

Ministry of Defence

Synopsis of Causation

Dermatitis (Eczema) including Occupational Dermatitis

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Disclaimer

This synopsis has been completed by medical practitioners. It is based on a literature search at the standard of a textbook of medicine and generalist review articles. It is not intended to be a meta-analysis of the literature on the condition specified.

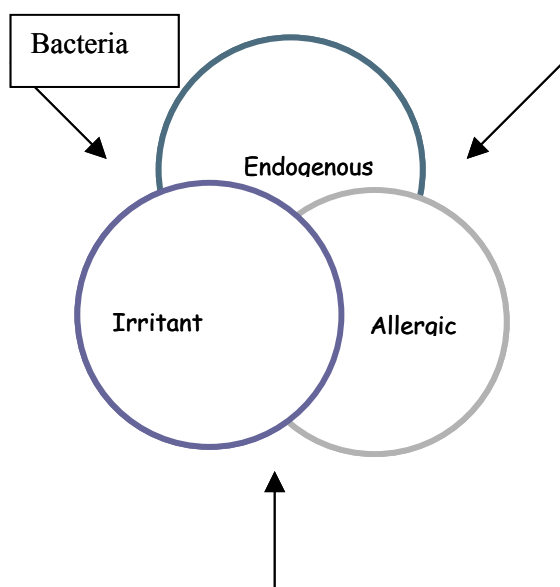
Every effort has been taken to ensure that the information contained in the synopsis is accurate and consistent with current knowledge and practice and to do this the synopsis has been subject to an external validation process by consultants in a relevant specialty nominated by the Royal Society of Medicine.

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1. Definition

- 1.1. "Dermatitis" simply means inflammation of the skin and the term is used interchangeably with "eczema", defined as an inflammatory process of the skin characterised variably by [erythema](#), oedema, [vesiculation](#), scaling, fissuring and [lichenification](#), depending on severity and chronicity².
- 1.2. Eczema is not a single disease entity, but describes a pattern of inflammatory responses originating in the [dermis](#). The inflammation may be [acute](#), [subacute](#) or [chronic](#), each representing one stage in the evolution of the inflammatory process.
- 1.3. Dermatitis may usefully be divided into [endogenous](#) and [exogenous](#) types, depending on whether the main precipitating factor of the inflammatory response is within the body or is caused by some external agent. There is no absolute division, however, and in many cases, the skin condition may be due to an interaction between external agents and individual responses of the body.¹ In addition, endogenous and exogenous types may be present in the same patient.

A dermatitis may be entirely endogenous (constitutional) or be entirely exogenous (contact).



The latter consists of irritant and allergic contact reactions. Commonly, dermatitis has a multifactorial aetiology and may be aggravated by the presence of pathogens (staphylococcus aureus). Assessment of the relative importance (contribution) of the possible factors may be difficult and subjective.

Patch testing provides an objective determination of contact allergy but not relevance. With patch testing one can show the presence or absence of contact allergy to chemical substances to which the individual has been tested.

2. Clinical features

- 2.1. **Endogenous eczema** is not primarily due to external factors and is mediated by inflammatory processes originating in the body. Principal forms include:-
- 2.1.1. **Atopic eczema** is particularly common in children, but occurs at all ages. It may occur all over the body but especially affects the flexures, appearing as areas of red and scaly skin which may become lichenified. It tends to be associated with intense itching and, consequently, the prevention of scratching is a major problem. Atopic hand eczema is a common manifestation of adult atopic dermatitis.
- 2.1.2. **Asteatotic eczema** (eczema craquele) appears when there is excessive drying of the skin. It is most commonly seen on the front and side of the legs, which become dry and scaly. If there is further drying accompanied by scratching, red plaques appear with long horizontal fissures. If the condition worsens, the horizontal fissures are joined together by shorter vertical fissures and the whole area resembles cracked porcelain.
- 2.1.3. **Seborrhoeic dermatitis** most commonly occurs on the scalp, face (especially the nasolabial folds and eyebrows) and presternal area of skin. Dandruff may be considered a banal and minor form of the condition. In more severe forms it is characterised by dull or yellowish greasy scales.
- 2.1.4. **Nummular (or discoid) eczema** most commonly occurs in middle age. The itchy coin-like lesions are red and are usually 1-5 cm across. Lesions characteristically occur on the limbs, but may be widespread.
- 2.1.5. **Stasis (gravitational) dermatitis** is characterised by eczematous changes in the skin of the lower legs which occurs in some patients with venous insufficiency; it may be accompanied by ulceration. Oedema is commonly present. Fat [necrosis](#) and subcutaneous [fibrosis](#) may follow thrombosis of small veins. A variety of changes may occur as a result of thrombosis of larger veins. These are known as **post-phlebotic syndromes**.
- 2.1.6. **Endogenous vesicular hand (and foot) eczema (Pompholyx** and dyshidrotic eczema are archaic terms) is a dermatitis occurring primarily on the palmar surfaces of the hands, sides of the fingers and feet consisting mainly of intensely itchy vesicles. These normally improve over a 3-4 week period with some scaling. It may evolve into a chronic eczematous process.
- 2.2. **Exogenous eczema** has well-defined external triggers, and an inherited tendency plays only a small part.
- 2.2.1. **Irritant contact dermatitis** is the most common type of eczema seen affecting the hand. It is typically seen in those engaged in 'wet work' and people whose occupations involve them in repeated wetting of the hands or exposure to irritant chemicals. The initial changes are dryness, chapping and redness. Cracking and fissuring may then occur. The changes at this stage are subacute. If there is further irritation, the itching intensifies and excoriation occurs. Superadded infection may be present.
- 2.2.2. **Allergic contact dermatitis** occurs when a specific allergy develops to some

substance with which the skin is in contact. As with any type of eczema, the condition can be exacerbated by exposure to washing, scratching, further irritants, and infection, or even by medication.

2.2.3. **Photo contact dermatitis** occurs when exposure to ultra violet light results in the transformation of a substance on the skin into an allergen (**photoallergic dermatitis**) or an irritant (**phototoxic dermatitis**).

2.2.4. **Id reaction** (dermatophytide) is the name given to an intensely itchy vesicular eruption occurring most commonly on the sides of the fingers but also on the palmar aspects of the hands and feet as a result of a fungus infection

2.3. Diagnoses in dermatology are made with a combination of clinical and [histopathological](#) criteria, using observation and biopsy. The severity of dermatitis varies up from extremely mild. In anything other than very mild forms it can cause considerable social difficulty.

2.4. Although skin diseases are probably not directly caused by **psychological disturbances**, they may cause considerable psychological upset.²

2.5. **Hand eczema** is extremely common and may interfere with normal daily activities. Irritant contact dermatitis affecting the hands is particularly common in occupations where 'wet work' is involved. The prevalence is between 5-6% of the population and it is twice as common in women as in men. Hand dermatitis is a significant factor as a cause of sick leave and change of employment.³ Predictive factors include previous childhood eczema, asthma or hay fever, occupational exposure to certain substances, and type of occupation.⁴ The differential diagnosis of hand eczema is difficult because there is poor association between the clinical presentation and the type or stage of eczema. Patterns of distribution vary and there are other conditions such as psoriasis which may appear eczematous. Disease of the hands can affect dexterity to the extent that normal activities become impossible.

2.6. **Stages of eczema**⁵

2.6.1. **Acute eczema** is characterised by [erythema](#) and a moderate to intense degree of inflammation. There is intense itching accompanied by an extreme desire to scratch. In all but very mild cases, some [vesicle](#) formation and blistering occurs. If no further exposure occurs, acute eczema improves spontaneously, passing through the subacute stage as it resolves.

2.6.2. **Subacute eczema** is characterised primarily by erythema and scaling, usually with indistinct borders. The intensity of itching varies greatly. Subacute inflammation may be the first manifestation of eczema, or it may follow acute eczema. Equally, acute eczema may follow the subacute form if it becomes infected or irritated. Subacute eczema will resolve completely without scarring if the causes are removed. If external irritation or [excoriation](#) continues, this stage may evolve into chronic eczema. Subacute eczema is seen in conditions such as allergic contact dermatitis, asteatotic eczema, [atopic](#) dermatitis, nappy rash, exposure to chemicals, irritant contact dermatitis, nummular eczema and stasis dermatitis (see sections 2.3 and 2.4).

2.6.3. **Chronic eczema** results from uncontrolled scratching and/or continuing irritation. There is thickening and fissuring of the inflamed area, most frequently seen in the areas of the body which are easily reached. The itching is always at least moderate in intensity. Scratching, which often occurs during

sleep as well as during waking hours, causes excoriation. The condition may become self-perpetuating since, as it becomes worse, the itching becomes more intense.

- 2.7. Some of the dermatological manifestations of certain **drug reactions** are eczematous in type. This is uncommon.
- 2.8. **Traumatic dermatoses** are not uncommon. They result from repeated scratching or picking of the skin surface and may be very difficult to diagnose if the possibility does not come to mind that the condition may be induced in this way.^{6,7} Common examples are lichen simplex chronicus, red scrotum syndrome, prurigo nodularis and neurotic excoriations.

3. Aetiology

3.1. Endogenous Eczema

- 3.1.1. **Atopic eczema** is genetically determined but may be exacerbated by exposure to irritant chemicals and by scratching.
- 3.1.2. **Asteatotic eczema** usually occurs on the shins of the elderly where the protective functions are compromised and excess drying occurs.
- 3.1.3. **Seborrhoeic dermatitis** is caused by infection of the skin with the yeast *Malassezia furfur*.
- 3.1.4. **Stasis dermatitis** probably has a number of different contributing causes. The basic cause is always related to excess hydrostatic pressure in the venous system. The variants depend on local anatomical and physiological factors.

3.2. Exogenous eczema

- 3.2.1. **Irritant contact dermatitis**. The most common irritants are solvents and detergents. Dermatitis occurs more often in people who wash and dry their hands frequently e.g. hairdressers, health care workers, catering staff. The [stratum corneum](#) of the skin normally acts to prevent external agents entering the skin and water escaping from it. Any factors which damage the stratum corneum interfere with its protective ability. Organic solvents, alkaline soaps, and chemicals are particularly powerful in this respect.
 - 3.2.2. **Allergic contact dermatitis** can be caused by exposure to many different agents. It is manifestation of a delayed hypersensitivity reaction occurring on the skin of a previously sensitised individual.
 - 3.2.3. **Photoallergic contact dermatitis** occurs as a result of exposure to photosensitisers, but the exact mechanisms are not well understood.
 - 3.2.4. **Id reactions** occur in association with an acute inflammatory process, often a fungal infection, at a distant site, and may be allergic reactions to fungal or other antigens created or released by the inflammatory process.
- 3.3. **Occupational dermatitis** is a skin condition which may originate from occupational exposure, but is often influenced by many other factors. There can be a constitutional predisposition such as previous childhood eczema, previous sensitisation to specific allergens, development of allergic reactions to topical medicaments used to treat the condition. Diagnosis depends on very careful history taking, physical examination, and patch tests. It is often difficult to attribute causation with certainty. An enormous range of substances may be implicated, but there is comprehensive information available.⁸ Occupational dermatitis is seen commonly in hairdressers (dyes, persulphates, nickel, perfumes, rubber chemicals, formaldehyde, resorcinol), health workers (rubber chemicals), cooks (rubber chemicals, formaldehyde) and industrial workers exposed to a variety of agents (chromate, rubber chemicals, resins, preservatives).
- 3.4. **Photoallergic and phototoxic contact dermatitides** require exposure to light after topical application of certain chemicals. Photoallergic and phototoxic contact

dermatitides must be differentiated from photosensitivity reactions to systemic drugs.

4. Prognosis

- 4.1. The prognosis in all forms of exogenous dermatitis depends on avoidance of, or protection from, the causative agents. Psychological distress may occur.
- 4.2. **Endogenous eczema.**
 - 4.2.1. **Atopic eczema** Although this type of dermatitis is not caused by irritants, it is exacerbated by them, and prognosis is partly related to adequate protection.
 - 4.2.2. **Asteatotic eczema** tends to improve in the summer months. The course is variable. Some patients have a severe form, with oozing, infection and crusting. Topical steroids may be useful, but the mainstay of treatment is the regular use of lubricants and avoidance of any agent which dries the skin.
 - 4.2.3. **Seborrhoeic dermatitis** in adults may be very persistent. However, it can generally be kept under control with regular use of antifungal agents and intermittent applications of topical steroids. Infantile seborrhoeic dermatitis usually clears up completely before the baby is six months old and rarely persists after one year.
 - 4.2.4. **Nummular eczema** may be resistant to treatment. The course is generally fluctuating, and many cases become inactive after some months, but lesions may reappear, usually at previous sites, at any time.
 - 4.2.5. **Stasis dermatitis** always has venous insufficiency as its root cause, and this must be addressed in all cases if the condition is to improve. Some patients will require surgical ligation of perforating veins. Infection must be properly treated, and oedema prevented. Emollients and local steroid creams will be useful in many patients. Active treatment of the condition at an early stage will prevent unnecessary progression of the dermatitis.
- 4.3. **Exogenous eczema**
 - 4.3.1. **Irritant contact dermatitis.** Adequate protection by appropriate barrier creams is vital. Use of emulsion skin cleansers other than alkaline soaps prevents drying, and emollients help to maintain skin hydration.
 - 4.3.2. **Allergic contact dermatitis.** The prognosis in this condition can be radically improved by identifying and avoiding the responsible allergen(s).
 - 4.3.3. **Photoallergic contact dermatitis** can be controlled by withdrawing the sensitizer and protecting the skin from exposure to light.
 - 4.3.4. The prognosis in **endogenous vesicular hand eczema** is variable. Various treatments are available, including local and oral corticosteroids, PUVA (phototherapy following sensitizers), and ciclosporin.
 - 4.3.5. **Id reactions** resolve completely when the acute inflammation or fungal infection at the distant site is controlled.
- 4.4. The prognosis of **traumatic dermatoses** depends entirely on whether the patient is able to change their underlying behaviour. In severe cases, antidepressive or antipsychotic medication may be necessary. In the meanwhile, treatment with topical

steroids and emollients according to the type of lesion may be helpful.

5. Summary

- 5.1. "Dermatitis" simply means inflammation of the skin. The term tends to be used interchangeably with "eczema".
- 5.2. Eczema is a group of inflammatory processes, characterised by erythema and vesiculation or scaling and/or fissuring and/or lichenification. It is not a single disease entity, but is a pattern of inflammatory responses originating in the dermis.
- 5.3. The range of conditions is large, many are multifactorial, their aetiologies poorly understood, and their prognoses very variable.
- 5.4. Causes may be primarily from within the body (endogenous) or mainly due to external agents (exogenous), but most inflammatory skin conditions have some elements of both.
- 5.5. The conditions may themselves cause psychological distress.
- 5.6. It may prove very difficult to attribute causation in skin conditions of possible occupational origin, although many substances used in the work environment may produce irritant or allergic reactions.

6. Related Synopses

None

7. Glossary

acute	Generally having rapid onset, severe symptoms and short duration. Has specific meaning related to appearances on microscopic examination of tissues.
antigen	A substance which provokes an immune reaction with the formation of antibodies.
atopic	Related to a hereditary predisposition to develop certain hypersensitivity reactions on exposure to specific antigens.
chronic	Generally lasting for a long period of time or marked by frequent recurrence. Has specific meaning related to appearances on microscopic examination of tissues.
cytokine	A messenger protein released by white blood cells
dermis	The middle of the 3 layers of the skin, containing blood, lymph vessels, sweat glands and nerve endings.
endogenous	Originating within or produced by the body.
emollient	A substance that softens and soothes the skin.
erythema	Redness due to increased blood flow.
excoriation	An area of the skin covered by a crust, or scab, usually caused by scratching.
exogenous	Originating from causes outside the body.
fibrosis	The formation of fibrous scar tissue.
histopathology	The study of the microscopic structure of diseased tissues.
lichenification	Thickening of the skin.
necrosis	Changes indicative of cell death.
stratum corneum	The most superficial protective layer of the skin.
subacute	Intermediate between acute and chronic.

vesiculation

Formation of vesicles - small fluid-filled blisters.

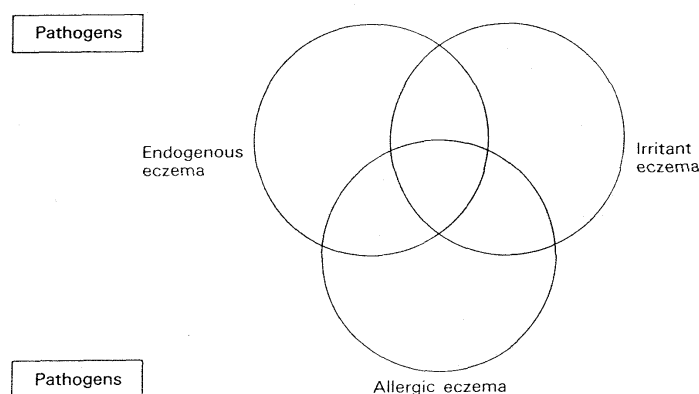
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Occupational Dermatitis

Ian R White

There are many dermatoses which have occupational relevance but the overwhelming majority are dermatitic. In current terminology the term ‘dermatitis’ is used synonymously with ‘eczema’ to describe inflammatory reactions in the skin with a spectrum of clinical and histopathological characteristics.



A dermatitis may be entirely endogenous (constitutional) in nature or be entirely exogenous (contact). Within the latter, irritant and allergic contact reactions are recognised. Frequently a dermatitis has a multifactorial aetiology and may be aggravated by the presence of pathogens (e.g. *Staphylococcus aureus*).

Atopic hand eczema and vesicular hand eczema are examples of endogenous eczema.

An occupational dermatitis is one where the inflammatory reaction is caused entirely by occupational contact factors or where such agents contribute to the reaction on a compromised skin i.e. they are partially responsible.

In the majority of cases an occupationally related dermatitis will affect the hands alone. There may be spread onto the forearms. Occasionally the face may be the prime site of involvement (e.g. airborne); other sites may be involved.

Irritant contact dermatitis is caused by direct chemical or physical damage to the skin. All individuals are susceptible to the development of an irritant contact dermatitis if exposure to the irritant (toxic) agent(s) is sufficient. It occurs particularly where the stratum corneum is thinnest. Hence it is often seen in the finger webs and back of the hands rather than the palms. There are two main types of irritant contact dermatitis - acute and chronic. The former is caused by exposure to an agent(s) causing early impairment in stratum corneum function and an inflammatory reaction. The latter by repeated exposure to the same or different factors causing 'cumulative' damage until an inflammatory reaction ensues which persists even after further exposure is stopped. Those with a previous history of atopic eczema, and especially atopic hand eczema, are at particular risk of developing a chronic irritant contact dermatitis. A chronic irritant contact dermatitis is particularly observed where 'wet work' is involved.

Acute irritant contact dermatitis

- severity of reaction depends on 'dose' of irritant agent
- 'chapping' can be considered a minor form with a 'chemical burn' (e.g. cement burn) an extreme event. Intermediate eczematous reactions are common; minor reactions are very common
- may occur on the face e.g., low humidity occupational dermatosis, airborne irritant vapours
- once the irritant factor(s) have been removed, resolution is usually spontaneous without important sequelae

Chronic irritant contact dermatitis

- a persistent dermatitis and the most common cause of continued disability from occupational skin disease
- problem continues for long periods even with avoidance of aggravating factors.
- re-exposure to even minor irritant factors may cause a rapid flare
- even after apparent healing there may be an indefinitely increased susceptibility to recurrence of a dermatitis following irritant exposure

Allergic contact dermatitis is a manifestation of a Type IV hypersensitivity reaction. An allergic contact dermatitis will occur at the site of skin contact with the allergen. Secondary spread may occur. Contaminated hands may spread the allergen to 'non-exposed' sites. Trivial or occult contact with an allergen may result in a persistence of a dermatitis; some allergens are 'ubiquitous'.

There are two phases to the presentation of an allergic reaction - induction and elicitation. Even with potent experimental allergens there is a minimum period of about 10 days from first exposure to the immunological acquisition of hypersensitivity. The probability of developing hypersensitivity depends on the sensitising capacity of the chemical and exposure

to it. Most potential allergens on the consumer and industrial market have a low intrinsic potential for sensitisation, an important exception being some biocides. Contact allergens tend to be low molecular weight (<600) and capable of forming covalent bonds with carrier proteins in the skin. It is not possible to determine an individual's own susceptibility to the development of contact allergy. Hypersensitivity is specific to a particular molecule or to molecules bearing similar allergenic sites. Although hypersensitivity may be lost over a long time, the state should be considered to last indefinitely.

A dermatitis of occupational cause may be suspected when:

- a dermatitis first occurred whilst employed
- there is a history of aggravation by work
- there may be, at least initially, improvement (or clearance) when not at work
- there is exposure to irritant factors or potential allergens
- work in an 'at risk' occupation

Examples of common irritants

- 'wet' work
- solvents
- detergents
- soluble coolants
- vegetable juices
- wet cement

Examples of common occupational allergens

- rubber accelerating chemicals
- biocides
- hairdressing chemicals
- epoxy resin monomers
- chromate
- plant allergens

The primary prevention of occupational dermatitis is aimed at providing appropriate information and protection

- the employer and employee should be aware of the potential risks of exposure
- education regarding the necessity of good occupational hygiene precautions
- the adequate provision of suitable and effective means of reducing exposure
- awareness of the limitations of personal protection devices

Management of occupational dermatitis

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- An *understanding of the patient's job* is vital. A job title is not sufficient for this understanding; the question to be asked is not “what do you do?” but “what do you actually do and how do you do it?” The title ‘engineer’ carries a multiple of descriptions from the desk bound professional to the lathe worker exposed to soluble coolants. From the job description, it may be possible to estimate sources of excessive contact with potentially irritant contact factors or with allergens. The provision of data sheets may be helpful in this evaluation although the information which they contain is often superficial and restricted to that needed to meet regulatory requirements. A site visit – watching the worker working – may be necessary.

Patterns of hand dermatitis

From the distribution and morphology of a dermatitis on the hands it is not possible to be definitive about the aetiology. For example, a vesicular hand dermatitis with a ‘classical’ endogenous distribution may be mimicked by an allergic contact dermatitis to isothiazolinone biocides or chromate sensitivity.

It is a major error to rely on patterns of hand dermatitis in making a diagnosis.

- The *history and anatomical distribution* of the dermatitis may provide clues as to the aetiology
- Irritant contact dermatitis may occur as ‘epidemics’ in a workplace if hygiene has failed. Allergic contact dermatitis is usually sporadic in a workplace
- The *evaluation* of irritant factors is always subjective. Evaluation of allergic contact factors is objective and provided only by diagnostic patch test investigations. Properly performed, patch tests will demonstrate the presence or absence of significant allergens
- *Patch testing* is the only method for the objective evaluation of a dermatitis. There are major pitfalls in the use of this essential tool; proper training and experience is essential if it is to be used properly

Patch testing

- Properly performed requires expertise, time and proper facilities
- It is difficult to undertake adequately in the workplace. There are no short cuts
- It is primarily a hospital based procedure
- Should be performed only by those with appropriate training who can prescribe an appropriately comprehensive screen, know what not to test, know what to dilute for testing, can competently read the reactions, and can give authoritative advice following interpretation of the reactions
- Anyone can patch test ; few do it well. If you don't know how to do it, don't do it!

- A *competent assessment* requires all of the above followed by recommendations on reducing / stopping exposure to the offending agent(s) and similar ones.

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- The *diagnosis* of an occupational dermatitis should describe thoroughly the nature of the condition with due regard to any endogenous or aggravating factors. A general practitioner medical record entry in a patient's notes of "*Works in a factory, contact dermatitis 2/52*" is inadequate as a description of an important disease process and it can have profound implications on the patient's concept of his problem and employment.
 - *Delays* in diagnosis resulting in continued exposure to relevant irritants / allergens can adversely affect the prognosis.
 - ***Early referral to an appropriate dermatology department is vital for a full assessment of a suspected occupational dermatitis; improper assessment can have devastating effects on future employment prospects for the individual with important medico-legal implications. If in doubt - refer.***

Rubber latex protein sensitivity

Of current concern is the increasing frequency of immediate Type 1 hypersensitivity occurring to proteins present in gloves made from natural rubber latex. The problem is seen principally amongst health care workers but individuals in other industries where 'examination' gloves are used are also at risk. Affected individuals are usually atopic. They can present with a localised urticarial reaction at sites of skin contact or with respiratory symptoms when starch powdered gloves have been used. It has become an important cause of occupational morbidity in some settings. Anaphylaxis is possible with appropriate exposure. A definitive demonstration of hypersensitivity can be made by prick testing with the water soluble proteins.

Primary prevention involves the use of non-powdered gloves with very low protein residues. Affected individuals will need to be provided with synthetic rubber alternatives.