

Advising on insect bites and stings

Alan Nathan provides information for responding effectively to people with insect bites or stings

Insect bites and stings are usually no more than a minor annoyance during the summer months but, in rare cases, they can have serious consequences. Pharmacies are often the first port of call for advice and treatment.

Insect bites

Insects usually bite in order to feed on the victim's blood. The skin is punctured and the insect's saliva is secreted into the dermis. The saliva usually contains enzymes or other agents to thin the blood in order to facilitate its flow back through the insect's feeding apparatus. It may also contain a local anaesthetic so that the bite goes undetected by the victim, allowing the insect to feed undisturbed. The bite itself causes little injury and lesions occur as a result of the immune response to antigens introduced by it.

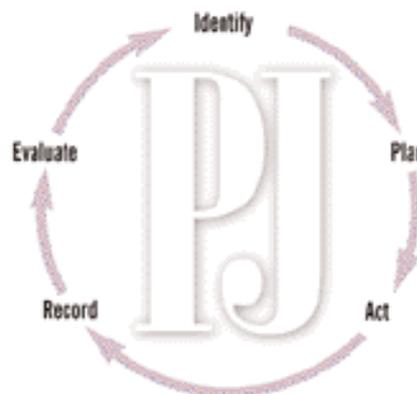
The time course of the reaction depends on the immune mechanism involved. An immediate urticarial wheal is produced through a type I allergic reaction (see Panel 1 for mechanism of allergic response), if a person is hypersensitive to the bite or is bitten several times at once or in quick succession. A firm itchy papule usually then develops over about 24 hours. Itchy papules, nodules or vesicles that develop within 48 hours following a bite are manifestations of a delayed hypersensitivity (type IV reaction). Repeated exposure to bites generally results in eventual desensitisation, with further bites causing little or no reaction.

In atopic individuals, particularly young children, papular urticaria can occur as a



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Infected bites may require treatment with flucloxacillin



Identify knowledge gaps

1. In your part of the country, which insects are the most likely to be responsible for bites?
2. Could you identify the possible warning signs of malaria?
3. Would you know what to do if someone is brought in to your pharmacy in anaphylactic shock from a bee or wasp sting?

Before reading on, think about how this article may help you to do your job better. The Royal Pharmaceutical Society's areas of competence for pharmacists are listed in "Plan and record", (available at: www.rpsgb.org/education). This article relates to "management of common symptoms" (see appendix 4 of "Plan and record").

result of bites or mere contact with sensitising insects or their body products. Crops of itchy red papules up to 2cm in diameter, which can develop into fluid-filled blisters, appear every few days during summer or autumn. They occur most frequently on the legs and other uncovered areas such as forearms and face, but can be scattered in small groups all over the body. The lesions can become secondarily infected through scratching. The most common causes are fleas and mites living on household pets. Common biting insects in the UK and the lesions they cause are described in Panel 2 (p558).

Malaria Although it has long been eradicated from the UK, each year about 2,000 people return infected from tropical areas of the world where malaria is endemic. The initial symptoms are non-specific and resemble those of influenza. Pharmacists have an important role in identifying suspected cases of malaria and referring people for investigation. They should be alert for symptoms of febrile illness occurring in adults or children, any time after the first week of possible exposure and for up to a year after return from a malarial area, including: raised temperature, headache, muscle ache, vague abdominal discomfort, lassi-

Panel 1: Mechanism of allergic response

Type I reaction Initial exposure to an antigen produces an antibody, antigen-specific immunoglobulin E (IgE), mediated by B-lymphocytes. IgE attaches to mast cells and basophils, which become sensitive to further antigenic material. On further exposure, the antigen binds to IgE, causing degranulation of the mast cells and release of chemical mediators, including histamine, leukotrienes and prostaglandins, which produce the inflammatory response.

Type IV reaction Delayed hypersensitivity that is cell-mediated rather than antibody-mediated and occurs over 12 to 72 hours after exposure. Allergens are taken up by antigen-presenting cells (eg, Langerhans cells in the skin) and migrate to lymph nodes where they stimulate T-lymphocytes to proliferate. These return to the site of allergen entry, activating macrophages and producing cytokines that cause inflammation.

Glossary

Abscess A localised collection of pus surrounded by inflamed tissue

Bulla A large blister

Macule A small, flat lesion, noted by a colour change

Papule A small, solid, usually conical elevation of the skin caused by inflammation, accumulated secretion, or hypertrophy of tissue

Wheal A suddenly formed elevation of the skin surface

Panel 2: Common biting insects in the UK and appearance of lesions

| Insect | Where found | Bite characteristics |
|---------------------------|---|---|
| Midges, gnats, mosquitoes | Common around rivers, ponds, lakes and reservoirs | The reaction involves small papular lesions; wheals and bullae develop in sensitised individuals |
| Fleas | On cats, dogs and other domestic animals | Bites are grouped in lines or in irregular clusters, often on the ankles and lower legs; they cause papular urticaria and occasionally bullae in sensitised individuals |
| Horse flies | In fields and hedgerows, especially near water, from May to September | Bites can result in an often painful wheal that can be accompanied by urticaria, dizziness, weakness, wheezing, or angio-oedema; secondary infection is common |
| Blandford flies | Around rivers, in an arc running from East Anglia through Oxfordshire into Dorset | Bites occur most frequently on the legs and are painful. The reaction varies from a small blister to a large, blood-filled, hard lesion. May be accompanied by fever or pain in the joints. |
| Bedbugs |  Old furniture, seams and folds of mattresses, bed frames and springs, in poorly maintained and dirty environments | Bites often do not cause sensitisation, with only a purple macule at the site; sensitised individuals, however, characteristically develop intensely irritating wheals or papules surmounted by blood-filled points; bites can occur anywhere on body, and in linear groups of three |
| Ticks | In tall grass and trees, and on animals (eg, deer and sheep) | Bites are not usually painful (there may simply be a red papule at the site) but can progress to local swelling and redness and, in some cases, blistering, severe pruritus and bruising. (Panel 3 describes the features of Lyme disease, a bacterial infection transmitted to humans via tick bites.) |
| Cheyletiella mites | On cats, dogs and rabbits | Intensely itchy papules form on the skin where mites have fed; there may be tiny blisters surmounting the papule; older lesions can show signs of necrosis |
| Mites in stored products | In grain, flour, dried meat, cheese and fruit | Bites result in intensely itchy minute, papules or papulovesicles |

Photograph: Sinclair Stammers/SPL

tude, lethargy and loss of appetite. As well as recommending prophylaxis to anyone planning to visit a malarial zone, pharmacists should advise travellers to take measures to avoid being bitten by mosquitoes.

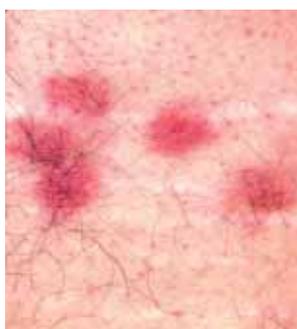
Stings

Insect stings are weapons, either of attack (when used to incapacitate prey) or of defence (when a threat is perceived) and their effect is intended to be immediate.

The pain and inflammation of a bee or wasp sting is caused by the direct pharmacological effects of its constituents. These include: histamine and other biogenic amines; toxic polypeptides (including melittin, which has a haemolytic effect); apamin (which is neurotoxic); mast cell degranulating peptide (which causes further release of histamine); and enzymes (such as hyaluronidase and phospholipase, which break down intercellular tissue cement and assist penetration of the venom into the tissues).

Common stinging insects Stinging insects commonly encountered in the UK are wasps and bees. Three main types of wasp are responsible for most stings:

- Yellowjacket — the most common wasp, with a smooth, yellow and black striped



Flea bites are grouped in irregular clusters or in lines

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body. They are aggressive and are widely distributed in both town and country

- Paper wasp — stripes are generally more red and brown than yellow and black. They are more often found in rural locations and are less aggressive than the yellowjacket
- Hornet — a bigger and more yellow version of the yellowjacket

There are two main types of bee: the European honey bee (black and yellow striped, with a hairy body) and the bumblebee (larger and more hairy than the honey bee). Bees are generally less aggressive than wasps.

The stinging apparatus of bees and wasps consists of a sac of venom attached to a stinger. Once the stinger has pierced the skin, the insect's abdomen contracts to compress the sac and the venom is deposited in the victim's tissue. After stinging, wasps extract the stinger from the victim, but a bee's stinger is barbed. It is torn off the bee as it pulls away and is left in the wound. The sting stays connected to the venom sac, which continues to pump venom into the wound for up to a minute from the time of insertion. Bee stings should, therefore, be removed as quickly as possible, by gently scraping away with a fingernail. A bee sting is thought to deliver around 50mg of venom and a wasp or hornet

■ Alan Nathan, BPharm, FRPharmS, is a freelance pharmacy writer and consultant

Panel 3: Lyme disease

Lyme disease is an infection caused by the spirochaete, *Borrelia burgdorferi*, which is transmitted in the UK by the ticks *Ixodes ricinus* and *I. persulcatus*. The main vectors are deer, rodents and sheep, but ticks can also be carried on cats, dogs and horses. The consequences of infection can be serious, but the prognosis is good if the condition is diagnosed and treated early. In common with other spirochaete infections, such as syphilis, the disease occurs in three phases: early, middle and late, which are usually separated by an asymptomatic interval.



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Early phase Only one third of victims are aware of the bite, which is a red macule or papule, most commonly in the groin, thigh or armpit, but within days or weeks the victim develops erythema chronicum migrans (a spreading, red, flat rash originating at the bite site), symptoms of systemic infection (including fever, headache, stiff neck, arthralgia and myalgia, swollen lymph glands, lethargy and fatigue) and multiple secondary skin lesions. The initial symptoms resolve within three to four weeks, although the skin manifestations may recur.

Middle phase If the rash is untreated, 60 per cent of patients get brief attacks of arthritis, particularly in the knee, 15 per cent have neurological problems and 8 per cent develop cardiac conditions. These usually occur within four weeks of the initial illness and resolve over three months. Erythema chronicum migrans may also recur, and the victim may have ocular and hepatic problems.

Late phase If the illness has not been treated, months or years later serious chronic arthritic, dermatologic, cardiac and Parkinson's disease-like conditions can develop.

Treatment For early stage disease, treatment is with oral doxycycline 200mg *ad* for 14 days (contraindicated in children) or cefuroxime 500 mg *bd* for 14 days. Intravenous cefotaxime, ceftriaxone or benzylpenicillin, for up to four weeks, is used for middle and late phase treatment.

Prevention In areas where Lyme disease is endemic, bite avoidance measures should be taken. For example, legs and arms should be covered and sleeves and trouser bottoms secured so that ticks cannot gain entry. No vaccine is currently available.

Removing ticks A tick will remain attached to a host to continue feeding. It is necessary to remove ticks as quickly as possible, as follows:

- First cleanse the area gently with an antiseptic solution or soap and water.
- Using blunt tweezers or gloved fingers to grasp the tick as close to the skin as possible, gently pull it directly away from the skin.
- If the tick's head breaks off in the skin, remove it with tweezers, like a splinter.
- Wash the hands and the area around the bite with an antiseptic solution.
- Take care not to use sharp tweezers, crush, puncture or squeeze the tick's body, or use a twisting or jerking motion when removing the tick.

sting around 3 to 15mg. Bee venom also appears to contain a higher proportion of toxic polypeptides than wasp venom and the likelihood of allergy to bee stings is greater than allergy to wasp stings.

Effects of stings Typically, insect stings produce intense, burning pain followed by redness and a small area (up to 1 cm) of oedema, which usually subsides within a few hours. However, in sensitive individuals there may be a systemic allergic reaction severe enough to cause anaphylactic shock. (For details of anaphylaxis, which requires emergency treatment, see Panel 4, p560.)

Treatment of bites and stings

Over-the-counter preparations marketed for the treatment of bites and stings are generally intended to suppress cutaneous sensory receptors, and contain antihistamines, local anaesthetics, antipruritics and soothing constituents. Hydrocortisone is also licensed to treat insect bites.

Antihistamines Histamine is one of the main mediators of the inflammatory response to bites and is also a principal component of insect stings, so treatment with antihistamines would seem logical. Several topical products containing antihistamines are licensed for treatment of the pain, itching and inflammation associated with bites and stings. However, these have been criticised for not being effective. Topical antihistamines can also cause sensitisation so they should not be used more often than twice or three times a day for a maximum of three days. Oral antihistamines are more likely than topical preparations to bring sustained and effective relief. Non-sedating compounds are preferred; they are as effective as older antihistamines for peripherally mediated reactions but are not associated with central sedating and antimuscarinic side effects.

Local anaesthetics The effectiveness of local anaesthetics in the treatment of bites and stings is debatable. Sensitisation on prolonged usage is also an acknowledged problem and licensing restrictions on the length of use take account of this. Sprays, creams and lotions are available, usually containing benzocaine. They are likely to be most useful immediately after a bite or sting because they will produce relief, although short-lived, when the pain is most intense. The cooling effect produced by the evaporation of the propellant in spray formulations will also contribute to the pain relief.

Other topical antipruritics Crotamiton, available as cream or lotion, has antipruritic properties and can be used for bites and stings. It is claimed to have a prolonged action (six to 10 hours following application).

Calamine is naturally occurring zinc carbonate with ferric oxide, which imparts the characteristic pink colour. It is mildly astringent and its soothing antipruritic action is due to the large surface area and porous nature of its particles, which promote the evaporation of water from the preparations in which it is formulated, with a consequent cooling effect. Calamine Lotion BP also contains 0.5 per cent phenol as a preservative, which has a local anaesthetic action and contributes to its effectiveness. Calamine has been used for generations to treat urticaria and pruritus from many causes, including insect bites. It is cheap and there are few restrictions on its use. Zinc oxide has similar properties.

Ammonia solution Ammonia is claimed to have a neutralising effect on bites and stings and is frequently recommended in consumer literature and on websites. However, apart from a documented report of the successful

Panel 4: Anaphylaxis

Anaphylaxis is a potentially life-threatening type I allergic reaction. Causes include foods, medicines and latex, as well as insect venom. Incidence is estimated at about 8 per 100,000 per annum, with about 60 per cent of reactions caused by insect venom.

Anaphylactic shock is a rare but extreme allergic reaction, resulting in acute circulatory failure in which cardiac output is inadequate to maintain normal perfusion of blood to major organs, leading to a sudden and profound drop in blood pressure, light-headedness, giddiness, and fainting, accompanied by tachycardia. Breathing difficulties due to bronchospasm and throat swelling also often occur. Shock can develop within minutes, and victims can experience seizures, become unresponsive, and die.

Emergency treatment Immediate treatment is necessary for laryngeal oedema, bronchospasm and hypotension due to anaphylaxis, and the following steps should be taken:

- Call an ambulance
- Secure the airway
- Give intramuscular adrenaline if there are signs of shock, airway swelling or definite breathing difficulty. Patients with known hypersensitivity usually carry an auto-injector pen containing adrenaline 1 in 1,000 (1mg/ml) for emergencies. There is an exemption to the legal restrictions controlling the supply and administration of medicines allowing adrenaline injection 1 in 1,000 to be administered by anyone for the purpose of saving life in an emergency.

Prevention Measures that hypersensitive individuals should take to minimise the possibility of being stung include:

- Being cautious when outdoors, particularly in warmer weather
- Wearing long-sleeved shirts and trousers
- Avoiding bright colours
- Not wearing perfumes or colognes
- Not wearing sandals or not walking barefoot
- Staying calm if in proximity to a stinging insect and moving away slowly

use of aromatic ammonia spirit to treat bathers who had been stung by Portuguese man-of-war jelly fish, there appears to be no objective evidence of its effectiveness.

Hydrocortisone Hydrocortisone has anti-inflammatory activity and the 1 per cent cream can be used to treat itching caused by insect bites. However, its usefulness may be limited by the licensing restriction of two applications daily, because more frequent application may be necessary to sustain relief. Also, it is not licensed for use in children under 10 years of age.

Infected bites and stings

Bites and stings can become bacterially infected. The signs are redness, swelling, heat and pain around the bite, extending from the original site as the infection spreads. An abscess can develop. The infecting organism is usually *Staphylococcus aureus*. OTC topical antiseptics are unlikely to be effective, and infected bites are treated with a prescription-only medicine — a topical antibacterial, such as mupirocin cream, if the infection remains localised, or a systemic antibiotic such as flucloxacillin.

Insect infestations

Isolated or small clusters of bites on exposed sites on the body usually indicate flying insects as the cause. Persistent or recurrent lesions on and around body areas covered by clothing could be due to insects that have colonised sites in or around the home.

Infestation and the type of insect can often be identified by the distribution of bites on the body and other factors. Bites below the knees and most commonly around the ankles are usually caused by cat and dog fleas. Bite clusters may occur on other parts of the body if a person has been sitting or lying on furniture or furnishings that have been infested (eg, armchairs, settees and rugs). Fleas can survive for long periods in empty premises and it is possible for someone moving into a new dwelling to be bitten by fleas left behind by the previous occupant's pet. The presence of fleas can be confirmed by identifying their faeces and eggs, which have a salt and pepper appearance, on an animal's fur and bedding and in crevices and cracks of floors and walls around its sleeping area. Human flea infestation is possible in overcrowded housing with poor hygiene standards.

Bites on abdomen or thighs, especially if a person allows a pet to sit on their lap could be caused by cheyletiella mite. Confirmation is provided by identifying the mite infestation, which has the appearance of "walking dandruff" on the animal's body;

Bites all over the body can indicate bed bugs or bird fleas or mites. Bedbugs can grow to about 5mm long. They colonise not only mattresses and bedding, but can also be found in old houses, furniture and upholstery, and are capable of travelling great distances to find a host. Bites occur at night. Heavy infestations are accompanied by a pungent odour. Birds' nests or nest boxes on or near houses can be the source of bird fleas. People who handle stored products (eg, warehouse workers) are at risk of being infested by mites.

Eliminating infestations For cat and dog flea infestations the pet, its bedding, carpets and soft furnishings should all be treated with insecticide. Rugs and furniture should be thoroughly vacuumed. Pharmacists can also advise on preventive treatments for pets.

For bedbugs, insecticide can be applied to to mattresses, walls and furniture likely to be harbouring the bugs, but it may be better to call a professional pest controller. Bedclothing should be washed at high temperature. If cheyletiella mite infestation is suspected the person should be referred to a veterinarian because their pet will need special treatment.

Action: practice points

Reading is only one way to undertake CPD and the Society will expect to see various approaches in a pharmacist's CPD portfolio.

1. List questions you would ask a person presenting with suspected bedbug bites.
2. Find out about insecticides to deal with infestations. Which is the most effective? What precautions are required in their use?
3. Familiarise yourself with adrenaline auto-injectors. Make sure you know how to use these devices if needed.

Evaluate

For your work to be presented as CPD, you need to evaluate your reading and any other activities. Answer the following questions: What have you learnt? How has it added value to your practice? (Have you applied this learning or had any feedback?) What will you do now and how will this be achieved?