessment of the risk of infection in the UK</th>
<th>Probability</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current situation: Very low</td>
<td>Current situation: Very low</td>
<td></td>
</tr>
<tr>
<td>Level of confidence in assessment of risk</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td><strong>Action(s)/Recommendation(s):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td></td>
<td></td>
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<tr>
<td>This remains an evolving situation; new evidence will be monitored and reviewed closely, particularly developments in Northern Europe.</td>
<td></td>
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<tr>
<td>Although it has been determined that Zika virus currently presents a very low risk to the UK population, this outbreak reinforces the need for a UK-wide contingency plan for the management of human and animals cases of exotic vector borne disease. This coordinated response is ongoing and includes early detection and control of invasive mosquitoes, along with ensuring all available controls are available for use.</td>
<td></td>
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<tr>
<td>For UK residents travelling to Zika virus affected countries, the HAIRS group supports the advice already provided by the respective health and travel authorities: Public Health England, Public Health Wales, Health Protection Scotland, Public Health Agency of Northern Ireland, National Travel Health Network and Centre and Fit for Travel.</td>
<td></td>
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</table>
Assessing the risk to the UK population from new and emerging infections

Step One: Assessment of the probability of infection in UK population

The likelihood of an infectious threat causing infection in the UK human population. Where a new agent is identified there may be insufficient information to carry out a risk assessment and this should be clearly documented.

<table>
<thead>
<tr>
<th>QUESTION</th>
<th>OUTCOME</th>
<th>QUALITY OF EVIDENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Is this a recognised human disease?</td>
<td>Yes</td>
<td>Good</td>
</tr>
</tbody>
</table>

Zika is a mosquito-borne infection caused by Zika virus, a member of the genus flavivirus and family Flaviviridae (1, 2). There are two main lineages, the African and the Asian lineage (3-5). ZIKV is transmitted by *Aedes* mosquitoes, principally *Aedes aegypti*. Although the incubation period has not yet been defined clearly, it appears to range from three to 12 days. Infection is often asymptomatic (60-80%) and generally mild and self-limiting, lasting two to seven days. Symptoms of ZIKV infection are similar to but usually milder than dengue or chikungunya virus infections and may include rash, itching/pruritus, fever, headache, joint and muscle pain, conjunctivitis, lower back pain and pain behind the eyes (6-8). Severe disease requiring hospitalisation is uncommon. Deaths associated with ZIKV are very rarely reported and mostly associated with underlying conditions (7, 9).

Infection with ZIKV can be confirmed by RT-PCR. Serological cross-reaction with related flaviviruses (eg dengue) means that such tests are problematic. No specific anti-viral treatment or vaccine is available or usually required for ZIKV infection.

In 2007, an epidemic occurred in Micronesia (Yap Islands in the Pacific Ocean), causing 5,000 infections (6). Outbreaks were notified in several islands of the Pacific region in 2013 and 2014 with 8,750 suspected cases in French Polynesia (10) and further spread to New Caledonia, the Cook Islands and later Easter Island (Chile) (11, 12). Cases of ZIKV infection were reported in Brazil from February 2015 onwards and autochthonous transmission was confirmed in May 2015. The circulating virus strain is of the Asian lineage.

Zika virus is now considered to be widely distributed across most of southern and central America and the Caribbean (see PAHO for latest epidemiological information). Localised outbreaks of ZIKV transmission have also been reported in Florida and Texas (see the US CDC for latest epidemiological information). In addition, since 2015 many countries outside the Americas have also reported ZIKV transmission (see WHO for latest epidemiological information).

Serious complications and deaths from ZIKV are not common. However, based on a growing body of research there is scientific consensus that ZIKV is a cause of microcephaly and other congenital anomalies [also referred to as congenital Zika virus syndrome (13)], and Guillain-Barré syndrome.
ii) Is this disease endemic in the UK?  

<table>
<thead>
<tr>
<th>No</th>
<th>Good</th>
</tr>
</thead>
</table>

No, Zika is not endemic in the UK. The vast majority of UK diagnosed cases are in travellers returning from areas with active Zika virus transmission. Sexual transmission of infection is very rarely reported. As the UK lacks established populations of *Aedes* spp., no cases of Zika virus infection as a result of vector borne transmission have been reported.

iii) Are there routes of introduction into the UK?  

<table>
<thead>
<tr>
<th>Yes</th>
<th>Good</th>
</tr>
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</table>

Introduction could occur via imported infected mosquitoes or viraemic individuals. However, significant onward transmission of ZIKV in the UK is contingent on the presence of competent mosquito vectors. No established populations of *Aedes* spp. are present in the UK.

Since 2015, an increase in travel-associated cases of ZIKV infection have been diagnosed in the UK has occurred in response to ongoing international outbreaks. In addition, sexual transmission of ZIKV infection has also occurred in the UK but is very rarely reported.

There is no evidence to suggest that ZIKV would infect animals in the UK. Although other species cannot be ruled out, non-human primates are the only known reservoir for ZIKV.

The main vector responsible for transmission of ZIKV is *Aedes aegypti*, which, in Europe, is only present around the Black Sea coast in Russia and Georgia as well as the island of Madeira (see ECDC mosquito maps). *Aedes albopictus* may also have a role as vector for ZIKV. This species has been imported into some areas of Europe via used tyres and wet-footed plants, and colonised new areas via main highway routes, having moved across regions in vehicles. *Aedes albopictus* has been reported in Paris for two consecutive years, and is expected to become established in further areas of northern France in the next few years (14). To date, there have been no reports of either species being established in the UK. Active surveillance programmes are run by PHE entomologists in collaboration with Port Health authorities (15, 16). However in recent months, reports have been published of the first detection of *Aedes albopictus* eggs in Kent (17) and an unusual finding of a male *Aedes aegypti* in Merseyside (Dallimore and colleagues, in press). Both findings were followed up, and so far in both cases, no further mosquitoes were found.

The main route of transmission of ZIKV is through a mosquito vector, and person-to-person transmission has not been widely reported. However mother-to-child transmission can occur, most probably transplacentally or during delivery in a viraemic mother (18). The virus has been shown to persist in semen for prolonged periods (19, 20). ZIKV has also been found in the female genital tract (21-24). A relatively small number of cases of sexual transmission of ZIKV have been reported, which have been mainly male-to-female. Limited reports of male-to-male and female-to-male transmission have also been reported. The risk of sexual transmission of Zika virus is considered to be low.

During the 2013 ZIKV outbreak in French Polynesia, 3% of blood donations were found to contain ZIKV by PCR (25) and thus transmission would be expected to occur via this route, although at this time there are no substantiated reports of transfusion transmission.
iv) Are there effective control measures in place to mitigate against these?  

<table>
<thead>
<tr>
<th>No/Yes</th>
<th>Good</th>
</tr>
</thead>
</table>

Shall the vector be found in the UK, a combination of source reduction to reduce aquatic habitat and control (adulticides and larvicides) would need to be implemented in order to reduce or eradicate the population. K-Othrine deltamethrin adulticide is licenced for use in the UK.

A UK-wide contingency plan for invasive mosquito control is being developed. In the event of established competent mosquitoes, there may also be a requirement for local mosquito control in the vicinity of imported human cases of Zika (and other VBDs).

In the UK since mid-2015, there has been a deferral of blood donors for four weeks for those who have visited countries under the tropical virus deferral guidelines, and for six months under current malaria deferral guidelines if the affected area also has a malaria risk. The tropical deferral guidelines also now specifically include countries where ZIKV is circulating. Any donors with confirmed or compatible symptoms indicating chikungunya, dengue or Zika virus infection after returning from a “Tropical Virus Risk” country cannot donate blood or tissues for six months from their return to the UK.

Advice for UK travellers to reduce the risk of sexual transmission has been in place since January 2016.

| v) Do environmental conditions in the UK support the natural reservoirs? | No | Good |

No. *Aedes aegypti* would not survive more than two or three days at temperatures below 14°C, although introduced individual mosquitoes might be able to survive for a few days or weeks in the summer months. It is too cold for *Aedes aegypti* to overwinter and establish in the UK (26). A recent review of historical distribution of *Aedes aegypti* has shown that established populations (up until the 1950s) were restricted to Southern Europe (27).

The **PROBABILITY** of human infection with Zika virus in the UK population: **VERY LOW**
Step Two: Assessment of the impact on human health

The scale of harm caused by the infectious threat in terms of morbidity and mortality: this depends on spread, severity, availability of interventions and context. Please read in conjunction with the Impact Algorithm following the boxes shaded green.

<table>
<thead>
<tr>
<th>Question</th>
<th>Outcome*</th>
<th>Quality of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Is there human-to-human spread?</td>
<td>No/Yes</td>
<td>Satisfactory</td>
</tr>
</tbody>
</table>

The overwhelming majority of ZIKV cases are vector borne but human-to-human and mother-to-child transmission also occurs. The virus has been shown to persist in semen for prolonged periods (19, 20). ZIKV has also been found in the female genital tract (21-24). A relatively small number of cases of sexual transmission of ZIKV have been reported, which have been mainly male-to-female. Limited reports of male-to-male and female-to-male transmission have also been reported. The risk of sexual transmission of Zika virus is considered to be low. Spread of ZIKV infection through transfusion or transplantation is not believed to play a major role in ZIKV transmission although 3% of blood donors in French Polynesia, asymptomatic at the time of blood donation, were PCR positive for ZIKV, supporting a potential risk of transfusion-derived transmission (25, 28).

ii) Is there zoonotic or vector borne spread? Yes

Yes (see previous section).

iii) For zoonoses/vector-borne disease is the animal host/vector present in UK? No

There are no established populations of Aedes spp. in the UK. So far, no invasive Aedes mosquito has been found at any UK airport or seaport that is part of the current network, despite considerable effort. A range of surveillance approaches have been used by PHE and partners as part of national efforts to understand the potential risk posed by invasive mosquitoes, and to help in preparedness for detection and control. Surveillance projects have included both passive (eg PHE Mosquito Recording Scheme and Mosquito Watch) and active surveillance. Active surveillance has been conducted at airports and seaports, at used tyre importer companies, and surveys at motorway service stations along the direct links from south-coast ferry ports and Eurotunnel. The recent reports of eggs of Aedes albopictus in Kent (17) and the findings of a male Ae. aegypti in Merseyside (Dallimore and colleagues, in press) highlight the UK’s vulnerability to mosquito incursion. However, the introduction of a mosquito via an aeroplane or through road vehicles does not necessarily constitute establishment. Ongoing surveillance in Kent will determine whether Ae. albopictus has established.

The **IMPACT** of Zika virus on human health in the UK: VERY LOW
Hatched boxes reflect the increase in reports of sexual transmission of Zika virus. Condom use is an effective intervention to prevent sexual transmission.

*This question has been added to differentiate between those infections causing severe disease in a handful of people and those causing severe disease in larger numbers of people. ‘Significant’ is not quantified in the algorithm but has been left open for discussion and definition within the context of the risk being assessed.
References


