

resuscitation and are accompanied at all times.<sup>8</sup> This practice has been accepted by all the staff involved in resuscitation. Relatives require full practical and emotional support, and occasionally have to be escorted out of the resuscitation room.

Several possible benefits might follow from relatives being present during cardiopulmonary resuscitation. They would see that everything possible was done<sup>6,8</sup>; fantasy may often be worse than reality. They might help the medical team to decide when to discontinue resuscitation. Being present during resuscitation could help the next of kin in coming to terms with the death of a relative,<sup>8</sup> just as it is now accepted good practice to offer bereaved relatives the opportunity to see the dead body.

While doctors may have reservations about the presence of relatives during resuscitation,<sup>2</sup> the Foote Hospital experience suggests that when appropriate support and supervision is provided some of these fears (such as interference by the relatives in resuscitation) may be exaggerated.<sup>8</sup>

In conclusion, we believe that a prospective study with larger numbers may help clarify the significance of our results. In the meantime the recent publication from the Resuscitation Council (UK)<sup>6</sup> provides valuable guidelines for practice.

We would like to acknowledge assistance and advice from Dr E Glucksman.

- 1 Adams S, Whitlock M, Basket P, Bloomfield JF, Higgs R. Should relatives be allowed to watch resuscitation? *BMJ* 1994;308:1687-9.
- 2 Schilling RJ. No room for spectators [letter]. *BMJ* 1994;309:406.
- 3 Day J. Opportunity is appreciated [letter]. *BMJ* 1994;309:670.
- 4 Back D, Rooke V. The presence of relatives in the resuscitation room. *Nursing Times* 1994;90(30):34-5.
- 5 Redley B, Hood K. Staff attitudes towards family presence during resuscitation. *Accid Emerg Nursing* 1996;4:145-51.
- 6 *Should relatives witness resuscitation?* A report from a project team of the Resuscitation Council (UK). London: Resuscitation Council (UK), 1996.
- 7 Barnett V. *Sample survey: principles and methods*, 2nd ed. London: Hodder and Stoughton, 1991.
- 8 Hanson C, Strawser D. Family presence during cardiopulmonary resuscitation: Foote Hospital emergency department's nine-year perspective. *J Emerg Nursing* 1992;18:104-6.

## Tick bite anaphylaxis in Australia

Anthony F T Brown, Duncan L Hamilton

### Abstract

**Tick bite anaphylaxis has rarely been reported. It may follow the bite of any of the different tick life cycle forms, is related to the release of salivary juices, and may range from mild itch to severe wheeze or shock. Data obtained suggest that it is more common and potentially life threatening than tick paralysis, which is more widely reported. Emergency physicians should recognise this possibility following a tick bite and be prepared to give treatment such as adrenaline rapidly. Patients should be referred to an allergist after recovery.**

(*J Accid Emerg Med* 1998;15:111-113)

Keywords: anaphylaxis; tick infestations; tick borne diseases

Ticks and mites of the order *Acari* are specialised arachnids, successfully exploiting a wide variety of habitats. While mites are responsible for causing scabies, dermatitis including "grocers itch" or "grass itch," and various plant and animal infestations,<sup>1</sup> ticks appear better known, particularly for causing paralysis. Eight hundred species of ticks are described internationally, with 70 species in Australia,<sup>2</sup> of which at least 15 are known to have attacked man. Tick paralysis in Australia is caused by the common bush or scrub tick *Ixodes holocyclus* found in eastern coastal regions from northern Queens-

land to Victoria, although occasional cases have been reported due to *Ixodes cornuatus* found in southern New South Wales, Victoria, and Tasmania.<sup>3</sup> Adult female ticks are usually responsible, with the earliest symptoms following several days of engorging,<sup>4</sup> most commonly in spring and summer during warm, moist weather.<sup>5</sup> Up until 1945, 20 deaths from tick paralysis had been reported, mostly in children under three years of age.<sup>6</sup>

Tick paralysis is encountered worldwide, from North America, Western Canada, and Africa to Europe including the United Kingdom.<sup>7</sup> Several different genera of tick are responsible including *Dermacentor*, *Amblyomma*, *Ixodes*, *Haemaphysalis*, *Hyalomma*, and *Rhinicephalus*, most often affecting animals such as dogs, sheep, and cattle. Fewer species are definitely implicated in human disease, which typically affects young girls during the spring and summer months or adult males exposed occupationally during farming or forestry work.<sup>8,9</sup> In addition to paralysis, ticks have many other important medical effects including bite site infection, foreign body granuloma due to retained mouth parts, local allergy including dermatitis, systemic anaphylaxis, and such vector borne diseases as Lyme disease, tularaemia, tick typhus, Rocky Mountain spotted fever, ehrlichiosis, and babesiosis<sup>5,8,9</sup> (table 1).

The ill effects of native Australian ticks were first recorded in 1827, with definite human

Department of  
Emergency Medicine,  
Royal Brisbane  
Hospital, Queensland  
4029, Australia  
A F T Brown  
D L Hamilton

Correspondence to:  
Dr Anthony F T Brown,  
Staff Specialist, Department  
of Emergency Medicine,  
Royal Brisbane Hospital,  
Brisbane, Queensland 4029,  
Australia.

Accepted for publication  
8 September 1997

Table 1 Examples of tick borne diseases (see refs 4, 8, 9)

Classification	Causative agent	Disease
Bacterial	<i>Borrelia burgdorferi</i>	Lyme disease
	<i>Borrelia duttoni</i>	Relapsing fever
	<i>Francisella tularensis</i>	Tularaemia
Rickettsial	<i>Rickettsia rickettsii</i>	Rocky Mountain spotted fever
	<i>Ehrlichia chaffeensis</i>	Ehrlichiosis
	<i>Rickettsia australis</i>	Queensland tick typhus
	<i>Rickettsia honei</i>	Flinders Island spotted fever
	<i>Rickettsia conorii</i>	Boutonneuse fever
	<i>Coxiella burnetii</i>	Q fever
Protozoal	<i>Babesia</i> sp	Babesiosis
Viral	<i>Coltivirus</i> sp	Colorado tick fever

Table 2 Arthropod causes of hypersensitivity reactions

Caterpillars	Locusts
Cockroaches	Mites
Deer fly	Spiders
Hymenoptera	Ticks
Kissing bugs	

paralysis in Australia recorded by Joseph Bancroft in 1884. However, the first reports of acute tick bite anaphylaxis did not appear until the early 1960s.<sup>6-10</sup> Since then, only a few cases have been reported in Australia, the first to involve a child being in 1985.<sup>11</sup> The first reported case outside Australia was in America in 1991 and was due to *Ixodes pacificus*.<sup>12</sup> In this paper we report three cases of tick bite anaphylaxis seen in one adult emergency department in a single year, and when compared with the paucity of cases (three) admitted with tick bite paralysis in the previous five years in the whole of metropolitan Brisbane, we conclude that tick bite allergy is as important if not potentially more dangerous than tick paralysis.

### Case reports

#### CASE 1

The patient, a 43 year old female from the Brisbane outer suburbs, had experienced a pulseless episode followed by a hypoxic seizure in 1993 after her husband removed a tick from her scalp. She made a full recovery and was prescribed an adrenaline metered dose inhaler following referral to an allergist. On the present occasion she noticed a common bush tick on the right shoulder. She immediately called an ambulance. She became flushed, nauseated, and faint when an attempt was made to remove the tick. Her pulse rate was 110 beats/min and systolic blood pressure 100 mm Hg.

She took two 350 µg doses of adrenaline from her metered dose inhaler, and had a further 0.3 mg of 1:1000 adrenaline intramuscularly in the emergency department. The remainder of the tick hypostome was removed. She made a full recovery.

#### CASE 2

This patient, a 43 year old male forest worker from north west of Brisbane, claimed that tick infestation was common in his work. He had had an allergic reaction two years previously, requiring intramuscular adrenaline. On this occasion he noticed a common bush tick on the glans penis while showering after work. He removed this by squeezing at 23:30. At 04:30 he awoke with swollen genitalia, generalised urticaria, and a tight sensation in his throat. On arrival in the emergency department his pulse rate was 90 beats/min, blood pressure 120/60 mm Hg, and respiratory rate 16/min. He had no stridor or wheeze. Widespread urticaria was noted.

He was given 1:1000 adrenaline 0.3 mg subcutaneously, prednisolone 50 mg orally, and

promethazine 25 mg intravenously. He made a full recovery but declined allergy referral. He was discharged on loratadine 10 mg orally for three days.

#### CASE 3

This patient was an 18 year old female visiting a mountain resort in the Lamington range, south of Brisbane. She noticed a tick on the left side of her chest. This was removed but within 20 minutes she started to wheeze and noticed facial swelling. Her pulse rate was 110 beats/min, systolic blood pressure 110 mm Hg, and respiratory rate 22/min. There was widespread wheeze.

The helicopter rescue service with an emergency department registrar was activated and arrived 40 minutes later. She was given 1:1000 adrenaline 0.5 mg intramuscularly plus 1:100 000 adrenaline 50 µg intravenously. She made a full recovery on scene but was transported to hospital, where no further treatment was required. She was referred to an allergist.

### Discussion

Reports of allergic reactions to tick bites—whether due to the genera of hard ticks with a dorsal, sclerotised scutum belonging to the family *Ixodidae*, or soft ticks of the family *Argasidae* lacking the scutum—are rare.<sup>6-10, 11</sup> Moreover, allergic reactions, although well recognised, are poorly defined because of small sample sizes and a lack of reliable diagnostic tests.<sup>13</sup> Gauci *et al*<sup>13</sup> were the first to study allergic reactions to *Ixodes holocyclus* in Australia systematically. They classified tick bite reactions in 42 volunteers from south east Queensland referred for study by their doctors, employers, or themselves into six classes based on the clinical details. These included small local, large local, anaphylactic, atypical, tick paralysis, and tick borne infection reactions. Skin prick tests and radioimmunoassay indicated that all anaphylactic and atypical reactions were IgE mediated, while most (73%) large local reactions and a few (12.5%) small local reactions were also IgE mediated. IgE mediated reactions were more common in subjects reporting heavy exposure to ticks—whether occupational, domestic, or recreational—and in those with a history of atopy.

Humphery-Smith *et al* attempted to quantify allergic reactions to ticks by studying a population exposed to the seabird soft tick *Ornithodoros capensis*.<sup>14</sup> They found among 97 residents of Heron Island, Great Barrier Reef, that 10–15% suffered from hypersensitivity reactions. Some reactors showed cross reactivity to other arthropod allergens on radioallergosorbent testing. Control measures consisting of spraying the acaricide deltamethrin inside sleeping quarters were ineffective.

Tick bite allergy may be seen with any of the life cycle stages including the six legged larva, eight legged sexually immature nymph, and the male or female adult. It occurs rapidly upon feeding or following removal of the tick.<sup>11</sup> This is in contrast to tick paralysis, which usually

only occurs after several days of engorging by the adult female. Several major and minor allergens of 23 to 200 kDa have been identified by protein blotting from *Ixodes holocyclus*, with two consistent major allergens at 37 and 45 kDa, which are thought to be digestive enzymes released in salivary juice.<sup>15 16</sup>

Prevention of tick bite anaphylaxis includes awareness of intermediate hosts such as the bandicoot, dog, cat, possum, kangaroo, and echidna and avoidance of tick infested areas. Exposure may be reduced by sensible clothing and the use of insect repellent. Long sleeves and long trousers with the legs tucked in will reduce access by ticks that tend to drop onto humans having been attracted by movement.<sup>4 15</sup> Inspecting for tick infestation should concentrate on the trunk, axillae, neck, and scalp, as ticks migrate upwards over the body.<sup>8</sup> Removal is best achieved by first pressing the skin down around the embedded mouth part or hypostome, which is then gripped firmly as far forwards as possible with a pair of forceps or fine scissors. Gentle traction is applied, lifting and detaching the entire tick.<sup>1 3 4</sup> It is important not to squeeze the tick body during removal as this may cause further release of salivary juice.<sup>1 4</sup> Irritants or poisons such as kerosene, acetone, ethyl chloride, alcohol, or heat are ineffective and are not recommended, as they may damage the tick and increase the risk of complications.<sup>3 4</sup>

IgE mediated allergic reactions to tick bites are one of many arthropod hypersensitivity reactions known to affect humans (table 2). As our ability to recognise and accurately diagnose allergic reactions increases, the list of possible causes will continue to grow.

#### CONCLUSIONS

IgE mediated tick bite anaphylaxis is well documented, is likely to be related to salivary juices released from any of the tick stages, ranges from urticaria to severe wheeze or

shock, and subjects may have cross reactivity with other arthropod allergens. Our three cases seen in one year in a single department suggest that tick bite anaphylaxis is not uncommon. By contrast, in the previous five years ending in our study year only three cases of tick paralysis were identified by searching computerised admission data for the three adult, two paediatric, and one mixed emergency departments serving the whole Brisbane metropolitan region. All three were in children; only one received antitoxin and none required intensive care. Thus tick bite anaphylaxis appears more frequent and is potentially a greater threat to life than tick paralysis, certainly in south east Queensland.

- 1 Southcott RV. Some harmful Australian arthropods. *Med J Aust* 1986;145:590-5.
- 2 Sutherland SK. Ticks. In: Sutherland SK, ed. *Australian animal toxins*. Melbourne: Oxford University Press, 1983: 299-315.
- 3 Tibballs J, Cooper SJ. Paralysis with *Ixodes cornuatus* envenomation. *Med J Aust* 1986;145:37-8.
- 4 Playford G, Whitby M. Tick-borne diseases in Australia. *Aust Fam Physician* 1996;25:1841-5.
- 5 Pearn J. The clinical features of tick bite. *Med J Aust* 1977; 2:313-18.
- 6 Banfield JF. Tick bites in man. *Med J Aust* 1966;2:600-1.
- 7 Barber PA, Chambers ST, Parkin PJ. Australian paralysis tick bite. *NZ Med J* 1994;107:252-3.
- 8 Pearce RL, Grove DI. Tick infestation in soldiers who were bivouacked in the Perth Region. *Med J Aust* 1987;146: 238-40.
- 9 Spach DH, Liles WC, Campbell GL, Quick RE, Anderson DE, Fritsche TR. Tick-borne disease in the United States. *N Engl J Med* 1993;329:936-47.
- 10 Trinca JC. Insect allergy in Australia. Results of a five-year survey. *Med J Aust* 1964;2:659-63.
- 11 Kemp A. Tick bites. *Med J Aust* 1986;144:615.
- 12 Van Wye JE, Hsu Y, Terr A, Moss RB, Lane RS. Anaphylaxis from a tick bite. *N Engl J Med* 1991;324:777-8.
- 13 Gauci M, Loh RKS, Stone BF, Thong YH. Allergic reactions to the Australian paralysis tick, *Ixodes holocyclus*: diagnostic evaluation by skin test and radio immunoassay. *Clin Exp Allergy* 1989;19:279-83.
- 14 Humphery-Smith I, Thong YH, Moorhouse D, Creevey C, Gauci M, Stone B. Reactions to argasid tick bites by island residents on the Great Barrier Reef. *Med J Aust* 1991;155: 181-6.
- 15 Dorey CN, Thurn MJ, Broady KW. Allergies of the Australian paralysis tick [abstr]. *Eur J Allergy Clin Immunol* 1993; 48:S132.
- 16 Van Wye JE, Hsu Y, Lane RS, Terr A, Moss RB. IgE antibodies in tick bite-induced anaphylaxis. *J Allergy Clin Immunol* 1991;88:968-70.