Identifying the causes of contact dermatitis

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What are the causes of contact dermatitis?

CONTACT DERMATITIS RESULTS FROM SKIN CONTACT WITH AN EXOGENOUS SUBSTANCE. It can be caused by direct skin contact, airborne particles, vapours or light. Individuals of any age can be affected. The condition can lead to disability and unemployment and is an important occupational problem.

VARIANTS The two most common variants are irritant contact dermatitis (ICD) and allergic contact dermatitis (ACD). ICD is more common and has a worse prognosis. Studies of unselected populations suggest that the prevalence of ACD is between 7 and 13%.

Other less common forms of contact dermatitis include photocontact allergy and, in food handlers, protein contact dermatitis.1 Often multiple mechanisms are involved. For example, an underlying endogenous eczema or impaired skin barrier predisposes to ICD which in turn facilitates penetration of potential allergens.

How should diagnosis be confirmed?

Irritant contact dermatitis ICD is a form of eczema and is induced by direct inflammatory pathways without prior sensitisation. Strong irritants or caustic agents can cause acute changes but more often ICD is chronic and caused by repetitive exposure to multiple weaker irritants. These may be either wet, such as water, soaps, detergents, solvents, weak acids or alkalis, or dry, such as friction, low humidity and heat or cold.

Allergic contact dermatitis Classical ACD is mediated by type 4 cell-mediated immunity. Sensitisation

What are the management options?

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occurs within 5 to 16 days of skin contact with a potential allergen but at this first exposure there is no inflammation, see figure 1, above.

On re-exposure previously sensitised T cells recognise the antigen and a cascade of events occurs resulting in inflammation 12 to 72 hours later, see figure 2, above.

Metabolism of a substance may be necessary to allow it to penetrate the stratum corneum and further metabolism may be required within the epidermis before immunological stimulation can occur. Mutations of genes encoding enzymes and cytokines involved in these processes influence individual susceptibility to ACD. Frequent exposure and high concentrations of potential allergens increase the risk of sensitisation.

Some sensitisers, such as sunscreen ingredients may only become capable of inducing ACD after they are exposed to ultraviolet light. Most can also induce classical ACD.

If eczema is recurrent/persistent, or occurs in an individual with no previous history of eczema, contact dermatitis should be considered, see figure 3, opposite. As in any eczema, contact dermatitis is itchy. If acute there will be erythema, oedema, vesicles, and exudation. If the condition is chronic, the skin will be lichenified with scaling and fissures.

The distribution of an eruption may provide valuable diagnostic clues. Dorsal aspects of the hands are the site most often affected by ICD, usually with involvement of the finger webs as well, see figure 4, opposite.

ACD caused by shampoo ingredients typically involves the face and upper trunk, usually sparing the scalp. Hair dyes can elicit intense inflammation resembling angioedema but scaling or flaking during resolution indicates an eczematous process.

An occupational factor should be sought if eczema deteriorates during the working week and improves at weekends or during periods of leave.

**Protein contact dermatitis**

Individuals suffering from protein contact dermatitis develop vesicles within minutes at sites of skin contact with raw meat, fish, enzymes or plant proteins. Improvement occurs within a few hours but with repeated exposure chronic eczema can evolve. Inflammation is usually confined to

### Table 1

**Common causes of allergic contact dermatitis**

<table>
<thead>
<tr>
<th>Allergen</th>
<th>Sources of exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel</td>
<td>Metal jewellery, buckles, studs on clothing, coins</td>
</tr>
<tr>
<td>Fragrances</td>
<td>Cosmetics, toiletries, wet wipes, room fresheners, fabric conditioners, household products, scented candles, incense sticks, aromatherapy oils</td>
</tr>
<tr>
<td>Biocides including methylisothiazolinone *</td>
<td>Cosmetics, toiletries, wet wipes, household products, pharmaceutical creams, industrial oils and cooling fluids, water-based paints</td>
</tr>
<tr>
<td>Rubber additives (thiurams, mercaptobenzothiazole and carbamates)</td>
<td>Natural and synthetic rubber gloves and other rubber articles</td>
</tr>
<tr>
<td>Potassium dichromate</td>
<td>Tanned leather, cement</td>
</tr>
<tr>
<td>p-phenylenediamine</td>
<td>Permanent and semi-permanent hair dyes</td>
</tr>
<tr>
<td>Plants (sesquiterpene lactones) *</td>
<td>Compositae species, tulips and many others</td>
</tr>
<tr>
<td>Colophony *</td>
<td>Adhesive in fabric dressings, rosin, solder, pine trees</td>
</tr>
<tr>
<td>Topical antibiotics and corticosteroids</td>
<td>Pharmaceutical creams andointments</td>
</tr>
<tr>
<td>Acrylates</td>
<td>Artificial nails</td>
</tr>
<tr>
<td>Epoxy resins</td>
<td>Adhesive systems</td>
</tr>
<tr>
<td>Sunscreen ingredients $</td>
<td>Sunscreens, cosmetics, toiletries</td>
</tr>
</tbody>
</table>

* Can also cause airborne contact dermatitis

$ Can also cause photocontact allergy
the hands and is often of such severity that a change of occupation may be necessary. The mechanism of protein contact dermatitis is poorly understood.2

COMMON CULPRITS
Irritants
Cumulative effects of water, soaps and detergents are the most common cause of ICD which affects the hands more often than any other site. Frequent hand washing associated with the arrival of a new baby is often responsible for new onset hand eczema in a young mother. ICD is common in occupations involving frequent hand washing such as hairdressing, healthcare, and catering. Because of their impaired skin barrier function atopic individuals working in these occupations are at especially high risk.

Sweat and caustic substances trapped next to the skin by waterproof gloves or protective clothing can all cause ICD. Incontinent patients are at risk of developing ICD of the perineum. Cosmetics often contain abrasive particles capable of inducing ICD. Airborne irritants include abrasive dusts, especially dry cement, as well as caustic vapours. Organic solvents, acids and alkalis, low humidity, heat and cold are also important causes of ICD.

Allergens
Nickel, fragrances, rubber accelerators and biocides are the most common sensitisers, see table 1, p28. Biocides are added to products to prevent growth of pathogens. Methylisothiazolinone, a biocide, is responsible for a current epidemic of ACD involving numerous well known brands of cosmetics and toiletries. Sensitised individuals entering rooms freshly decorated with water-based paints containing methylisothiazolinone can develop airborne ACD on exposed skin.

More common causes of airborne ACD include fragrances in room fresheners, scented candles or incense sticks. Seasonal eczema on exposed skin suggests allergy to plants, see figure 5, below left. Acrylate vapours released during application or sculpting of artificial nails are an increasingly common cause of airborne ACD eczema in beauticians and their clients. Patients with leg ulcers and stasis eczema are at especially high risk of developing allergies to ingredients of their topical treatments, dressings and bandages, see figure 6, below left.

It is important to remember that topical antibiotics and corticosteroids can cause ACD. SIGN guidelines recommend that bandages and compression hosiery should be latex free to avoid inducing allergy to rubber accelerators.3

Carers applying topical treatments to individuals already sensitised to these chemicals should wear accelerator-free gloves. Wool alcohols (lanolin) and parabens, once common sensitisers in leg ulcer patients, have become infrequent causes of ACD now that they are seldom found in dressings and bandages.

In the UK, sunscreen ingredients are the most frequent cause of photopatch allergy but in sunnier latitudes allergy to topical NSAIDs in sports gels is an increasingly common problem. It can be difficult to differentiate between photopatch allergy, photosensitivity and airborne ACD, see figure 7, p30. Involvement of the posterior auricular areas suggests that eczema at an exposed site is caused by an airborne substance, not light, see figure 8, p30.

If relevant allergens can be identified there is a realistic prospect of cure.

INVESTIGATIONS
A careful history is important, enquiring about exposure at work and at home, hobbies, cosmetics and toiletries and timing of the eruption.

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‘Age should not be a deterrent to patch testing’

If ACD is suspected the patient should be referred to secondary care for patch testing. Age should not be a deterrent to patch testing. This involves applying standardised concentrations of suspected substances to the skin.
Accurate diagnosis, avoidance of identified allergens and protection from irritants are the key to successful treatment, see table 2, below.

Patient information leaflets are available from the British Association of Dermatologists, see Useful information box, p31. Formal hand dressings may be necessary if hand eczema is severe. Cotton gloves or dressings can be covered by waterproof gloves during unavoidable wet tasks. At home PVC gloves are a safer choice than rubber or nitrile as sensitisers in rubber can penetrate cotton gloves or dressings.

In an occupational setting glove choice will depend on the nature of the chemicals involved. Topical steroids of sufficient potency should be prescribed as ointments not creams. The latter are less emollient than ointments and contain potentially sensitising excipients usually not present in the equivalent ointment.

**Table 2**

**Management of allergic contact dermatitis**

- Identify and avoid the cause
- Protect affected skin
- Prescribe cotton gloves for hand eczema
- Use soap substitutes at home and at work
- Apply emollients frequently at home and at work
- Use topical steroid ointments (not creams)
Ingredient lists of prescribed topical treatments should be checked to ensure that previously identified allergens are not inadvertently supplied to the patient.

‘If contact dermatitis persists a change of occupation may be necessary’

Patients with eczema that is in an unusual distribution, recurrent or persistent despite appropriate management should be referred to secondary care for investigation and intensive treatment. Patch testing is especially important for patients suffering from chronic hand eczema, facial or stasis eczema.

Treatments available in secondary care include phototherapy, alitretinoin for refractory hand eczema, azathioprine and ciclosporin. If contact dermatitis persists a change of occupation may be necessary.

REFERENCES
3 Scottish Intercollegiate Guidelines Network. SIGN 120. Management of chronic venous leg ulcers. SIGN. Edinburgh. 2010

Useful information

British Association of Dermatologists
Patient information leaflets on hand dermatitis and contact dermatitis
www.bad.org.uk

National Eczema Society
www.eczema.org

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