Japanese Encephalitis (JE) in Australia

Relevance to Canada

InfoBulletin
June 2022

SIGNAL SUMMARY

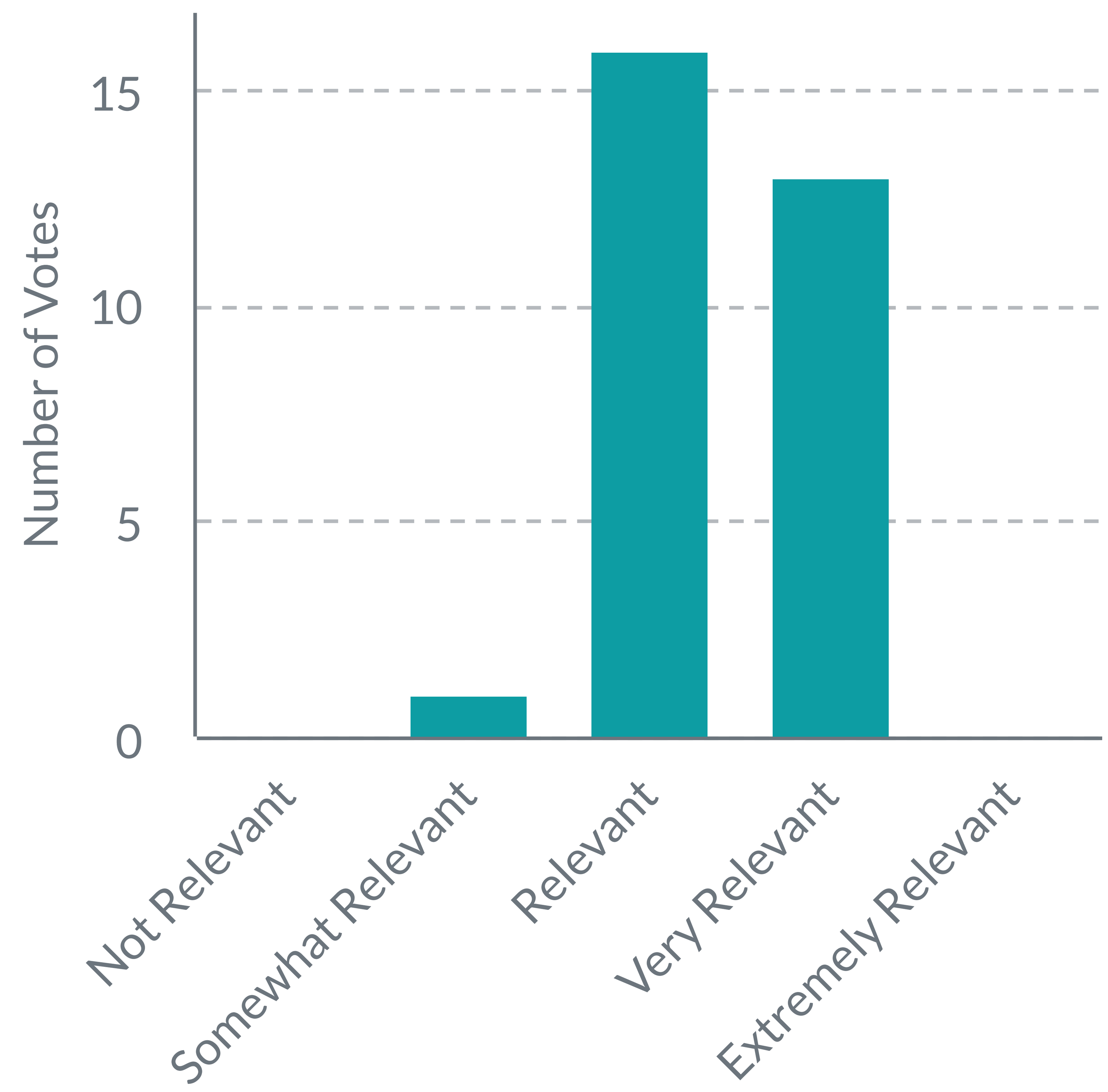
In February 2022, Japanese Encephalitis (JE) was detected in the Australian States of Victoria, Queensland, New South Wales, and South Australia, this is the first time that JEV has been detected outside of Northern Australia and was a very rapid range extension for the virus. (Government of Australia, 2022)

As of May 18, 2022, there were over 70 infected pig farms in Australia, as well as cases detected in horses, wild birds and a single alpaca (Government of Australia, 2022). Due to this outbreak, the Australian pork industry is expected to face production losses of approximately 80%. There have been 40 human cases of JE with five deaths. (Australian Department of Health, 2022).

This brief report provides evidence of the key factors of this threat from a Canadian perspective.

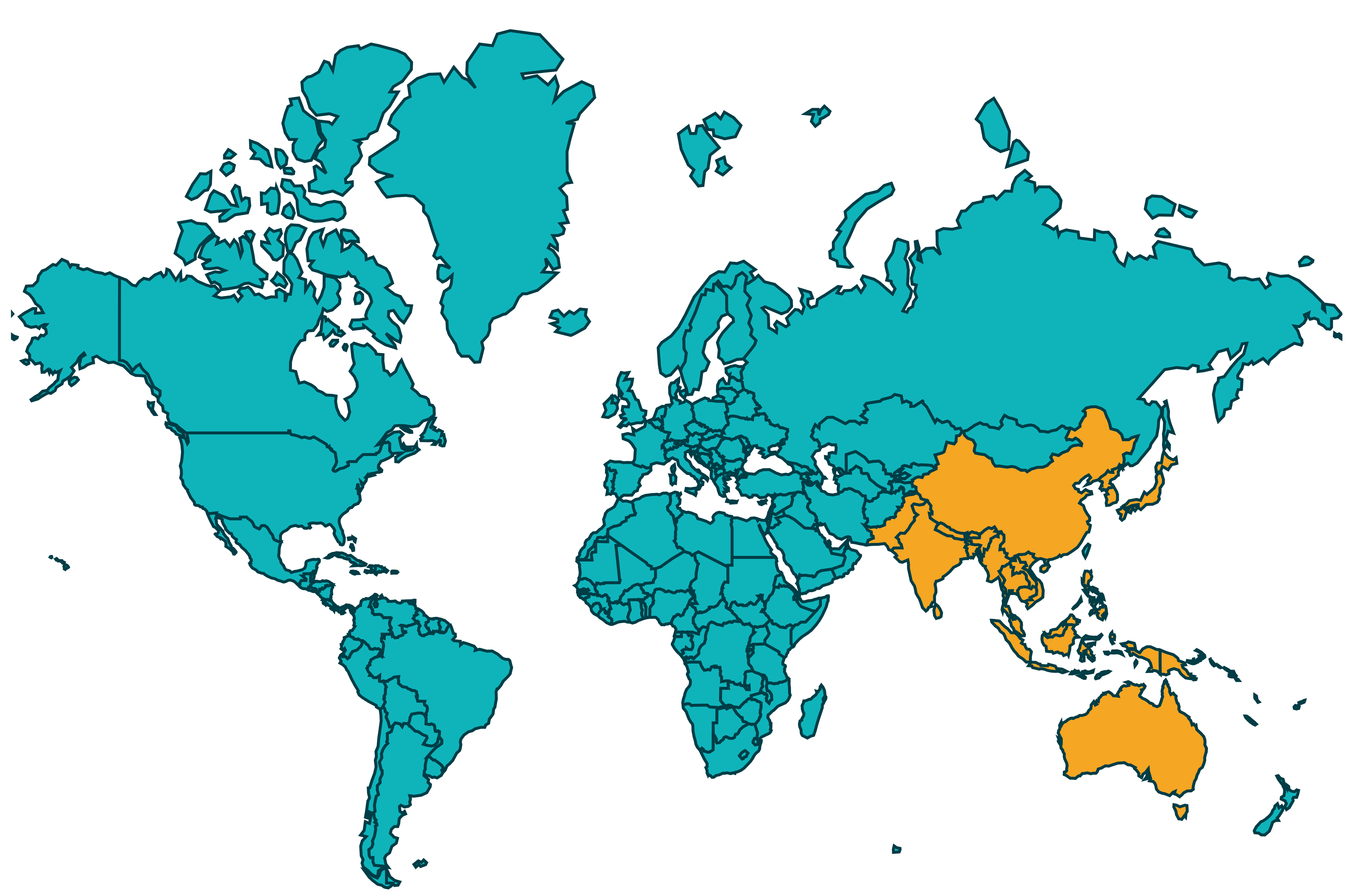
TRIAGE

This event was considered in scope for the Community for Emerging and Zoonotic Diseases (CEZD), and was originally sent as a ping poll to the community for feedback on March 14, 2022. The report was considered somewhat relevant to very relevant by community members.



GLOBAL DISTRIBUTION

Historically JEV has primarily been distributed through Asia. Until February of 2022, the only part of Australia affected was in the most northerly aspect of the state of Northern Australia.



Countries with published reports of detections

TRANSMISSION AND SUSCEPTIBLE SPECIES

JE is caused by the Japanese Encephalitis Virus (JEV), a mosquito borne Flavivirus, in the same genus as West Nile Virus and Dengue virus, among others.

Mosquito Vector

Culex sp. mosquitoes, primarily *Culex tritaeniorhynchus*, are the transmission vector of JEV, spreading the virus through their bite. (World Health Organization, 2019). JEV has been isolated from over 30 mosquito species, however simple isolation of the virus does not confirm vector competence. (Pearce et al, 2018)

Amplifying Hosts

The primary natural reservoir of JEV is ardeid birds, particularly herons and egrets. Ardeid birds are also considered amplifying hosts of JEV, as they experience a high enough level of viremia to facilitate transmission of JEV to the mosquito vector (Oliviera et al, 2018).

Swine are considered amplifying hosts of JEV as they experience high-level viremia that facilitates transmission of JEV to the mosquito vector. JE in swine causes reproductive failure, including stillbirth, spontaneous abortion, and decreased fertility in boars (SHIC Webinar 2022, SHIC JEV Infosheet 2021).

Dead End Hosts

JE in humans is often asymptomatic or causes mild headache and fever. Severe cases can progress to include encephalitis, seizures, and death. However, humans are considered dead end hosts as they do not generate a significant enough viremia to transmit the virus to the mosquito vector. (CDC 2019)

JE in horses is also often asymptomatic. However, more severe cases can result in fever, lethargy, neurological symptoms, and death. Horses are considered dead end hosts as they do not generate a significant enough viremia to transmit the virus to the mosquito vector. (Victoria State Government, 2022).

Additional species that have been identified as dead-end hosts that experience subclinical infection but do not have high enough viremia to transmit the virus back to the mosquito vector include cattle, sheep, goats, dogs, cats, chickens, ducks, wild mammals, reptiles and amphibians. (Center for Food Security and Public Health, 2016). A single alpaca has been identifed as infected with JEV during the current Australian outbreak.

LIFE CYCLE

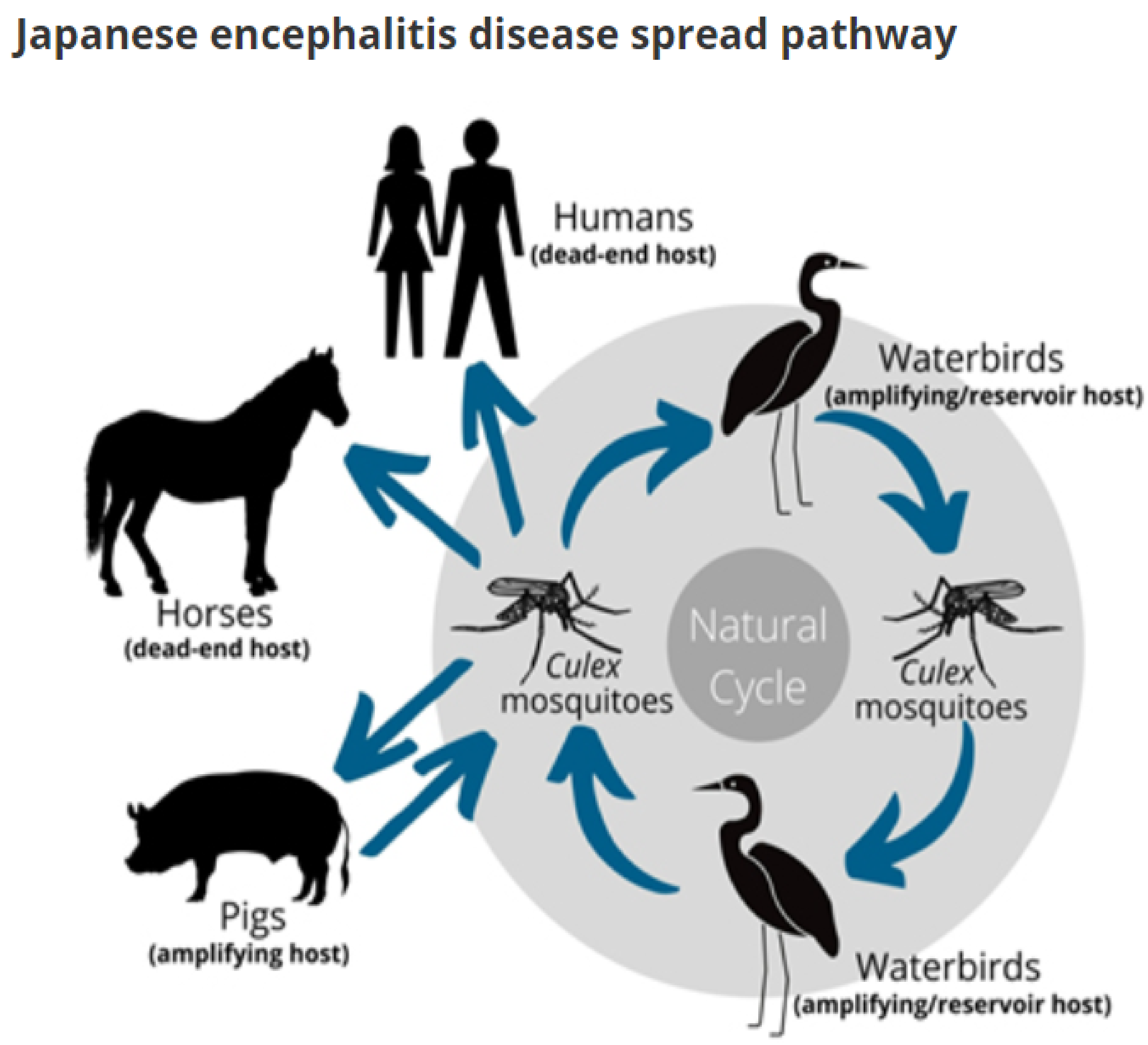


Figure credit: Australian Government 2022

IMPACT OF WARMING GLOBAL TEMPERATURES

Continuing climate change and increasing global temperatures impact the risk of JE. Temperature has a complex and variable impact on the replication of *Culex sp*. mosquitoes and JEV. Higher temperatures facilitate JEV replicating more effectively, resulting in vectors that are competent for infection. However, higher temperatures also result in higher mortality among *Culex sp*. which creates a smaller time period where transmission can occur (Foley et al, 2021).

An additional challenge posed by climate change with respect to JEV is increased flooding and other extreme weather, which can create increased standing water, resulting in larger mosquito populations.

POTENTIAL FOR INTRODUCTION TO NORTH AMERICA

A qualitative risk assessment conducted by the United States Department of Agriculture (USDA) outlines the potential introduction pathways to the United States. These same pathways are relevant in the Canadian Context.

These pathways include:
- Infected mosquito vectors
- Viremic animals
- Viremic migratory birds
- Infected humans
- Contaminated biological materials or animal products

The most likely mechanism of introduction to North America was determined to be infected mosquito vectors via airplanes. (Oliviera et al, 2019)

A subsequent quantitative risk assessment conducted by the USDA indicates that the risk of a single JEV infected mosquito being introduced to the US from Asia is high and that the most likely entry point is in California. (Oliviera et al, 2018)

Bird species present in North America have been found to have the capacity to act as amplifying hosts of JEV (Nemeth et al, 2012). If infected mosquitoes were transported to North America, and were able to infect amplifying/reservoir hosts, widespread distribution of JEV could occur; however, there is uncertainty in the likelihood of this occurring as previous infection with West Nile virus can provide cross-protective immunity against JEV in some bird species.

RESOURCES

World Organization for Animal Health
- Notifiable Disease Summary Information

World Health Organization
- Fact Sheet

Public Health Agency of Canada
- Japanese Encephalitis Diseases and Conditions Page

The Center for Food Security and Public Health
- Factsheet

Swine Health Information Centre:
- Australian JEV Outbreak Podcast

Swine Health Information Centre:
- Japanese Encephalitis Virus Factsheet

Government of Australia
- Public Health Advice
- Animal Health Advice

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