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PRACTICE POINTER

Insect bites

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What you need to know

- There is little research evidence on best practice for insect bites
- Insect bite reactions vary widely and depend on the insect and the patient's response
- Secondary infection may be indicated by fever, systemic symptoms, and worsening reactions with spreading erythema. It can be difficult to know if mild secondary cellulitis has occurred

Insects bites are a common reason for patients to seek medical advice, often with concerns that the skin around the bite might have become infected. Clinicians use a combination of clinical features and risk factors when assessing insect bites, but a lack of evidence for the diagnostic and prognostic value of these features, as well as a lack of data on outcomes, means that most practice is based on clinical experience and custom. This article outlines these uncertainties and offers an approach to assessing a patient in the UK who presents with an insect bite.

What type of insects bite?

In the UK common biting insects include mosquitoes, gnats or midges, ants, fleas, lice, bedbugs, sandflies, and flower bugs (small oval flies). Ticks and spiders (both technically arachnids) can also bite. Clinical assessment varies according to world location and includes consideration of vector-borne illnesses, which are mainly contracted outside the UK. Table 1 lists common vector-borne illness, which are most common in tropical and subtropical countries.[1]

Table 1 | Insect and tick vector-borne diseases[1]

Vector	Disease caused	Type of pathogen
Mosquitoes:		
Aedes	Chikungunya	Virus
	Dengue	Virus
	Lymphatic filariasis	Parasite
	Rift Valley fever	Virus
	Yellow fever	Virus
	Zika	Virus
Anopheles	Lymphatic filariasis	Parasite
	Malaria	Parasite
Culex	Japanese encephalitis	Virus
	Lymphatic filariasis	Parasite
	West Nile virus	Virus
Blackflies	Onchocerciasis (river blindness)	Parasite
Fleas	Plague (transmitted from rats to humans)	Bacteria
	Tungiasis	Ectoparasite
Lice	Typhus	Bacteria
	Louse-borne relapsing fever	Bacteria
Sandflies	Leishmaniasis	Bacteria
	Sandfly fever (phlebotomus fever)	Virus
Ticks	Crimean-Congo haemorrhagic fever	Virus
	Lyme disease	Bacteria
	Relapsing fever (borreliosis)	Bacteria
	Rickettsial diseases (such as spotted fever, Q fever)	Bacteria
	Tick-borne encephalitis	Bacteria
	Tularaemia	Bacteria
Triatome bugs	Chagas disease (American trypanosomiasis)	Parasite
Tsetse flies	Sleeping sickness (African trypanosomiasis)	Parasite

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Insect bite uncertainties

Incidence

The exact incidence of insect bites and stings is not known as most are not reported.[2 3] According to a study of data recorded by sentinel general practices in England and Wales, GP consultations about insect bites are 5.4/100 000 patients per week on average. This rises above 12 per 100 000 in August and September.[4] Geography, month, and activity influence insect bite experience. In some parts of the UK insect bites are particularly common. For instance, a questionnaire survey of mostly young adults attending a duathlon event in the West of Scotland reported that only 14.2% claimed not to have experienced a midge bite,[5] with 34% reporting experience of a "bad" bite reaction (defined as a red, itchy mark that lasts a few days).

Bite resolution, management, and outcomes

Draft guidelines from the National Institute for Health and Care Excellence (NICE) on antimicrobial management of insect bites[6] highlights the lack of evidence for recommendations, limited evidence with high uncertainty for the use of oral antihistamines, and no evidence for other self care treatments. Our literature review found no published research that could be used to inform insect bite management in UK primary care. Published literature tends to vector-borne illness (such as malaria, Lyme disease), anaphylactic reactions or severe allergy, and rare complications such as necrotising fasciitis. Incidence numbers in primary care of insect bites complicated by cellulitis or lymphangitis are also lacking. In the UK, flucloxacillin prescribing rises by 33% in the summer months, although it isn't clear how much of this is prescribed for infected insect bites.[7]

An approach to assessing a patient with an insect bite

Most insect bites are managed by the public, perhaps with use of over-the-counter drugs or with advice from community pharmacists. Patients may attend their GP with concerns about severity of reactions or infection, often referred by other healthcare professionals, including pharmacists.[8] Virtual consulting, widely adopted since the covid-19 pandemic, means that patients may send in photographs of bite lesions or ask the clinician to look at them on video. While photographs give high definition pictures that allow detailed inspection, videos give a useful 3D picture of the overall bite area and distribution. Clinicians may find looking carefully at both modalities helpful in determining the nature and severity of the bite. An approach to assessment is outlined in figure 1.

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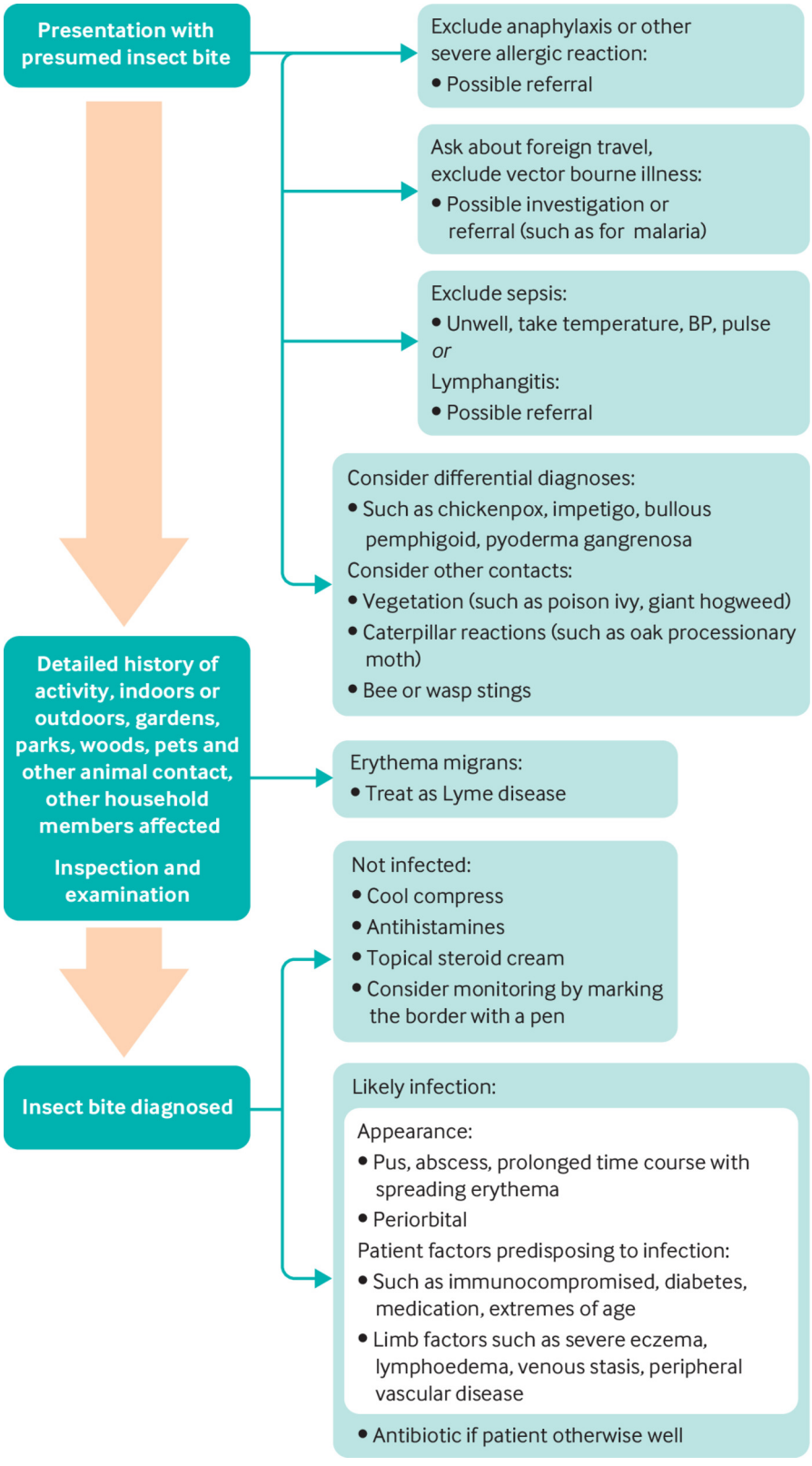

Fig 1 | Suspected insect bites: decision aid for primary care

Is it an insect bite?

When patients present with an "insect bite" it can be hard to tell, from inspection alone, if it is truly an insect bite. A detailed history can help and includes inquiry about outdoor activities, whether other household members are affected, and animal contact. Differentials to consider include bee and wasp stings and contact reactions to caterpillars such as the oak processionary moth, which

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can have a similar appearance. Scabies is due to a burrowing mite and egg laying, rather than a bite. It typically has intense tiny, red, multiple areas of itch, especially on the hands around the finger web spaces. Contact reactions may also occur with vegetation, such as poison ivy or giant hogweed. Chickenpox, shingles, impetigo, bullous pemphigoid, and pyoderma gangrenosum all may be difficult to differentiate, particularly in their early stages.

Clues from the history, appearance, and distribution

The puncture mark from an insect or arachnid bite may be visible. There may be no surrounding reaction. Most common reactions are small, red, raised, and itchy, demonstrating typical erythema and wheal shortly after the bite, making it hard to offer a definitive explanation of cause to the patient. However, the appearance and distribution, when combined with the history, can give some helpful clues:

- A single prominent mark or blister may indicate a tick, horsefly, mosquito, or flower bug bite or a sting. These tend to be painful
- Multiple small red papules suggest mosquitoes, fleas, midges, mites, or bed bugs (fig 2)
- Bed bug bites may occur anywhere on the body but are often multiple and occur overnight in exposed areas such as face and neck
- Flea bites, from pets, tend to occur below the knees (fig 3)
- Two small fang puncture marks may be visible after a spider bite
- Tick bites are often painless.

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Fig 2 | Bed bug bites on arm showing a cluster of erythematous papules

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Fig 3 | Flea bites on lower legs; multiple bites, each with a small surrounding area of erythema

If the patient saw the insect but cannot identify it, it may help to review images of common biting insects with them, for instance on the NHS website.[9]

Most insects that bite either do so defensively or are haematophagous (feed on blood). The latter inject saliva into the skin—containing a variety of products, including anticoagulants, vasodilators, and digestive enzymes—to effect the meal. People

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have different predispositions to such bites, with a variety of inflammatory and allergic responses. Reactions are either immediate wheal-and-flare reactions, mediated by specific IgE antibodies, or more delayed reactions characterised by pruritis, indurated papules, papular urticaria, or blistering.[10] Reactions can vary from single, small, red reactions to multiple or large areas of erythema. Erythema, swelling, heat, pain, and itch are typical features of any reaction and don't necessarily indicate secondary bacterial infection (fig 4). Note that erythema may be more difficult to distinguish on darker skin tones (fig 5). Severe systemic reactions, such as anaphylaxis, are unusual from insect bites—they are far more likely to occur after bee or wasp stings.

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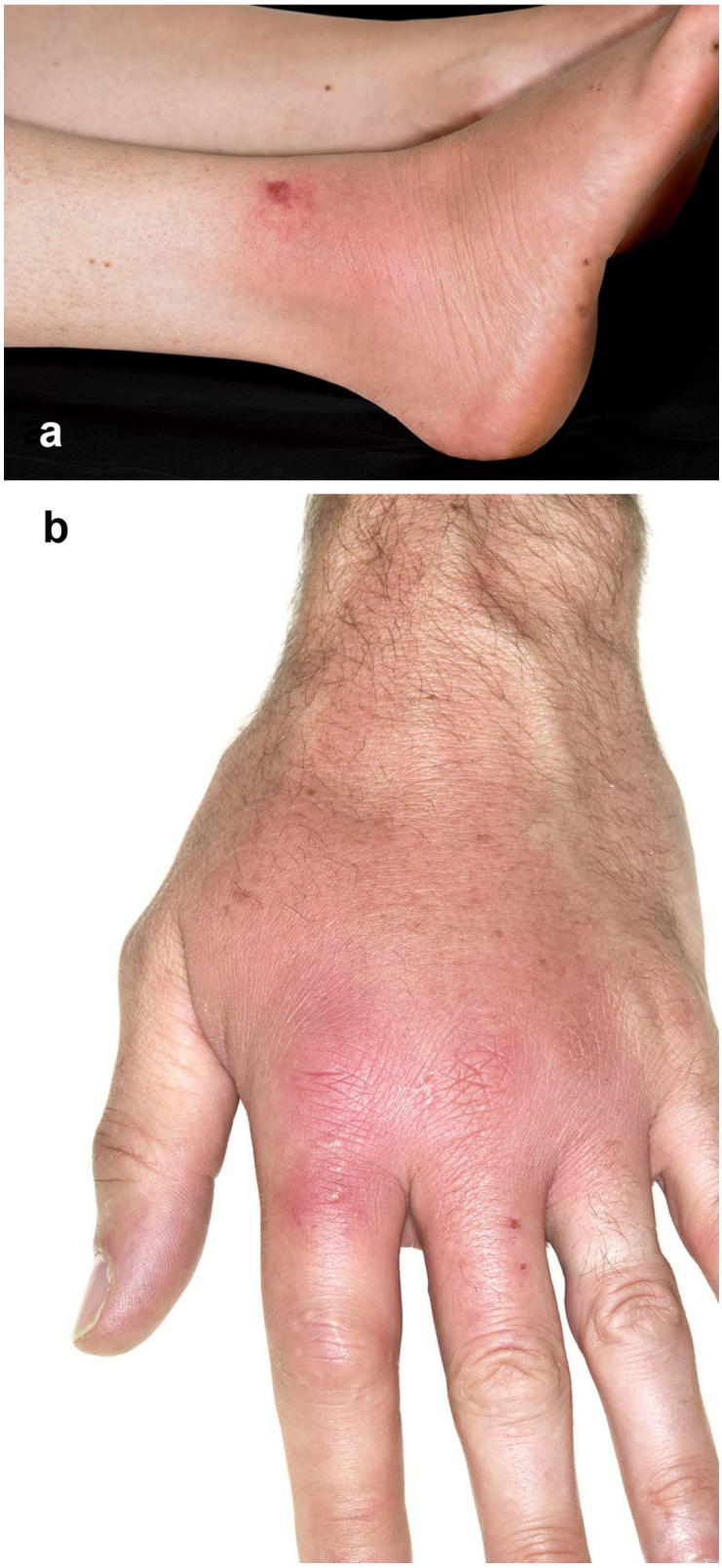

Fig 4 | Top: a single bite on the ankle with surrounding reaction of erythema and oedema. Bottom: Infected insect bite on the hand, with surrounding inflammation, redness, and swelling caused by cellulitis, a bacterial infection of connective tissue below the skin. Distinguishing between reaction and infection can be difficult and requires clinical judgement

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Fig 5 | Reaction to a gadfly bite. Swelling is apparent, but erythema is harder to distinguish on darker skin

Is it infected?

Our literature review found no published research to guide distinguishing "usual" insect bites from infected ones (see fig 1).

Clinical findings that may indicate infection include fever or other systemic features, and worsening reactions with spreading erythema after expected time to improvement (fig 4).[8] Other signs include pus, purulent discharge (providing an opportunity to take a swab),

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lymphangitis, and a fluctuant swelling suggestive of abscess formation.

Consider comorbidities such as diabetes, local factors such as leg ischaemia, and body areas of risk such as periorbital. These are often used in deciding benefit and harm thresholds for antibiotic prescribing when infection is possible but not certain.

Possible pitfalls in practice

Although most insect bites are easily diagnosed and will resolve with no treatment or advice on self care, there are some pitfalls to be aware of:

- Is it an insect bite? Consider differentials, including rare skin conditions, particularly if the appearance or history is unusual
- Ask about allergic reactions, anaphylaxis, wheeze, angioedema, past allergic reactions
- Ask about recent travel to a destination where malaria and other vector-borne diseases are endemic
- Does the patient have risk factors for secondary infection? These may be systemic (such as diabetes) or medication related (such as oral steroids)
- Is the reaction site at risk of severe infective complications (for example, a periorbital reaction or local limb factors such as chronic lymphoedema or past lymph node dissection in a breast cancer survivor)?
- Is there a rare complication requiring urgent secondary care opinion? Necrotising fasciitis typically has severe pain, out of proportion to the skin breach. There may also be pyrexia, malaise, or lymphangitis tracking up the limb
- Is there an erythema migrans rash of early Lyme disease?

Advice and self management

Explanation and reassurance are key aspects of management. Explore the reasons underlying the patient's attendance and acknowledge their underlying concerns. Provide an explanation of likely time to resolution. GPs in our survey thought non-infected bites reached maximum size at two to three days (range 1-7 days), and reactions could last 10-14 days (range 2-28), showing wide variability in experiences. Suggest to the patient drawing a line around the border of the erythema, and to seek further advice if the erythema spreads beyond the line or if they feel unwell or feverish, and offer self care options.

Discuss strategies for reducing itching, including cold compress and oral antihistamines.[3 6] Short term topical steroid application can also reduce itching. Explain that reducing itching could reduce the likelihood of secondary infection caused by scratching and breaks the itch-scratch cycle. Draft guidelines from NICE on antimicrobial prescribing for insect bites and stings recommend oral antihistamines as first line treatment, with reassessment for worsening reactions, signs of infection, or if the person feels systemically unwell.[6] Flucloxacillin is the first choice antibiotic for an infected bite. Direct patients to a local pharmacy or online self care advice if scabies or bed bugs are likely.

Consider follow-up strategies. It can be useful to ask the patient to take images on their mobile phone to show reaction progression. Serial images can often be used as part of a remote or online consultation. Consider follow-up contact for reassessment if there is diagnostic uncertainty.

Prevention is better than being bitten

A consultation about an insect bite severe enough for the patient to seek medical advice is an opportunity to discuss insect bite prevention. Insect bites can be reduced or prevented by wearing clothing that covers the limbs, especially in early evening, and by tucking trousers into socks. Insect repellents (such as DEET or picaridin) can be used for infants over 2 months old and by pregnant and breastfeeding women.[11 12] Citronella products are less effective (shorter period of protection compared with picaridin or DEET).[13] There are high quality online resources where patients can read about insect bite prevention in further detail (see box of additional resources). There is no evidence for popular suggestions to try turmeric, garlic, vitamin B, Marmite, and mint tea, which are ineffective protectors, nor for ultrasonic devices.[14]

Additional educational resources

- Travel Health Pro. HomeFactsheetsInsect and tick bite avoidance. https://travelhealthpro.org.uk/factsheet/38/insect-and-tick-bite-avoidance
- Fit for Travel. Insect bite avoidance. https://www.fitfortravel.nhs.uk/advice/general-travel-health-advice/insect-bite-avoidance
- Bug Off! https://www.bug-off.org/
- DermNet NZ. https://dermnetnz.org/

How this article was made

The idea for this article came from an online discussion in the RCGP Overdiagnosis Group, in the summer of 2018. The group sought to obtain a consensus, evidence based view to guide clinical management of insect bites. We carried out a formal literature review, looking for risk of bacterial infection, cellulitis, or sepsis after an insect bite. We searched HDAS (Medline, Amed, Embase), the Cochrane Library, BMJ Best Practice, Dynamed Plus, and Clinical Trials.Gov from 2010 to 2020 using literature available in the English language. Terms searched were "insect bites and stings" and then filtered out tick bites and vector-transmitted diseases. This resulted in 14 articles of interest. To find out more about current clinical practice, we surveyed members of the RCGP Overdiagnosis Group, and received180 responses from GPs.

Education into practice

- What factors would influence the safety-net advice offered to a patient with swelling and itch after an insect bite?
- How might consulting remotely influence your assessment of an insect bite, including your discussion about possible secondary infection?

How patients were involved in the creation of this article

No patients were involved in the creation of this article.

Contributors: All authors contributed to the authorship and consensus of the article. GB undertook the literature search. JW is guarantor for the article.

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