

# Insect bites and skin infestations

**Insect bite reactions and skin infestations are common presentations to primary care physicians. However, accurate diagnosis and appropriate management of these problems is not always straightforward.**

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Insect bite reactions and skin infestations are common presentations to primary care physicians. Most patients complain of pruritus and are concerned about their risk of infecting others. Accurate diagnosis and appropriate management requires careful attention to the history and examination, and is not always straightforward. A good working knowledge of the possible pathogens, demographics and clinical presentations will aid management.

There are many members of the Australian arthropod world that are responsible for insect bite reactions and skin infestations (see Table). This article focuses on the dermatological perspective of the more common problems. Bee, wasp and other hymenoptera stings are not normally seen by dermatologists and will not be discussed.

## Insect bite reactions

There are many biting insects and arachnids in Australia that can produce clinical features. The dominant symptom is pruritus, which can range from being brief and annoying to an intractable debilitating itch lasting many months.

The effect on a host is caused by a variety of factors, acting singly or together, including mechanical trauma, the injection of allergens or toxins, infection, invasion of host tissues, contact reactions, retained mouthpieces, and transmission of disease. The host's susceptibility and immune response, as well as the type of arthropod and the number of its bites, will determine the severity of a reaction. The immune response has a profound effect on the clinical picture – good examples are the extreme reactions seen in patients with HIV

## IN SUMMARY

- The effect of an insect bite on an individual is caused by a variety of factors, acting singly or together. Most clinically significant reactions are due to the host's immune response to the injection of allergens or toxins.
- Mite attacks should always be considered when there is an unusual exposure, particularly to materials or foods that have been stored for long periods.
- Not treating all the close physical contacts of a patient with scabies is a common reason for treatment failure.
- Management of head lice can be problematic. Maldison may be effective, and there have been reports of success with ivermectin treatment. A newer approach is to use oral sulfamethoxazole-trimethoprim.
- A variant of Barmah Forest virus has been described that causes an uncomfortable, rosacea-like facial rash lasting several days before becoming more typically morbilliform. Resolution is rapid, with few, if any, systemic symptoms.
- All Australian doctors should be alert to the possibility of 'exotic' diseases because immigration and world travel have increased the likelihood of these presentations.

continued

**Table. Australian arthropods implicated in dermatological disease**

Arachnids	Insects
<b>Mites</b>	<b>Mosquitoes, gnats, midges and flies</b>
Scabies mite ( <i>Sarcoptes scabiei</i> )	Biting midges
House dust mites ( <i>Dermatophagoides</i> )	March flies and horse flies
Mites found in stored products, especially food and bulbs ( <i>Tyrophagus</i> , <i>Acarus</i> and <i>Glycyphagus</i> )	Stable fly ( <i>Stomoxys calcitrans</i> )
Grain mites	<b>Fleas</b>
Straw mites ( <i>Pyemotes</i> )	Human flea ( <i>Pulex irritans</i> )
Dog mite ( <i>Cheyletiella yasguri</i> )	Cat flea ( <i>Ctenocephalides felis</i> )
Cat mite ( <i>Cheyletiella blakei</i> )	Dog flea ( <i>Ctenocephalides canis</i> )
Rabbit mite ( <i>Cheyletiella parasitivorax</i> )	Bird fleas
Poultry red mite ( <i>Dermanyssus gallinae</i> )	<b>Lice</b>
Bird mites ( <i>Ornithonyssus</i> )	Head louse ( <i>Pediculus humanus</i> var. <i>capitis</i> )
<b>Ticks</b>	Body louse ( <i>Pediculus humanus</i> var. <i>corporis</i> )
Australian paralysis tick ( <i>Ixodes holocyclus</i> )*	Pubic louse ( <i>Phthirus pubis</i> )
Tasmanian paralysis tick ( <i>Ixodes cornuatus</i> )*	<b>Bugs</b>
Brown dog tick ( <i>Rhipicephalus sanguineus</i> )*	Common bedbug ( <i>Cimex lectularius</i> )
Kangaroo soft tick ( <i>Ornithodoros gurneyi</i> )	Assassin bugs
Bush tick or New Zealand cattle tick, an introduced species ( <i>Haemaphysalis longicornis</i> )*	<b>Beetles</b>
<b>Spiders</b>	Whiplash rove beetles ( <i>Paederus</i> )
<b>Scorpions</b>	<b>Butterflies and moths</b>
	<b>Bees, wasps and ants</b>

\* Hard-bodied ticks.

papules or papulovesicles cropping in clusters on exposed sites. Scratching can produce erosions and secondary infection. Occasionally there is frank ulceration. If chronic sensitisation occurs then plaques or nodules may form. Bullous reactions are common on the lower legs but may occur on other areas, especially in children (Figure 2). The victim can become sensitised to the bite so that a further attack can cause all previously bitten sites to become inflamed and itchy.

General management measures for insect bites are outlined in the box on page 41.

**Ticks**

Hard-bodied ticks are responsible for the more serious tickborne diseases in Australia, such as tick paralysis, tick typhus and Q fever. Local allergic reactions and papular urticaria are common reactions to the bite. The immature forms of the hard-bodied ticks may produce extensive generalised rashes in summer months. Retention of the mouthparts can produce a foreign body reaction and infection.

I have found that wiping the tick's head area with an alcohol swab and then using small artery forceps to grip the head of the organism at the skin, below its body, allows easy removal of the head and mouthparts. A firm tug is required. If mouthparts are retained then a small excision or punch biopsy may be needed.

infection and those with haematological malignancy (Figure 1). The reaction will eventually subside when the immune system no longer produces a delayed

hypersensitivity response.

A number of clinical patterns occur. The most common is papular urticaria with urticarial wheals, followed by firm



Figure 1. Papular urticaria following insect bites in a patient with Hodgkin's lymphoma.



Figure 2. Insect bite bullous reaction on the lower leg.



Figure 3 (left). The unusual rosacea-like facial rash of a variant of Barmah forest virus.

Figure 4 (above). Bedbug sensitivity.

## Mosquitoes, gnats, midges and flies

These insects are ubiquitous, and probably the most common cause of papular urticaria. Larger flies tend to produce painful, more solitary bites and are common in alpine areas, rainforest and some coastal parts of southern Australia. Biting midges, colloquially known as 'sandflies', are common throughout Australia, inhabiting freshwater creeks, intertidal estuaries

and mangroves. Western Australia has its own *Austroconops* biting midges.

Ross River fever and Barmah Forest togaviruses are spread by mosquitoes and are very common in coastal areas of eastern Australia. Both produce maculopapular eruptions on the trunk and limbs lasting several days and are associated with malaise and polyarthrititis. Of more recent interest is a variant of Barmah Forest virus that causes an uncomfortable, rosacea-like

facial rash lasting several days (Figure 3) before becoming more typically morbilliform. Resolution is rapid, and there are few, if any, systemic symptoms, including polyarthrititis.

## Fleas

Attacks from animal fleas are more likely when the fleas do not have access to their usual host. Severe attacks are sometimes experienced by individuals moving into

## Management of insect bite reactions

Management of insect bites reactions requires protection against further bites. This may involve wearing protective clothing and footwear, applying repellents containing DEET (diethyl toluamide), and avoiding exposure at the peak times of insect prevalence.

Relieving the itch will stop the excoriation process and allow the sensitisation component to burn itself out. Daytime non-sedating antihistamines and nighttime sedating antihistamines can be combined with topical corticosteroids. Moderately potent topical corticosteroids, such as mometasone furoate (Elocon, Novason), methylprednisolone aceponate (Advantan) or betamethasone dipropionate 0.5% (Diprosone, Eleuphrat) are best; an ointment base is preferable so the treatment persists on the skin for longer.

Tricyclic antidepressants provide sedation and are potent antihistamines. It is preferable to start with a low dose (e.g. 10 mg doxepin [Deptran, Sinequan]) and build it up slowly. Topical antihistamine creams are not advocated because of the risk of contact sensitisation. Calamine may be helpful.

If areas of weeping skin are present, twice daily soaks with potassium permanganate (diluted to give a very pale pink solution)

for 10 minutes can give great relief. Secondary infection is likely to be due to *Staphylococcus aureus*; treatment with an oral antibiotic such as cephalexin is suitable.

If a reaction is severe and there has been no relief using the above measures then it can be appropriate to treat with a small dose of oral prednisone (Panafcort, Predsone, Sone) or prednisolone (Panafcortelone, Predsolone, Solone) – start with 0.5 mg/kg and taper off slowly over four weeks while continuing other treatments. Tapering is designed to reduce the inevitable flare when doses below 15 mg/day are reached. A patient who has rubbed and scratched for long periods may have developed prurigo nodules and lichen simplex chronicus – these need to be treated with potent topical corticosteroids (e.g. betamethasone in propylene glycol [Diprosone OV]) and occlusion, usually with a wet dressing. Corticosteroid, such as triamcinolone (Kenacort) in strengths between 10 and 40 mg/mL, can be injected directly into lesions.

If the skin is still not settling then narrow band UVB therapy can be very helpful. Occasionally, patients will require steroid-sparing immunosuppression for a short time with medications such as azathioprine.

## Tips for diagnosing and managing scabies

Although scabies is a very common condition, familiar to most GPs, it remains a challenging infestation to diagnose and manage (Figure 5a). It should be considered in the differential diagnosis of all patients who itch, and sometimes in those with an unexplained rash who do not report any pruritus. Other patients may have severe pruritus but no obvious rash.

A careful history can reveal unsuspected disease contacts. This not only helps trace the source of the infection, but is also an essential step in managing the outbreak. Not treating all close physical contacts is a common reason for treatment failure.

### Diagnosis

The symptoms and signs of scabies are determined by the host's immune reaction to the burrowing mite, which explains the enormous variation in clinical features. The itch usually commences three to four weeks after the initial infection, but re-infection will produce an immediate response. Contacts may not itch much at all but still be highly infective.



Figure 5a. An infant with scabies.

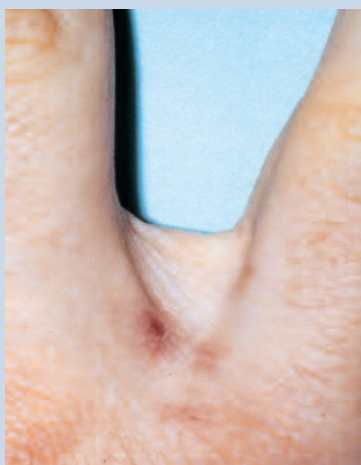


Figure 5b. A burrow in the interdigital web space.

FIGURE 5B REPRODUCED COURTESY OF DR STEVEN SHUMACK, SYDNEY

The itch is said to be worse at night, when the patient is warm, and it can be severe and intractable. It is poorly relieved by antihistamines, topical corticosteroids and moisturisers, and usually even by high doses of oral corticosteroids. This can be an important clue to the diagnosis, especially if a rather eczematous looking rash is present. Normally the head is not involved in the rash, except in infants.

The classic sign of scabies is the burrow, which looks like a small, heaped-up track of skin with a tiny black dot at one end. This is created by the female mite, which lays 40 to 50 eggs in her lifetime of four to six weeks. Most larvae do not survive, but some emerge after three or four days and leave the burrow to repeat the cycle. The average scabies patient will have about 12 adult female mites on the skin at any time. Common sites for burrows are the webspaces of the fingers (Figure 5b), the wrists, hand borders, insteps and penis. The palms and soles are other

premises that have been long empty but were previously occupied by pet cats or dogs – the vibration caused by footsteps triggers the emergence of flea larvae from their cocoons.

Household infestations with bird fleas may occur from nests or nest boxes located on or near the house. The site of the bites will reflect the exposure (e.g. bites on the lower legs from fleas living in flooring and carpets), but the bites may be widespread if the fleas have contaminated residents' bedding.

Management measures should include the treatment of pets with appropriate systemic agents for flea eradication on a

regular basis. Cheap flea treatments are available for infected flooring at most supermarkets; alternatively, a pest control company could be consulted.

### Bedbugs

Bedbugs are a widespread bloodsucking ectoparasite. Their bites are painless, but the saliva can produce severe sensitisation that can be widespread. Intensely irritating wheals or papules surmounted by haemorrhagic puncta are the characteristic reaction (Figure 4).

The insects may invade from bird nests or chicken runs. Eggs are deposited in floor cracks, mattresses and furniture,

and the adult bugs can survive without food for many months.

Bedbugs have been reported to be re-emerging as a frequent cause of papular urticaria in Australia. To eliminate them properly, the advice of a pest control company should be sought.

### Cockroaches

Cockroach debris contains allergen. On occasion, exposure to large amounts can induce contact urticaria and dermatitis.

### Beetles

Reactions to beetles can occur when the organism is crushed and the skin is

common locations in children and elderly patients. The presence of severe itch, linear excoriations or burrows on the penis and nodules on the scrotum is characteristic, and there may be pustules or small blisters at the site of the burrows. Some patients will be severely excoriated, with extensive secondary eczema or impetigo. Patients may have nodules or excoriated papules.

It is possible to prove the diagnosis beyond all doubt by scraping the burrow onto a glass slide for examination by the pathologist. Sometimes a skin biopsy will inadvertently display the mite (Figure 5c) or suggest the features of insect bite reaction.

In debilitated or immunosuppressed patients, crusted (Norwegian) scabies can occur. This is highly infective. Mite counts are very high, which reflects the inability of the host's immune system to deal with the infestation and absence of the protective mechanism of scratching.

## Management

To treat scabies, 5% permethrin cream (Lyclear, Quellada Scabies Treatment) is applied all over the body from the neck down, including the genitals, and left on overnight. In crusted scabies, the area under the fingernails must be included. It is advisable to re-treat the patient in six days for completeness. In infants, permethrin should also be used on the head and face. Permethrin is recommended for patients aged from 3 months upwards, but many experienced clinicians use it in younger infants. – the advice of a paediatrician or paediatric dermatologist is recommended.

In young babies, an alternative treatment is 10% sulfur in petrolatum, applied twice daily for four days. It is necessary to also treat the scalp and face. Lindane is no longer recommended because of its toxicity, and benzyl benzoate is very irritating to the skin.

All clothes and linen can be washed in hot water. Mites and eggs

exposed to the vesicant fluid. Skin penetration by hairs of the larvae can also produce papular urticaria, dermatitis and urticaria. A plague of whiplash rove beetles, *Paederus australis*, that had forced the evacuation of an Aboriginal community in the Northern Territory was reported in 1996.

## Moths and caterpillars

Contact exposure to the larval stages of moths and caterpillars can allow skin penetration of fine hairs (setae), which produces a foreign body reaction. Injection of venom also produces a localised, vesiculopapular dermatitis that may

resemble contact urticaria. This can be prolonged and occasionally severe, with urticaria, fever, malaise, local oedema and lymphadenopathy.

## Mites

There are many mites that can affect people. These include bloodsucking ectoparasites of birds and mammals, as well as mites occurring in stored products like grains with larval stages that feed on vertebrates. People can develop extensive itch, papular urticaria or dermatitis from exposure in a variety of circumstances, such as farm work, grain handling, floristry, and exposure to nesting birds,

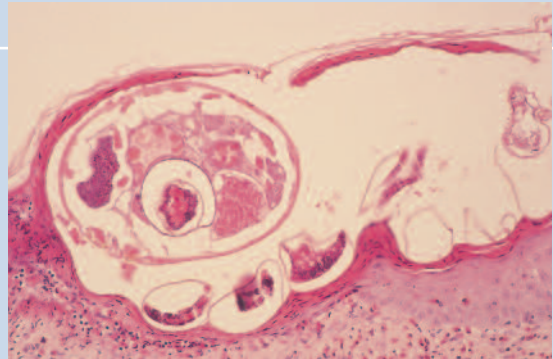


Figure 5c (above). Shave biopsy showing a cuticular mite within the stratum corneum.

FIGURE 5C REPRODUCED COURTESY OF PROFESSOR STEVEN KOSSARD, SYDNEY

can also be killed by storing clothing and blankets for three or four days in a sealed plastic bag because they do not survive away from the host for more than 36 hours. However, some studies have suggested that indirect disease transmission from bedding and clothing is relatively unimportant.

In large institutional outbreaks of scabies or immunosuppressed patients, oral ivermectin (Stromectol) is effective given in a single dose of 200 µg/kg. Repeat treatment in two weeks is recommended. The main concern with ivermectin has been reports of CNS toxicity in the elderly – specialist advice is recommended before proceeding.

In temperate climates, secondary infection is usually due to *Staphylococcus aureus*; in the tropics, *Streptococcus pyogenes* is also involved. Scabies infection is endemic in indigenous populations, and it is a serious cause of poststreptococcal renal and cardiac disease.

poultry, domestic animals and pets. *Cheyletiella* mites produce mange in cats, dogs and rabbits and can affect humans. Mite attacks should always be considered in a patient with suggestive features when there is a history of an unusual exposure, particularly to materials that have been stored for long periods.

The diagnosis and management of scabies, which is commonly encountered in general practice, are discussed in the box above.

## Head lice

Head lice infestation of the scalp hair is a very common problem in children, with

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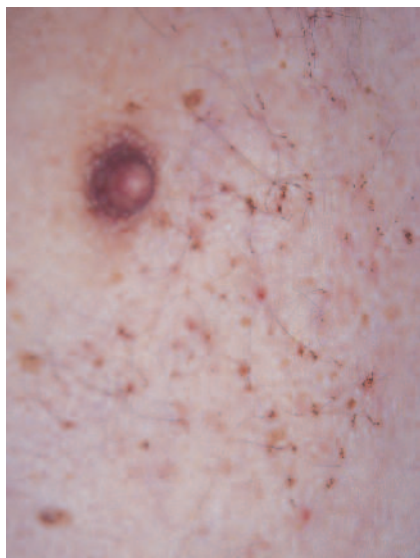


Figure 6. Body lice infestation with secondary irritation.

girls being more commonly affected than boys. The problem occurs in adults much less often.

The majority of infestations are acquired by head-to-head contact. Hair length, colour and thickness are not thought to be important factors. Fomites, such as pillows or clothing, are probably not very important in the spread of infection.

Itch is the predominant presenting symptom, but patients can develop secondary infection, nuchal lymphadenopathy, and dermatitis of the neck and shoulders. The presence of empty egg casts (nits) attached to the hair shaft, mostly in the occipital and parietal scalp, confirms the diagnosis.

Treatment is problematic because of the high incidence of lice resistance to the common pediculicides – the synthetic pyrethroids, permethrin and phenothrin. Maldison (Lice Rid) may be more effective but must be left on the hair for eight hours; lotions or creams at higher concentration are preferable to shampoos. Treatment should be repeated after seven days.

A new approach is to use sulfamethoxazole-trimethoprim, 10 mg/kg orally twice daily for 10 days, which kills bacteria in

the louse's gut that are essential for its survival. There are also reports of success with ivermectin (Stromectol), 200 µg/kg as a single dose; this must be repeated in 10 days to kill any newly hatched lice because the eggs are not destroyed by this agent.

Regular use of hair conditioner and fine combing helps to reduce recurrence. Lice in the eyelashes can be treated by applying petroleum jelly, which effectively suffocates the mite, and the eggs can be removed with a toothbrush.

### Body and pubic lice

The body louse, *Pediculus humanus var. corporis*, is the louse of poverty and neglect. Historically, it has been important for spreading epidemic typhus, trench fever and louse-borne relapsing fever. The organism flourishes on individuals who live in overcrowded, unhygienic situations and rarely remove their clothing. Patients present with widespread pruritus, sometimes associated with excoriations, erythema and papules (Figure 6). It is the clothing that harbours the lice and eggs – washing or hot tumble-drying at 60°C or simply destroying the clothing should eradicate the problem. Ordinary hygiene should prevent recurrences.

Pubic lice infestation is caused by *Phthirus pubis*, which is morphologically quite distinct from *P. humanus*. It can attack the eyebrows, eyelashes, beard, axillae, areolar hair and occasionally head hair, particularly at the scalp margin. Maldison and permethrin cream (Lyclear) are effective. Sexual contacts should be treated.

### Pelican itch

Pelican itch is a cercarial dermatitis caused by skin penetration of free-living schistosomes (trematode worms) of seabird origin. The intermediate host is the marine mollusc. The fluke cannot complete its lifecycle in the human host and dies. In Australia, it occurs in estuaries where seabirds visit – it probably can occur in the ocean but is more likely in concen-

trated still environments. Large amounts of aquatic vegetation and warm weather seem to encourage infestations, and it is common in the Great Lakes area of the NSW mid-north coast.

The clinical manifestations are due to local sensitisation and the immune response. There is a rapid onset of tingling lasting about an hour wherever there is water contact. A fine erythema may occur. Papular urticaria may develop within 12 to 15 hours, and usually subsides within about a week.

### 'Sea lice'

This is a misnomer applied to an itch or sting acquired while sea bathing. The irritation can occur at any time of year and in various coastal locations. There is believed to be no single causative organism, but a number of possible culprits have been proposed. These include small jelly-like creatures (such as hydroids, salps and ctenophores), pieces of jellyfish tentacles, glaucus (a tiny mollusc that eats jellyfish tentacles and uses them to sting its prey), and a seawater form of cercarial dermatitis. It is very common along the east coast of Australia, particularly on the north coast of NSW and Queensland.

Symptoms are usually mild and short lived, but excoriation can produce papular urticaria in those who are prone to more exaggerated bite reactions. The trunk and bathing suit areas are particularly affected.

### Final comments

This has been a brief overview of a wide-ranging topic, where accurate diagnosis may be difficult. Pattern recognition and careful history offer essential clues. There will always be regional variations in insect species and patients can often furnish the required local knowledge. The internet offers another invaluable resource for further exploration of this fascinating area of medicine.

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DECLARATION OF INTEREST: None.