QUEENSLAND MUSEUM

MAMMALIAN MEAT ALLERGY

FACT SHEET



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Queensland Government

WHAT IS MAMMALIAN MEAT ALLERGY?

Mammalian meat allergy (MMA), also known as alpha-gal syndrome (AGS) or tick-induced red meat allergy, is an allergic condition where people develop an immune response to galactose-alpha-1,3-galactose (alpha-gal), a sugar molecule found in most mammalian meat. The allergy is triggered by a tick bite. Unlike typical food allergies, alpha-gal reactions are delayed, occurring 3–6 hours after eating red meat, making diagnosis difficult.

MMA is increasingly common in Australia, particularly on the east coast where paralysis ticks are prevalent.

Natural hosts

MMA is not an infection, so there is no natural reservoir host. Certain ticks are known to cause the immune response in humans that leads to MMA. In Australia, most cases are caused by the paralysis tick, *Ixodes holocyclus*. The condition can also be caused by other tick species in different parts of the world.

How is it spread?

MMA is one of the few known food allergies caused by an environmental trigger – a tick bite. When the tick bites, it introduces the sugar molecule alpha-gal into the person's bloodstream through its saliva, causing the immune system to produce IgE antibodies against alpha-gal (allergic sensitisation is the initial stage). Humans and primates do not naturally produce alpha-gal, so our bodies see it as 'foreign'. Once a person has become sensitised to alpha-gal, eating mammalian meat that contains the sugar will trigger an allergic response.

Multiple tick bites can worsen sensitivity.

Only ticks can cause MMA:

- MMA has no indirect transmission. A tick must bite a person and introduce alpha-gal-containing saliva directly into the bloodstream to cause sensitisation.
- Direct contact with animals or meat does not cause the initial sensitisation.
- MMA is not transmitted from human to human. It is an individual allergic response that develops after tick exposure.

A tick bite can cause you to develop the allergy, but not every person bitten by a paralysis tick will become allergic to mammalian meat.

Who is at risk?

- People living in, or visiting, areas with high paralysis tick populations (coastal eastern Australia, particularly New South Wales and Queensland).
- Outdoor workers and enthusiasts (e.g. farmers, bushwalkers, campers, gardeners, wildlife workers).
- People with a history of tick bites.
- Pet owners whose animals bring ticks into the home.
- People with other allergies or atopic conditions may be more susceptible.
- Anyone who has been bitten by a paralysis tick.



The Gold Coast, Sunshine Coast and Sydney regions have high rates of MMA due to paralysis tick prevalence.

What are the symptoms?

In animals

The paralysis tick feeds on native mammals (bandicoots, possums, kangaroos), domestic animals (dogs, cats, cattle) and humans. Of these, only humans do not naturally have alpha-gal in their tissues and so only humans can develop MMA. The other animals bitten by ticks do not experience allergic sensitisation. They may experience other ill effects from tick bites, but it is not possible for them to develop MMA since they naturally produce alpha-gal.

In humans

People bitten by ticks may become sensitised to alpha-gal but not develop symptoms until they eat mammalian meat. If MMA develops, it happens weeks or months after the initial tick bite.

Some people with MMA may have mild initial reactions to meat or products containing alpha-gal. Allergic reactions typically occur 3–6 hours after eating red meat (beef, lamb, pork) or mammalian products (gelatine or dairy products). The delayed onset makes diagnosis challenging as the symptoms could be mistaken for other conditions, like asthma. Symptom severity varies from mild to life-threatening. Fatty meats tend to cause stronger reactions than lean meats. Exercise, alcohol and taking non-steroidal anti-inflammatory drugs (NSAIDs) like aspirin after eating meat can make reactions stronger.

⚠ MMA can be fatal. Deaths are rare but they do occur.

Symptoms may include:

- hives
- an itchy rash
- swelling of lips, face, tongue, throat, or other body parts (angioedema)
- gastrointestinal symptoms: nausea, abdominal cramps, diarrhoea, vomiting
- difficulty breathing
- wheezing
- shortness of breath
- a drop in blood pressure
- dizziness or fainting
- anaphylaxis (life-threatening allergic reaction requiring immediate emergency treatment).

ⓘ Diagnosis can be especially tricky due to a delay of 3–6 hours between meat consumption and symptom onset.

How is mammalian meat allergy prevented?

Currently, there is no vaccine available for MMA. Prevention measures include:

- Avoid tick bites by staying on cleared paths when bushwalking.
- Use insect repellent (DEET or picaridin; spray clothes and hats).
- Wear protective clothing outdoors (long pants tucked into socks, a wide-brimmed hat and a long-sleeved shirt).
- When returning from an area known to have ticks, remove clothing and search for ticks, especially behind the ears, on the back of the head, in the groin, armpits and backs of the knees.
- Remove ticks properly (freeze with ether-containing spray; don't squeeze, as that may force more allergens or pathogens into the person).
- Maintain tick-free zones around homes by keeping grass short and removing brush (unwanted plants and weeds).
- Treat pets with tick prevention products.

Management measures for those with identified MMA:

- Strictly avoid mammalian meat (e.g. beef, lamb, pork, venison, kangaroo) and products (e.g. gelatine and dairy products in severe cases). It is safe to eat poultry (chicken, turkey, duck), fish, shellfish, eggs and plant-based foods.
- Carry an adrenaline auto-injector (EpiPen) if one is prescribed.
- Wear medical alert identification (e.g. a bracelet).
- Read food labels carefully to check for hidden mammalian ingredients (gelatine is a common ingredient).
- Inform doctors, dentists and healthcare providers if you have MMA as some medications and vaccines contain gelatine.

ⓘ Preventing tick bites is the only way to prevent MMA. Once sensitised to alpha-gal, the allergy persists.

What treatments are available?

There is no cure for mammalian meat allergy. Management focuses on avoiding mammalian meat and products, and treating allergic reactions if they occur. In some cases, the sensitivity may decrease over time if no further tick bites occur, but this is unpredictable. Antihistamines may help mild reactions. Severe reactions may require adrenaline (epinephrine) and emergency medical care.

ⓘ The allergy may fade if you avoid further tick bites for several years, but this is not guaranteed.

If you think you may have been exposed to a paralysis tick, please contact your doctor or public health agency for further advice.

Cover: An engorged female Australian paralysis tick (*Ixodes holocyclus*). QM, Jeff Wright
Page 2: A paralysis tick caught on a yellow hi-vis shirt. Courtesy: Alamy/LS Sandiford

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