Probable Transfusion-Associated Transmission of Powassan Virus, 2018

Jen Brown, DVM, MPH
State Public Health Veterinarian
Indiana State Department of Health
About the flaviviruses

Family Flaviviridae, genus *Flavivirus*

Prototype: Yellow fever virus

Arthropod transmission

Great public health importance
Most flaviviruses of public health importance are transmitted by arthropod vectors.

Mosquito-borne flaviviruses
- West Nile virus
- St. Louis encephalitis virus
- Dengue virus
- Zika virus
- Yellow fever virus
- Japanese encephalitis virus

Tick-borne flaviviruses
- Powassan virus (POWV lineage I)
- Deer tick virus (POWV lineage II)
- Tick-borne encephalitis virus
- Kyasanur Forest disease virus
- Alkhurma hemorrhagic fever virus
- Omsk hemorrhagic fever virus
Other transmission mechanisms have been established for some flaviviruses.

**West Nile virus**
- Blood transfusion
- Organ transplantation
- Laboratory exposure
- Mother to child

**Zika virus**
- Mother to child
- Sexual activity
- Blood transfusion
- Laboratory exposure
- Other?
About Powassan virus (POWV)

Tick-borne flavivirus

Rare cause of encephalitis in humans

Endemic in US in the Upper Midwest and Northeast

Vector: *Ixodes scapularis*

Reservoir: small mammals

Habitat: deciduous forests

Blacklegged tick (*Ixodes scapularis*). CDC.
White-footed mouse (*Peromyscus leucopus*). CDC.
Blacklegged tick habitat. ISDH.
*Ixodes scapularis* is a three-host tick.
*Ixodes scapularis* ticks have been found in most Indiana counties.
POWV is a rare cause of encephalitis in humans.

- Incubation period: one week to one month
- Initial symptoms
  - Fever
  - Headache
  - Vomiting
  - Weakness
- Severe disease: meningitis or encephalitis
- Fatality rate for those with severe disease: 10%
- Half of those who survive severe disease have long-term complications
An average of 13 POWV cases were reported annually in the US during the last 10 years.
In the US, most POWV cases are reported in the Upper Midwest and the Northeast.

Reporting period: 2009–2018
In July 2018, ISDH was notified that an Indiana resident had positive laboratory tests for multiple flaviviruses.

• Hospitalized with encephalitis in Wisconsin
• Past medical history of systemic lupus erythematosus
• Recent kidney transplant
• No international travel
• Ongoing neurological symptoms
## Patient lab testing

<table>
<thead>
<tr>
<th></th>
<th><strong>Prior to Illness Onset</strong></th>
<th><strong>After Illness Onset</strong></th>
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<tbody>
<tr>
<td><strong>Powassan virus</strong></td>
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</tr>
<tr>
<td>PCR</td>
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<td>-</td>
</tr>
<tr>
<td>IgM</td>
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<tr>
<td>PRNT</td>
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Four possible exposure mechanisms were investigated.

- Tick exposure in Wisconsin
- Tick exposure in Indiana
- Organ transplantation
- Blood transfusion
Kidney transplant
June 11

Transfusion A
June 12

Transfusion B
June 13

Transfusion C
June 16

Return to Indiana
June 27

Illness onset
Hospitalization
July 4

Discharge
July 11

Specimens collected
July 18

Hospitalization
July 14

ED visit
July 13

2018

Indiana
Wisconsin
Tick exposure in Wisconsin
Tick exposure in Wisconsin

Tick exposure in Indiana

Icons: Melissa Schmitt and Andrejs Kirma, The Noun Project
Tick exposure in Wisconsin
Tick exposure in Indiana
Organ transplantation
Organ donor

- Kidney recipient
- Lung recipient
Organ donor lab testing

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<tbody>
<tr>
<td>PCR</td>
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<td>IgM</td>
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Lung recipient lab testing

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Tick exposure in Wisconsin

Tick exposure in Indiana

Organ transplantation

Blood transfusion
## Blood donor lab testing

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<tr>
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<th>Donor A</th>
<th>Donor C</th>
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<td>Test Type</td>
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## Blood donor lab testing

<table>
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Conclusions

• Blood transfusion was the likely mechanism of POWV transmission in this case

• The benefits of blood transfusion outweigh the risks

• Healthcare providers should consider POWV to be a possible transfusion-associated pathogen
Prevention

• The benefit of screening blood donations for POWV is unclear

• There is no FDA-licensed test to screen blood donations for POWV

• Pathogen reduction technologies can inactivate viruses in plasma and platelets, but not red cells or whole blood

• There is no vaccine for POWV

• All people in areas with endemic POWV and other tick-borne pathogens should take precautions against tick bites
Before you go outdoors

• Know where to expect ticks
• Treat clothing and gear with permethrin
• Use EPA-registered insect repellents
While you are outdoors

• Avoid tick habitats
• Walk in the center of trails
After you come indoors

- Check your clothing and gear
- Check your pets
- Take a shower within 2 hours
- Check your body for ticks
How to remove a tick

1. Use fine-tipped tweezers. Avoid folklore remedies such as “painting” the tick with nail polish or Vaseline or burning it with a match.

2. Use the tweezers to grasp the tick as close to the skin as you can.

3. Pull upward with steady, even pressure. Don’t twist or jerk the tick. Flush the tick down the toilet, or save it in a Baggie or rubbing alcohol.

4. After removing the tick, clean the bite area and your hands with rubbing alcohol or soap and water.
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