

Tick Allergy

Distribution map of the Australian Paralysis Tick (*Ixodes holocyclus*)



Map adapted from Roberts FHS (1970) *Australian Ticks*. Yeerongpilly, QLD, Australia by TAGS Inc., Bill Conroy & Norbert Fischer.

Introduction

Like other arachnids (such as spiders, scorpions and house dust mites), ticks have eight legs. They pass through a number of life stages from egg to larva to nymph and then finally, the adult.

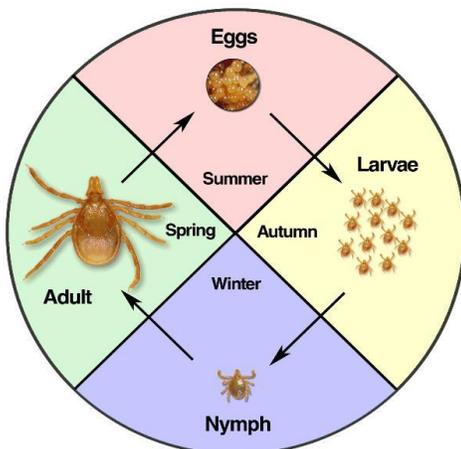


Illustration courtesy of Stephen Doggett, Dept of Medical Entomology, University of Sydney, Westmead

Health problems associated with tick bites include:

- Allergic reactions to tick bites;
- Allergic reactions to red meat and gelatin;
- Transmission of infections (less common than allergic reactions); and
- Tick paralysis (rare in humans, more likely to occur in children).

The focus of this article is *allergic reactions provoked by tick bites*.

Adult ticks cause the majority of health problems

Ticks are present mainly on the east coast of Australia, with known populations of ticks in several non-coastal areas (see map). Adult ticks cause the majority of the health problems in humans. All stages of ticks, however, are capable of provoking allergic reactions.

Larvae are very small, approximately 1mm in size and can be difficult to see, nymphs are slightly larger at approximately 2mm diameter with adult ticks (before a blood feed) being approximately 4mm in size.



Illustration courtesy of Stephen Doggett, Dept of Medical Entomology, University of Sydney, Westmead

Adult ticks attach to the tips of grass blades and vegetation, and from there transfer themselves to passing animals or humans. The tick usually crawls up inside clothing and attaches strongly to their host by biting through the skin, generally lodging in the skin of the head or neck or scalp of their host. The most common reaction is local irritation and swelling.

While the “tick season” is often considered to range from around February to August, ticks may be present at any time, therefore the risk of exposure remains throughout the entire year.

Allergic reactions to ticks

- Minor local itching and swelling is common at the site of a tick bite and is not due to allergy.
- Sometimes large local swelling and inflammation can arise at the site of a tick bite and last several days. Such reactions are usually due to mild allergy to the tick.
- Severe allergic reactions (anaphylaxis) have also been described to the Australian paralysis tick, *Ixodes holocyclus*.

Severe allergic reactions (anaphylaxis) occur when the tick is disturbed, for example, after inadvertently disturbing the tick by scratching something which can't be seen, by deliberate attempts at tick removal or by application of irritant chemicals such as methylated spirits or kerosene to the tick.

Disturbing the tick may cause the tick to inject more allergen-containing saliva.

General strategies for managing reactions to ticks

Regardless of the type of reaction experienced after tick bites, the principles of management are:

- Try to reduce the risk of accidental tick bites (see below);
- Do not scratch anything you can't see if you live in a tick-endemic area;
- Know what to do if you find a tick lodged in your skin (and how best to remove it);
- Know how to manage *allergic reactions* (including anaphylaxis) to tick bites;
- Have your tick allergy confirmed by a doctor. This may require referral to a clinical immunology/allergy specialist, particularly if you are at risk of anaphylaxis;
- Be aware of the association between previous tick bites and the development of allergic reactions to mammalian meats and/or mammalian meat-derived gelatin.

Unfortunately, allergen immunotherapy (commonly known as desensitisation) is currently not available to “switch off” tick bite allergy.

Reducing the risk of tick bites

The following measures may reduce the risk of tick bite:

- Wear long-sleeved shirts and long trousers when walking in areas where ticks occur;
- Tuck shirt into trousers;
- Tuck trouser legs into long socks;
- Wear a wide-brimmed hat;
- Wear light-coloured clothes, which makes it easier to see ticks;
- Brush clothing before coming inside to remove ticks;
- Undress and check for ticks daily, checking carefully in the neck and scalp;
- An insect repellent may help, particularly ones containing DEET (e.g. RID®, Tropical RID®, Tropical Aerogard®, Bushmans®);
- Consider using permethrin-treated clothing when exposed to tick habitat (e.g. gardening in tick endemic areas); and
- In those with *recurrent dangerous allergic reactions* to tick bites, relocating to an area where ticks are not endemic is an option to consider.

What to do if you find a tick lodged in your skin and you are NOT allergic to ticks

The aim is to first kill the tick with an ether-containing spray and then remove it as soon as is practicable and in as safe a setting as is possible. Doing so may reduce the possibility of you becoming allergic to ticks and may also reduce the risk of you contracting a tick-borne infectious disease or developing tick paralysis.

Common advice is to insert fine forceps or tweezers between the skin and the tick mouthpiece and lever the tick out. This method, however, does not prevent anaphylaxis in tick allergic individuals and therefore *ASCIA specifically advises against this method.*

What to do if you find a tick lodged in your skin and you are ALLERGIC to tick bites

If you are allergic to ticks, you should carry emergency medication -adrenaline (epinephrine) autoinjector (e.g. EpiPen®) and a means of summoning medical assistance (such as a mobile telephone).

- If you know you are allergic to ticks and you are having an allergic reaction to a tick bite, follow your ASCIA Action Plan, including the use of an adrenaline autoinjector if symptoms of anaphylaxis occur.
- If you find a tick, do *NOT* forcibly remove the tick, but rather **kill the tick first** by using a product to rapidly freeze the tick to prevent it from injecting more allergen-containing saliva.

- In a tick allergic person, the tick should be killed and removed in a safe place (e.g. an emergency department of a hospital) until it is established that the process of killing the tick and removing it can be safely performed by the tick allergy sufferer. Once this is established, ticks may be killed and removed without necessarily attending an emergency department, depending upon the individual circumstances and after consultation with your medical specialist. Some tick allergic individuals are so highly allergic that
- medical support should always be sought. Your medical specialist will advise you as to which approach will be safest for you.
- If suffering your first allergic reaction to a tick, seek urgent medical attention. The tick can then be removed under medical supervision where facilities are available to treat the allergic reaction.
- Ether-containing aerosol sprays are currently recommended for killing the tick. Aerostart® and other similar products have been used extensively to kill ticks in allergic patients. It should be noted that these products are not registered for use in humans and contains benzene but there is long term experience with these products which have been shown to be very effective in treating those with serious tick allergies.
- The use of other ether-containing sprays (e.g. Wart-Off Freeze®, Elastoplast Cold Spray®) has also been effective. These products will continue to be studied and advice updated as experience increases.
- If available, liquid nitrogen applied by a doctor should also (in theory) be effective.

It is important to note that:

- This advice is based on the clinical experience of those treating patients with tick allergy.
- Some of these products are not “registered” for use as therapeutic products for humans.
- All of these products are highly flammable, and thus should not be used near a naked flame or when smoking.
- Rapid cooling of the skin and thus skin irritation may occur.
- More information on these products may be obtained from manufacturers and distributors.
- Pending future studies of the effectiveness of various tick removal and killing methods, such advice is based on a consensus of “expert opinion” rather than derived from results of formal clinical studies.
- Freezing the tick (regardless of whether one is concerned about transmission of infection, tick paralysis or tick allergy) may also have the advantage of reducing the risk of tick sensitisation and later development of tick allergy or related allergic syndromes, as discussed below.

Confirming a diagnosis of possible tick allergy

At this time, there is no reliable skin or blood allergy test to confirm a diagnosis of tick allergy. Australian researchers have identified that the allergens causing problems are proteins in tick saliva. Diagnosis is currently largely based on the history of the reaction but some allergy test results have been associated with exposure to tick bites. Researchers have identified that the following blood allergy tests are positive in the majority of those with serious allergic reactions to tick bites, and that testing may assist in confirming the diagnosis:

- Mammalian meats Immunocap®.
- Alpha-galactose Immunocap®, a sugar molecule present in meat from mammals other than humans, great apes and Old World monkeys, as well as being found in the gut of ticks.
- Tryptase (an enzyme that is increased in those with a condition called mastocytosis, which is associated with an increased risk of allergic reactions to a number of allergic triggers including insect stings and tick bites and with more severe anaphylactic reactions to those insect stings and bites).

It is important to note that while positive red meat allergy tests are frequently seen in those with isolated tick bite allergy, routine avoidance of red meat and gelatin is *not* advised *unless* a patient has an allergic reaction to one of these foods as well. Nonetheless, patients should be aware of this possibility and informed by their doctors of the potential risk.

Tick bites and mammalian meat allergy

Australian allergic diseases physicians first described an association between tick bites and the development of mammalian meat allergy and these findings have since been confirmed by researchers in the USA and in Europe. A subgroup of these patients will also be allergic to mammalian milks and animal-derived gelatin (present in some food products, as a binding agent in some medications as well as in intravenous blood substitutes known as gelatin colloid (e.g. Haemaccel®, Gelofusine®). The target allergen associated with these allergic reactions appears to be a sugar molecule known as alpha-galactose, present in the gut of ticks (and probably tick saliva) and all mammalian meats except for humans, great apes and Old World monkeys

(e.g. beef, pork, lamb, kangaroo, venison, buffalo) and some more exotic meats eaten in some countries (e.g. guinea pig) in South America and ethnic specialty restaurants in North America and even Australia; and probably even whale meat (e.g. in Japan) as well as gelatin.

Researchers have identified that the following *blood allergy tests* are positive in the majority of those with serious allergic reactions to mammalian meat, and that testing (which can be ordered by any doctor) may assist in confirming the diagnosis:

- Beef, lamb, pork Immunocap®.
- Alpha-galactose Immunocap® a sugar molecule present in mammalian meats (but not in humans, great apes or Old World monkeys), as well as the gut of ticks.
- Elevation of tryptase (an enzyme that is increased in those with a condition called mastocytosis, which is associated with an increased risk and severity of allergic reactions to a number of allergic and non-allergic triggers including insect stings and tick bites).
- By contrast, blood allergy testing to gelatin is usually negative (even in patients who have had clear allergic reactions to gelatin orally or by injection).

In contrast, skin allergy testing to commercially available mammalian meats is much less reliable unless performed with raw, organic mammalian meats for confirmation (and very occasionally, even using raw meats, the diagnosis may not be confirmed). Gelatin skin testing results are highly variable, with often minor reactions on skin prick testing with gelatin, whilst intradermal injection skin testing is more reliable in diagnosing gelatin allergy.

Those with allergic reactions to mammalian meats are best advised to avoid all mammalian meats (beef, lamb/mutton, pork, goat, horse meat, kangaroo, venison and probably other more exotic mammals) and artificial blood (made from beef) as well as all forms of gelatin and to wear a medical bracelet warning of potential allergy to intravenous gelatin colloid (an intravenous preparation used as a blood substitute) as well.

Further advice on dietary avoidance strategies and tick-induced allergies may be found on the TiARA website.

Weblinks

Tick-induced Allergies Research and Awareness (TiARA): www.tiara.org.au
University of Sydney Department of Medical Entomology: medent.usyd.edu.au/fact/ticks.htm

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Content updated 2016