

# **A GUIDE TO OCCUPATIONAL SKIN DISEASE**

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## **Introduction**

An occupational skin disease is one in which workplace exposure to some physical, chemical or biologic hazard has been a causal or a major and necessary contributing factor in the development of the disease. Diagnosis requires a high index of suspicion and a knowledge of the worker's environment. Contact dermatitis accounts for at least 60% of occupational dermatoses<sup>1</sup>, which, in turn, account for 40-70% of occupationally acquired illness<sup>2,3</sup>.

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## **Contact Dermatitis**

Contact dermatitis may be irritant or allergic or both. It may co-exist with an endogenous dermatitis such as atopic dermatitis.

In general, the morphology of contact dermatitis is unable to differentiate it from endogenous dermatitis. Having said that, lichenification is an atopic phenomenon, and blistering (except on the palms and soles) is more likely in contact dermatitis. Interdigital dermatitis suggests wet work.

The diagnosis of occupational contact dermatitis, however, is usually made on the basis of history and distribution of the dermatitis, exclusion of other causes, and allergy testing as appropriate.

The industries most likely to result in occupational dermatitis are:

- Food handler/chef
- Hairdresser/beautician
- Medical/dental/nurse/vet
- Agriculture/florist/gardener
- Cleaning/laundry
- Painting
- Mechanical/engineer
- Printing/lithography
- Construction.

### **History**

1. Is the worker exposed to plausible irritants or allergens?
2. Is there a temporal association between the dermatitis and the work?
  - Is the dermatitis associated with particular tasks?

- Does it resolve/improve when the worker is away from work for a week or more?

Sometimes a longstanding irritant or allergic dermatitis does not resolve when the exposure ceases — some allergens are particularly notorious in this regard, e.g. chromate.

Sometimes “holiday improvement” in dermatitis does not occur because the worker engages in similar work around the home (e.g. the mechanic who works on his own car, the florist who’s a keen gardener) or because he or she is exposed to the same allergen in an entirely different context (e.g. the hairdresser who is allergic to hair dye being exposed to the same allergen in domestic rubber gloves).

### **Distribution**

The sites of contact dermatitis depend on the following factors:

- Sites of exposure to the chemicals/substances;
- Whether irritant or allergic mechanism;
- Occlusion;
- Pre-existing skin disease;
- Regional variation in the skin’s susceptibility to allergic/irritant dermatitis.

This is dealt with in more detail under the specific types of contact dermatitis.

### **Differential Diagnoses**

Hands	discoïd eczema dyshidrotic eczema atopic dermatitis fungal infection (usually affects only one hand) psoriasis
Face	seborrhoeic dermatitis drug reaction (photosensitive) fungal infection atopic dermatitis

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## **Contact Irritant Dermatitis**

An irritant is a substance which will induce dermatitis in anyone if applied to the skin:

- In high enough concentration;

- Over sufficient time; or
- With sufficient frequency.

Individuals differ in their predisposition to irritants, but lowering the concentration of an irritant reduces and eventually abolishes its tendency to induce dermatitis.

**Irritant dermatitis is therefore concentration-dependent.**

Factors which enhance irritancy include occlusion, heat and pre-existing damage to the skin through disease or trauma.

Occlusion may be produced by gloves, clothing and rings, and sometimes inadvertently by barrier creams.

Barrier function of the skin can be impaired both by increased hydration of the stratum corneum (occlusion, high temperature and humidity, prolonged or frequent immersion in water), and decreased hydration (low temperature and humidity).

The irritancy of a particular substance depends on its ability to remove the surface lipid layer (the intercellular lipids of the stratum corneum) and/or the ability to produce cellular damage. Once the surface corneocytes are damaged, the potency of irritant required to sustain the damage is considerably less than that required to induce damage in the first place.

Irritants may be:

- acids
- alkalis
- solvents
- detergents/soaps
- abrasives
- enzymes
- oxidants
- reducing agents
- oils
- concentrated salt solutions
- low molecular weight plastics
- hygroscopic chemicals.

Often an irritant dermatitis is the cumulative result of a variety of environment factors (e.g. cold conditions, oils and greases, solvents, industrial-strength hand cleaner).

Not all workers in the same area will be affected. Who is affected will depend on individual predisposition (e.g. atopsics are more susceptible to irritants), personal hygiene, and the circumstances of exposure.

Irritants usually result in hand/forearm dermatitis. The irritant effect is concentration-dependent, therefore usually only affects the site of primary contact.

Occasionally the face may be affected by an irritant dust, vapour or aerosol. Irritant particles gaining access to boots or clothing may produce dermatitis in unusual locations where their irritant effect is enhanced by friction and occlusion.

### **Approach to the patient with possible irritant contact dermatitis**

1. What irritants is he/she exposed to?
2. What is the duration/frequency of exposure?
3. Are the sites of dermatitis consistent with the manner of exposure?
4. Does the dermatitis resolve when he/she is removed from the irritant exposure?
5. Can contact allergy be excluded?
6. Are there alternative explanations that might better account for the signs and symptoms?

### **Management of contact irritant dermatitis**

#### **Notes**

1. Treat with steroids, emollients, antibiotics, etc. as indicated by the clinical picture.

If severe, may need to remove the worker from work (or to alternative work) until the dermatitis is largely resolved.

Damaged skin is more susceptible to irritation.

2. Reduce the exposure to irritants:

- Reduce frequency or duration of exposure.
- Substitute less irritating chemical(s).
- Avoid occlusion.
- Avoid skin trauma.
- Avoid excessive heat and humidity.

Getting irritants down inside protective clothing is worse than no protective clothing. Ensure gloves of proper length, undamaged, and clean are worn. Do not use gloves or barrier creams over contaminated skin.

- Avoid cold, chapping conditions.
- Use protective clothing (e.g. gloves if appropriate).  
Gloves need to be suitable for the task. Need to consider grip, dexterity, hazards of moving machinery, etc.
- Use barrier cream if appropriate.  
Barrier cream has limited benefit. Allows easier clean-up at end of shift. Will be contra-indicated in some industries.
- Use regular emollient.  
Moisturisers prevent irritant dermatitis from detergents at least.<sup>4</sup>
- Encourage personal hygiene, and careful working habits.  
Clean off irritants with the mildest cleanser possible. Do not just use the nearest solvent-soaked rag. Dry hands carefully.

Where alterations to chemicals or work processes seem indicated, advice can be obtained from staff of the Occupational Safety and Health Service of the Department of Labour, occupational medicine specialists or dermatologists with an interest in occupational dermatology.

## Contact Allergic Dermatitis

Contact allergic dermatitis involves a Type IV (cell mediated) immune reaction. Once sensitised, any further exposure, even to minuscule amounts, will reproduce the allergic dermatitis within a few days.

**Allergic reactions are therefore not concentration-dependent.**

The time interval between the first contact with a chemical and the development of sensitisation depends on:

- The chemical;
- The conditions of exposure; and
- Constitutional factors.

It is often measured in years. Sensitisation to any particular allergen is more likely if the exposure is frequent or in high concentration.

Damage to the skin, e.g. due to an irritant contact dermatitis, increases the likelihood of penetration of the allergen through the skin to immunocompetent cells and thus the risk of allergy.

In general, only a very small percentage of people exposed to a particular chemical will develop an allergy to it.

Because allergic reactions are not concentration-dependent, the dermatitis commonly involves not only the site of primary contact, but also distant sites where small amounts have been accidentally transferred, e.g. by the finger-tips.

Thick skin (such as the palms) is relatively resistant to contact dermatitis, whereas thin skin (face, genitals) is much more susceptible. It is possible therefore for a contact allergy to a substance in contact with the hands to present first as an eyelid dermatitis, or penile dermatitis, and only later produce a hand dermatitis. An allergy to rubber gloves may present with a dermatitis on the flexor wrist, with later involvement of the dorsa of the hand.

Occupational contact allergic dermatitis, therefore, commonly affects the hands, forearms and face, and sometimes affects the neck and male genitalia. If other sites are involved, they are usually involved in **addition** to one of the above mentioned sites.

### **Photoallergy**

Some chemicals require the additional action of sunlight to produce an allergic dermatitis.

Photoallergic contact dermatitis, therefore, has a distribution similar to that produced by airborne allergens (face, neck, V of neck  $\pm$  forearms and dorsa of the hands).

Common photoallergens include:

- Plants (horticulturalists, florists);
- Lichens (forestry); and
- Sunscreens (outdoor workers).

### **Testing for Contact Allergy**

The diagnosis of contact allergic dermatitis requires confirmation by patch testing (or photopatch testing for photoallergens).

Even those who specialise in contact dermatitis are only able to “guess” the allergens on the basis of history and clinical findings in a small percentage of cases. One “guesses right” with non-occupational nickel allergy 80% of the time, but allergy to rubber and colophony are correctly guessed about 50% of the time, and other allergens are much less likely to be correctly incriminated by the physician<sup>5</sup>. For this reason it is important to document all the substances which might possibly be responsible for the worker’s dermatitis, and patch test with all the possible allergens. Ideally, the worker should be referred to a dermatology clinic equipped to carry out such investigations. They will generally be tested with a routine screen of chemicals (there are international guidelines as to what constitutes a routine screen, although this

may be modified to suit local conditions), plus additional allergens as determined by the worker's history of exposure. A routine screen alone will miss the allergen relevant to the person's current dermatitis in 50% of cases<sup>6</sup>.

In a patch test, test substances are applied to the back using test chambers and tape designed for the purpose. The tapes are left on for 48 hours, and readings of the site are done at 48 hours and 96 hours. Some people do an additional reading at one week. A single reading at 48 hours will miss about 30% of positive reactions, and may include irritant reactions (false positives)<sup>7</sup>.

Photopatch tests are similar except that the test sites are photoexposed.

### **Approach to the patient with possible contact allergic dermatitis**

1. What possible allergens is he/she exposed to?
2. Are the sites of the dermatitis consistent with the manner of exposure?
3. Does the dermatitis resolve when he/she is away from that work?
4. Is there a previous history of contact allergy?
5. Is there a co-existing irritant or endogenous dermatitis?
6. Are there alternative explanations that might better account for the signs and symptoms?
7. Arrange for allergy testing as appropriate.

### **Management of contact allergic dermatitis**

#### **Notes**

- |   |  |
|---|--|
| 1. Treat with steroids, emollients, antibiotics, etc. as indicated by the clinical picture.   |  |
| 2. Substitute a non-allergenic chemical for the allergic one, or;                             | E.g. if allergic to an epoxy resin, use a different epoxy. If allergic to rubber gloves, use non-rubber gloves.                                      |
| 3. The worker should avoid the allergen altogether; let non-sensitised workers handle it, or; | If the allergen is infrequently encountered, and is of low sensitising potential.  |
| 4. Recommend personal protective equipment such as gloves; or                                 | Choose gloves carefully — some allergens penetrate gloves. Gloves may be inappropriate in the workplace for reasons of grip, dexterity, safety, etc. |
| 5. Advise worker to leave this type of work.  | Most will improve with a change even if they don't heal. However,  |

up to 30% of those with contact dermatitis may be able to continue in their work. The prognosis depends in part on the cause of the contact dermatitis. Also, atotics tend to do badly whether they stay in or leave the industry<sup>8</sup>.

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## **Contact Urticaria**

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Erythema and wheals occurring at the site of contact with the causative chemical, within an hour of exposure, and resolving within 24 hours. Immunologic (Type 1, IgE-mediated) and non-immunologic mechanisms. Protein-contact urticaria is a specific subtype of contact urticaria which results in immediate itch, swelling and vesiculation; there is an underlying dermatitis, and contact with proteinaceous food-substances.

Immunologic contact urticaria may be accompanied by generalised urticaria or anaphylaxis.

### **Some causes of non-immunologic contact urticaria:**

- Balsam of Peru
- Ethyl alcohol
- Caterpillars, jellyfish, moths<sup>9</sup>.

### **Some causes of immunologic contact urticaria:**

- Seafood
- Various fruits
- Various vegetables
- Meat/blood
- Animal secretions
- Rubber latex<sup>9</sup>.

The frequency of contact urticaria to latex is about 3% in occupations where surgical or 'household' rubber gloves are worn routinely<sup>10</sup>. Food handlers with dermatitis have a 30% risk of contact urticaria<sup>11</sup>.

### Testing for contact urticaria

The test substance is applied to the skin, and the site observed for 30 minutes or so. Firstly, the substance is tested on normal skin, then on previously affected skin, then occlusive tests are performed and if no reaction occurs, an invasive (prick or scratch) test is performed. For some immunologic contact allergens, RAST (radioallergosorbent) testing for IgE antibodies can be used for confirmation.

**Testing for contact urticaria is best carried out by persons experienced in the procedure, since there is a small risk of inducing an anaphylactic reaction with the test.**

The majority of people with contact urticaria will also have a dermatitis, which may be endogenous, contact irritant, or contact allergic. In many people, therefore, it will be appropriate to test both for contact urticaria and delayed hypersensitivity (patch test).

Rubber gloves deserve specific mention since they can be responsible for irritant dermatitis (by making the hands hot and sweaty), allergic dermatitis (type IV reaction to rubber additives not the latex), and contact urticaria (type I reaction to latex, not the additives). Glove powder is not usually incriminated in cutaneous reactions, but it may adsorb chemicals in the glove and act as an airborne vehicle of allergens — provoking respiratory reactions in those already sensitised.

### Management of contact urticaria:

	Notes
1. Treat the underlying dermatitis.	In some circumstances contact urticaria will not occur unless the skin is already damaged.
2. Avoid the chemical/compound which induces contact urticaria.	Seek advice from a dermatologist or allergist regarding the risk from further exposure.
If the substance is unavoidable in the workplace, and if there is a risk of severe reactions, a change of work may be required.	E.g. Type I allergy to rubber latex may provoke anaphylaxis. Further exposure is dangerous, especially contact with mucous membranes (e.g. during medical/dental procedures). A Medic Alert bracelet is indicated.
	Other contact urticarias may be much less hazardous.

## **Occupational Infections**

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Human papilloma virus type 7 warts occur in butchers, fishmongers and poultry processors<sup>12</sup>. The virus is not caught from the meat or fish. It is thought that some cofactor present in the workplace enables a latent wart virus infection to become activated<sup>12, 13</sup>. There is some evidence that wearing gloves reduces the risk of HPV 7 warts occurring<sup>14</sup>. They can be treated in the usual manner, but producing raw areas with destructive therapies can be undesirable in these industries.

Some infections may be transmitted from animals to man in those who work with animals. Examples include viral infections: orf (from sheep and goats), and milkers' nodules; dermatophyte (ringworm) infections from horses, cattle, pigs, cats, dogs; bacterial infections such as erysipeloid from fish.

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## **Dermatoses Due to Physical Agents**

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Friction blisters and calluses, may occur as a result of mechanical trauma. Vibration may result in Raynaud's phenomenon (white finger).

Hot humid environments may aggravate acne, or cause sweat duct occlusion (miliaria). Low humidity results in chapping and fissures. Both increase the risk of irritant dermatitis.

Cold environments increase the risk of chilblains, Raynaud's, cold urticaria and other dermatoses.

Ultraviolet increases the risk of skin cancer and photoaging. Basal cell carcinoma may also follow an injury (especially a burn from a piece of molten metal) which fails to heal<sup>1</sup>.

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## **Miscellaneous Occupational Dermatoses**

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Machinists and auto mechanics exposed to oils may develop a folliculitis or acne, especially on the thighs or forearms.

Exposure to chlorinated hydrocarbons (e.g. dioxin, polychlorinated biphenyls) may result in chloracne (rare).

Vitiligo may occur following exposure to monobenzyl ether of hydroquinone (rubber industry — rare).

Workers with silicosis have a markedly increased risk of acrosclerosis, as do workers exposed to vinyl chloride (rare).

Cement burns usually occur as a result of kneeling in wet cement, or getting cement down into work boots. Symptoms may be delayed a couple of hours. Initially, the skin is a dusky red and extremely painful, followed by deep necrotic ulcers<sup>15, 16</sup>. Although rare, the consequences are incapacitating, and it is imperative that cement workers avoid kneeling in cement, and remove contaminated clothing or boots immediately.

Numerous nail changes may occur in response to trauma, irritant chemicals, allergens, etc. including atrophic nails, leukonychia, koilonychia, onycholysis and paronychia.

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