+61 7 3872 2246 actm@tropmed.org

Japanese Encephalitis Guidelines

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1 INTRODUCTION

1.1 Purpose of Guidelines

The purpose of this guideline is to aid travel health practitioners to assess the risk of Japanese encephalitis (JE) for individual travellers, educate them about preventive measures and determine whether vaccination should be recommended.

1.2 Pretravel Health Risk Assessment

Travellers from Australia and New Zealand are recommended to have a pre-travel consultation, including information on JE, when required. Travellers should consult with a health practitioner experienced in travel medicine. More than one consultation may be required particularly for those with complex medical history or complex travel plans.

When considering the risk of JE to a traveller we need to assess:

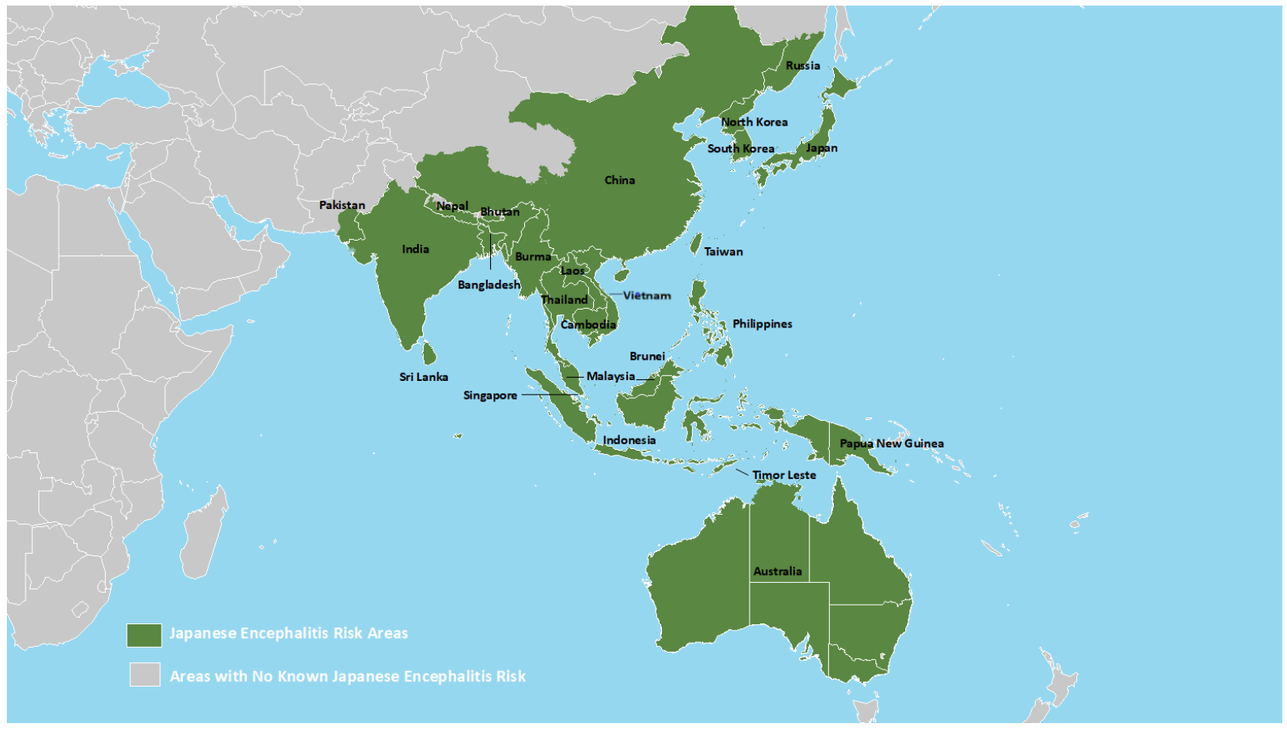
1. Is the traveller going to an endemic region of JE?

2. Is the traveller likely to undertake activities which may increase the risk of JE?
3. Is there sufficient risk to consider vaccination and what do we need to inform the traveller about the vaccine prior to this decision being made?
4. What other personal mitigation and preventive measures are available to reduce the risk of JE?
5. Advice on illness overseas or on return to Australia or New Zealand.

2 ENDEMIC AREAS FOR JAPANESE ENCEPHALITIS

JE is a viral disease, caused by an RNA flavivirus, spread through mosquito bites (WHO, 2024; CDC, 2025). JE is endemic in 24 countries in South-East Asia and Western Pacific regions and the most common vaccine-preventable cause of viral encephalitis in Asia (WHO, 2024; CDC, 2025). In Australia, local transmission was recorded in the Torres Strait, but more recently local cases were reported in the eastern states of Australia (McGuinness, 2023). No local transmission of JE has been reported in New Zealand (Morris, 2023).

Figure 1. Japanese Encephalitis, countries or areas at risk

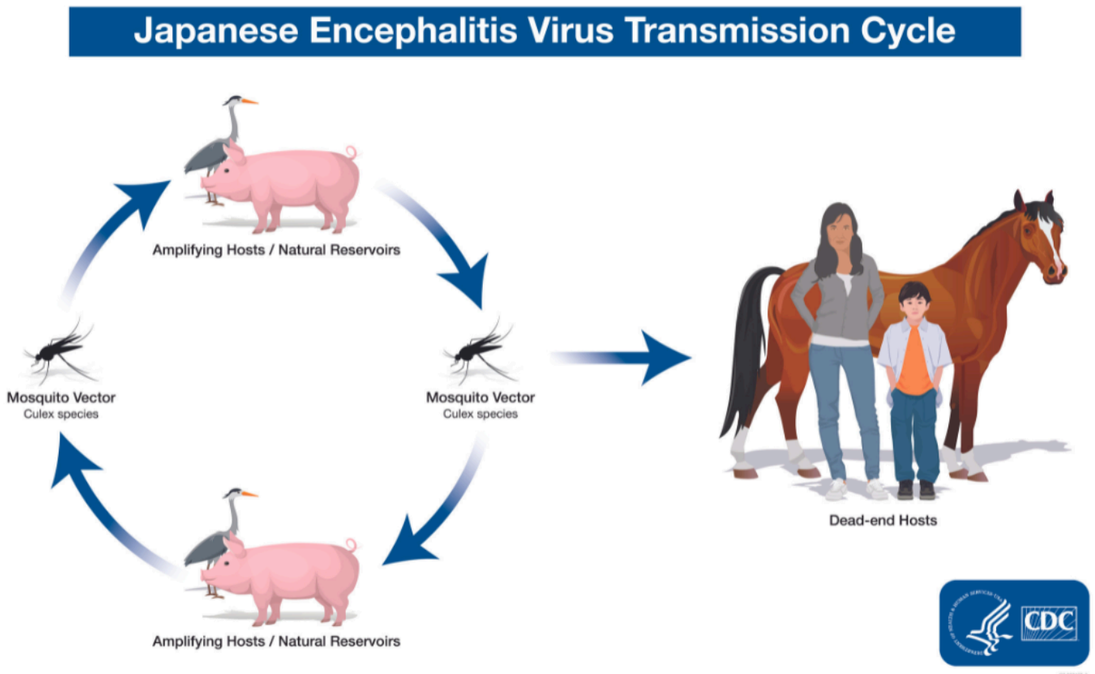


Source: Centers for Disease Control (CDC), 2024 available from https://www.cdc.gov/japanese-encephalitis/data-maps/index.html (accessed 13 February, 2025. Use of this link does not imply endorsement of this guideline by CDC, ATSDR, HHS or the United States Government.

JE virus is spread among humans by the bite of a Culex mosquito (see Figure 2 below) after they are infected by feeding on viraemic animal hosts which are often living in areas near rice paddies and piggeries (WHO, 2024; CDC, 2025). The mosquito habitats are rural and peri-urban areas of tropical and temperate regions, and their breeding grounds are stagnant waters (WHO, 2024; Solomon, 2000). Peak biting is usually between dusk and dawn (Solomon, 2000; Lindquist, 2018).

The main mosquito vector for JE virus in Asia *Culex tritaeniorhynchus* (WHO, 2024) and in Australia is *Culex annulirostris* (McGuiness, 2023; Klein, 2024).

Figure 2. Life cycle of JE virus



Source: Centers for Disease Control (CDC), 2024 available from https://www.cdc.gov/japanese-encephalitis/php/transmission/index.html#:~:text=JE%20virus%20is%20transmitted%20to,amplifying%20hosts%20or%20natural%20reservoirs). Accessed 13 February, 2025). Use of this link does not imply endorsement of this guideline by CDC, ATSDR, HHS or the United States Government.

Animals can be infected with the JE virus from a bite from an infected mosquito vector, but they cannot transmit the virus to humans directly.

- An **amplifying host** is one in which infectious agents multiply rapidly to high levels, providing an important source of infection for vectors, in this case, mosquitoes (Solomon, 2000). JE virus is amplified in cycles between infected mosquito vectors, the main reservoirs (waterbirds) and the amplifying hosts (mostly pigs) (CDC, 2025). Pigs rarely show signs of JEV infection, but the virus can cause abortion and stillbirth of their offspring as well as symptomatic infection in piglets (Solomon, 2000; SHIC, 2021).
- A **dead end host** is one from which infectious agents are not transmitted to other susceptible hosts. Humans and other large animals such as horses do not develop sufficient levels of JE viraemia to infect mosquito vectors and transmit onward to other potential hosts (CDC, 2025; Morris, 2023). JE virus cannot be transmitted between humans, or by eating meat or other products from an infected animal (Lindquist, 2018; Department of Health and Aged Care, 2024).

3 ACTIVITIES THAT INCREASE RISK

The risk of JE to travellers is low, but infection can be devastating. Approximately 1 in 100 infections are symptomatic and can result in severe disease, neurological sequela, and death. The risk of disease for a non immune traveller spending a month in a lower income country can be seen below (Streeton, 2024). It is estimated to be <1 in 1 million per month of travel although it is higher in those at higher risk of infection (Steffen, 2023; CDC, 2025). As mentioned, although symptomatic JE is rare, the case-fatality rate among those who develop encephalitis can be as high as 30% (Solomon, 2000; WHO, 2024; CDC, 2025). Permanent neurologic or psychologic sequelae can occur in 30% to 50% of survivors (Solomon, 2000; WHO, 2024; CDC, 2025). The annual incidence of clinical disease varies both across and within endemic countries, ranging from <1 to >10 per 100 000 population or higher during outbreaks (CDC 2025; WHO, 2024).

Table 1. Monthly incidence estimates of travel vaccine-preventatble diseases in nonimmune travellers*

Disease	Approximate incidence
COVID-19	4 in 100
Influenza	1 in 100
Dengue (symptomatic with seroconversion)	6 in 1000
Rabies risk (animal bite)	4 in 1000
Yellow fever	0.1–1 in 1000
Typhoid (South Asia)	2 in 10,000
Hepatitis A	1–7 in 100,000
Hepatitis B (Asia)	2 in 100,000
Tick-borne encephalitis (rural Baltics)	5 in 100,000
Measles	3 in 100,000
Pertussis	2 in 1,000,000
Typhoid (Africa, Latin America, Middle East, South East Asia)	8 in 1,000,000
Active tuberculosis	2 in 100,000
Typhoid (Caribbean, North East Asia)	<1 in 1,000,000
Japanese encephalitis	<1 in 1,000,000
Rabies (fatal)	<1 in 1,000,000
Meningococcal disease	<1 in 1,000,000
Cholera	<1 in 1,000,000
Diphtheria	<1 in 1,000,000

* Adapted from Steffen R, et al. Travel vaccines-priorities determined by incidence and impact. J Travel Med 2023; 30: taad085.[2]

Reproduced with permission from: Streeton C, Chu S. An update on travel vaccinations. Medicine Today 2024; 25(10): 47-58. Adapted from: Steffen R, et al. Travel vaccines-priorities determined by incidence and impact. J Travel Med 2023; 30: taad085.

Considerations of risk for the individual traveller:

- Length of travel
- Cumulative risk over time (multiple trips)
- Season of travel – wet or dry
- Accommodation type – air-conditioned hotel, no screens on windows or camping for example.
- City vs peri-urban vs rural
- Time likely to be spent outside from dusk to dawn – shift workers or travellers who may be camping/sitting around a campfire at night.

The risk of contracting JE is cumulative, and consideration should be given to lifetime risk, not just the impending trip i.e., people who visit endemic locations multiple times for short periods (Lindquist, 2018) have a higher risk of infection.
Individuals working in endemic areas need to be assessed for risk and it may be considered part of the employers' duty of care to their employee if they are to work in risk areas.

Table 2. Risk factors for JE virus infection (CDC, 2025; WHO, 2024; Lindquist, 2018; Steffen, 2023)

Duration of travel	• Travellers spending 1 month or more in endemic areas in Asia, PNG and Torres Strait during wet season. • The longer the travel (including cumulative time of multiple trips) the higher the risk in endemic areas
Destination	• Travel to rural/agricultural areas (rice paddies, water birds and pigs in region)
Activities	• Outdoor activities from sundown to sunrise
Season or time of year	• *Asian temperate or subtropical regions:* epidemics occur during the summer or wet season (April-May & September to October

	• *Tropical regions*: disease occurs throughout the year, more prominent during wet season
Accommodation	• No mosquito screen protection or mosquito nets

All of these factors should be considered when determining risk of infection.

An online calculator to estimate risk of disease in a traveller has been created and published by the University of Queensland and can be found here.

4 VACCINATION CONSIDERATIONS

Two JE vaccines are available:

- Imojev, a live attenuated vaccine
- JEspect, an inactivated vaccine

Australia has both vaccines readily available (ATAGI, 2024); Whilst JEspect is readily available in New Zealand (Medsafe, 2021), Imojev currently falls under 'Section 29' (provides access to unapproved medicines that have been imported into New Zealand by licensed wholesalers and pharmacies). This requires doctors to prescribe the vaccine with traveller's name before it is available for injection.

Each vaccine has different:

- Registered age groups
- Vaccine schedules (ATAGI 2024)
- Booster dose requirements
- Contraindications for use

In general, within Australia, Imojev is the preferred option (ATAGI, 2024). In those over 18, the vaccine is given as a single subcutaneous dose and once given, it is considered to give lifelong cover. Imojev is registered for use in babies 9 months and older (ATAGI, 2024). In those under 18 a booster is needed

after 1 to 2 years to provide long term cover. As the vaccine is a live attenuated vaccine it must be given on the same day or 28 days apart from other live vaccines (such as MMR, Varivax, BCG, yellow fever vaccine) (ATAGI, 2024). A vaccine checklist should be performed prior to administration to make sure there are no concerns regarding the individual receiving the vaccine. A pre-vaccination check list can be found in the Australian Immunisation Handbook.

JEspect is the preferred vaccine in individuals where Imojev is contraindicated (ATAGI, 2024). It is a 2-dose intramuscular regime given, one month apart (a rapid schedule can be given to adults if travel is imminent – day 0, day 7) (ATAGI, 2024). In adults over 18, a booster is given after 1-2 years if at continuing risk, which then gives cover for a further 10 years. This vaccine can be used in infants from 2 months of age in a reduced dosage however there is no data to inform whether boosters are required for those < 18 years (ATAGI, 2024).

Table 3. Vaccines available for JE prevention

	Imojev	JEspect
Type of vaccine	Live attenuated	Inactivated
No. doses	Single SC dose (see below)	2 IM doses 1 month apart (accelerated schedule for adults only day 0, 7)
Age groups	> 9 months	>2 months
Boosters	If <18 years give booster at 1-2 years after primary dose if ongoing risk	Yes ≥ 18 years at 1-2 years after primary dose if ongoing risk (valid for 10 years) < 18 years currently no data to inform recommendation for booster
Contraindications	• Pregnant women • Immunocompromised	<2 months

	• <9 months • Breastfeeding woman	
Administration with live vaccines	Give at same time as other live vaccines or wait 28 days	Can be given at any time in relation to other live vaccines

Clinicians should discuss vaccine considerations with travellers and can refer to the Australian Immunisation Handbook, which contains extensive discussion on the different vaccines to help determine which vaccine is preferable for an individual traveller. New Zealand does not yet have specific immunisation guidelines like Australia and can either follow Australian or other international guidelines.

The cost of the vaccine may appear prohibitive to some travellers however the sequalae if infected can be life changing therefore those at risk should understand the cost benefit of being vaccinated (Turtle, 2019; Janatpour, 2022).

Traditionally the JE vaccine has been recommended for travellers to endemic areas for a month or more in the transmission season. It was rarely offered for anyone on one off short package holidays to resorts and capital cities in Asia. However, due to cases occurring in short term travellers, the Australian Immunisation Handbook now includes discussion with all travellers visiting JE endemic areas. Vaccination should be considered for short-term travellers travelling to endemic areas, particularly if:

- the travel is during the wet season
- the traveller is staying in rural or peri-urban areas
- there may be ongoing or repeated travel to risk areas
- there is planned outdoor activity during travel, particularly in the evenings or overnight
- the traveller is staying in basic accommodation without air conditioning, insect screens or bed nets (CDC, 2025; ATAGI, 2024).

Research has and is being undertaken in Australia to establish effectiveness of intradermal vaccination (Furuya-Kanamori, 2023). This method can be used as a dose sparing measure in the event of an outbreak (ATAGI, 2024). This route is not yet recommended to be used for travellers as it is only for use by public health officials in outbreak settings (ATAGI, 2024).

Information on the immunogenicity of a single fractional intradermal dose of JE encephalitis live attenuated chimeric vaccine is available here (Furuya-Kanamori, 2023).

5 MITIGATION AND PREVENTION MEASURES

There are 2 ways to prevent JE (WHO, 2024; CDC, 2025; McGuinness, 2023):

1. vaccination
2. prevention of mosquito bites.

It is essential travellers are aware of the personal protective measures used to reduce the risk of insect borne diseases in general. It is particularly important for those at risk of exposure to JE who choose not to be vaccinated. It is also important to consider that JE is not the only vector borne disease prevalent in most JE endemic areas.

In general, travellers should be encouraged to wear clothing that covers as much of the body as possible and, in lighter colours (Solomon, 2000; WHO, 2024; ATAGI, 2024). Apply repellent to all exposed areas evenly, as directed by the product instructions (WHO, 2024; ATAGI, 2024).
Various insect repellent formulations are available (Webb, 2016; CDC, 2025).

- DEET (Diethyltolumide)
- Picaridin
- OLE (Oil of lemon eucalyptus)
- IR3535® (ethyl butylacetylaminopropionate)

These formulations are available in different concentrations of the active ingredient. All are effective against JE vector *Culex spp*. The strength (% active ingredient) influences how frequently they must be applied.

Further details on personal protective measures for mosquitoes are available in the Arthropod Borne Disease Guideline.

It is important that all travellers are educated on mode of transmission and how to prevent JE.

6 RETURNING TO AUSTRALIA OR NEW ZEALAND

It is important practitioners reinforce to travellers the need to seek medical attention if they develop a fever or become unwell during or after travel. This will ensure early and correct diagnosis of febrile illnesses in travellers.

In those that develop symptoms, the time from infection with JE virus until illness onset is typically 5-15 days (CDC, 2025).
Symptoms of JE infection:

- Fever, headache, and vomiting.
- Mental status changes, neurologic symptoms, weakness, and movement disorders might develop over the next few days.
- Seizures are common, especially among children.
- Among patients who develop encephalitis 20% – 30% die.
- Although some symptoms improve after the acute illness, 30%-50% of survivors continue to have neurologic, cognitive, or psychiatric symptoms (WHO, 2024; CDC, 2025).

Treatment of JE is supportive only and beyond the scope of this document.

6.1 Public health management

In Australia, JE is a notifiable disease therefore practitioners need to contact their state or territory public health unit if a patient is found to be infected.
In Australia in March 2022, JE was declared a communicable disease incident of national significance as part of a national emergency response. In June 2023 this emergency ended. See here for details.

State and territory public health authorities can provide advice on the public health management of Japanese encephalitis, including management of cases.

In New Zealand, whilst the disease is not currently notifiable, it is highly recommended that any patient found to have JE, be notified to the Ministry of Health Communicable Diseases Team.

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Dated 13 March, 2025

Written by Edith Torricke August 2023

Updated by Frances Daily March 2025

Next update scheduled for TBC

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Tel: +61 7 3872 2246

Email: actm@tropmed.org

PO Box 123

Red Hill Qld 4059