What is an occupational skin disease?

An occupational skin disease is any skin disorder which is caused by a person's work. A person's existing skin disorder may also be made worse by work activities, and such cases should also be considered as occupationally related conditions.

The commonest type of occupational skin diseases is dermatitis, an inflammation of the skin.

Common causes of Occupational Skin Disease

Irritation

The commonest cause of occupational skin disease is irritation of the skin from contact with substances at work. Strong irritants (such as acids, alkalies or organic solvents) cause skin inflammation after a short period of contact. Weak irritants (such as water, detergents and coolants) can cause inflammation after repeated exposures over a longer time. Irritation may also be exasperated by the inappropriate use of gloves (cf Guidance Note 2). Repeated exposure to adverse reagents can lead to chronic skin problems, such as irritant contact dermatitis. Contact dermatitis is not contagious.

Allergy

Another important cause of occupational skin disease is allergy to substances handled at work. Examples of substances which can cause skin allergies are cement, metals, resins and formaldehyde. Rubber gloves and boots worn for protection may sometimes paradoxically cause allergenic reactions in some individuals. See Guidance Note 2 and also the previously published guidance on Allergies.

How can occupational skin disease be recognised?

Occupational skin disease usually occurs on the parts of the body which come into contact with work substances. Occupational skin diseases occur most frequently on the hands and forearms.

Early signs of occupational skin disease include dryness, redness and itching of the skin. If severe, the skin may become swollen and vesicles may develop. The skin may eventually become cracked, scaly and thickened. Figure 1 overleaf gives illustrated examples of occupationally caused skin problems to the hand.

These skin changes often improve when the affected individual is away from work, such as during weekends and holidays. Other individuals who
do the same or similar tasks may also have similar skin problems, although this may not happen in all instances.

If you notice that such an occurrence is happening, then do not continue working on a particular task or activity until you have had a discussion with your line manager. Changes to the task or activity may be required to prevent further skin damage.

**FIGURE 1**

Examples of different severity of skin damage caused by irritant contact dermatitis are shown below.

These examples show differing degrees of severity of contact dermatitis (eczema). Individuals must examine their hands for signs of skin damage, however, minor, after wearing gloves. Skin problems should be reported immediately to your line manager who must involve occupational health to ensure that the correct corrective measures are applied. No gloves should be worn until advice from occupational health has been received.

**Structure of the skin**
The skin is a complex biological structure that carries out various functions that are important for the health of each of us.

The diagram (Figure 2) outlined below shows the basic structure of the skin.

**FIGURE 2**

*Structure of the Skin*

The skin consists of an outer, protective layer (epidermis) and an inner, living layer (dermis). The top layer of the epidermis is composed of dead cells containing keratin, the horny protein that also makes up hair and nails.

The skin, therefore, is our first line of defence in the prevention of bacterial or viral infections. Breaks in the epidermis through cuts or abrasions or the fact that the skin becomes irritated not only results in pain and/or discomfort but there is also the increased chance for bacterial, viral or fungal infections to occur within the skin epidermis itself. Any physical break in the epidermis may allow adventitious agents entry into the vascular system that permeates the dermal and subcutaneous layers.

**What is the size of the problem?**

From 2004/05 the self reported work related illness survey estimated the prevalence of self-reported work-related skin disease in Great Britain as 29,000. An estimated 3,500 new cases of work related skin disease were
diagnosed each year between 2002/04 and of these approximately 75% were contact dermatitis. Occupations at highest risk over this time period were “floral arrangers”, “florists”, “beauticians and related occupations” and “hairdressers and barbers”. Those other industries where workers were estimated to be at highest risk during this period included “other service activities”, “research and development” and the “manufacturer of chemicals and chemical products”. Table 1 overleaf illustrates the number of individuals with a reported skin disease between 2002/04.

TABLE 1

<table>
<thead>
<tr>
<th>Occupations</th>
<th>Cases/100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hairdresser and barbers</td>
<td>102</td>
</tr>
<tr>
<td>Beauticians and related occupations</td>
<td>93</td>
</tr>
<tr>
<td>Floral arrangers, Florists</td>
<td>79</td>
</tr>
<tr>
<td>Other service activities+</td>
<td>54</td>
</tr>
<tr>
<td>Research and Development*</td>
<td>23</td>
</tr>
<tr>
<td>Chemical manufacturer and chemical products</td>
<td>20</td>
</tr>
</tbody>
</table>

*R & D includes Universities, govt agencies and research councils such as the MRC.

+including health care workers

Skin damage

This can be placed into three major categories:

1. corrosion and chemical burns.
2. allergic reactions.
3. irritant reactions.

When assessing the risk of skin exposure, then determining:

(a) the substance or substances being used and,

(b) its strength or potency and,

(c) how long and how often it touches the skin, can be useful starting points in the assessment process.

Control Measures

Making a decision on the best way to ensure that adequate controls are in place to protect skin from damage is not straightforward. The Health and Safety etc. at Work Act¹ and the Control of Substances Hazardous to Health Regulations (COSHH) 2002², plus the addition of the 2004 Amendments and, the Personal protective equipment at work (second
edition) regulations 1992\(^3\) (as amended) are the main statutory instruments that require to be followed. However, unlike respiratory exposure where “Workplace Exposure Limits” (WELs) have been calculated and listed, for many substances there are no such equivalent figures for skin exposure. The question therefore, is “how can any control measures be applied?” Reliance solely on the manufacturers data sheet will in many instances be unreliable or lead to inappropriate conclusions. Substances with Risk (R-) phrases maybe of some help and often studying the “Approved Supply List”\(^4\) will give some aid when deciding the control measures for skin exposure. However, no accurate figures will be provided in terms of safe limits for skin exposure.

The “Principles of Good Practice” as outlined in schedule 2A of the 2004 COSHH amendments gives sound advice and these should be followed when considering any risk assessment. Following these principles should ensure that appropriate controls are put in place to reduce exposure to a particular hazard to an acceptable level. Hand protection and skin care should be part of the risk assessment when control measures are being considered.

(a) Design and operate processes and activities to minimise emission, release and spread of substances hazardous to health.

(b) Take into account all relevant routes of exposure – inhalation, skin absorption and ingestion – when developing control measures.

(c) Control exposure by measures that are proportionate to the health risk.

(d) Choose the most effective and reliable control options which minimise the escape and spread of substances hazardous to health.

(e) Where adequate control of exposure cannot be achieved by other means, provide, in combination with other control measures, suitable personal protective equipment.

(f) Check and review regularly all elements of control measure for their continuing effectiveness.

(g) Inform and train all employees on the hazards and risks from the substances with which they work and the use of control measures developed to minimise the risks.

(h) Ensure that the introduction of control measures does not increase the overall risk to health and safety.

Guidance Note 2 addresses the use of gloves as appropriate personal protective equipment. However, full face visors, goggles or safety spectacles may be required for possible hazards to the face or eyes. It is important that, in this instance, the correct protective equipment is
selected and our published policy and guidance document “Selection, provision and use of eye protection” should be consulted.

**Guidance Note 2**

**Gloves and Skin Care Management**

**Introduction**

In many MRC establishments, gloves are one of the most commonly used type of Personal Protective Equipment (PPE). In many instances this kind of PPE is often the most misused or inappropriately used type of PPE. The use of the correct type of gloves for a particular task can offer the wearer protection against the perceived hazard. The incorrect use of gloves for a particular task can compound the possibility of the wearer being harmed, either by using gloves inappropriate to the task, the gloves offer little or no protection against, say the chemical being used, because of the gloves’ composition or the gloves are too large or small for the wearer or, they have been physically damaged perhaps by incorrect storage. Like all other types of PPE the use of gloves for any particular purpose or task must be subject to a “Risk assessment” and should, like all personal protective equipment, be the control considered after other measures have been implemented. The risk assessment will be looking at all the perceived hazards within a particular task and deciding the appropriate controls that should be in place to prevent any hazard or risk being realised. The use of gloves and the type and make of glove being used must also be part of the overall risk assessment process.

**What should the risk assessment address?**

When considering the use of gloves as PPE for any particular task, the following points must be taken into consideration.

1. The skin conditions of the proposed wearer.

What exactly does this mean? COSHH has, as one of its principles, the concept to always consider the health status of the individual when carrying out any risk assessment. This is equally applicable to the proposed use of gloves as PPE.

It may not be appropriate for a person already with a poor skin condition for example, with cracked or dry skin, to wear gloves. The risk assessment must consider the health, in this case, skin health of the person when gloves are being used or are being considered as part of the suitable controls for any particular task.
2. The nature of the task and perceived hazard.

Some factors that the risk assessment may consider:

- The nature of the chemicals or biological agents to which exposure might occur.
- The concentration and/or temperature of the chemicals, both of which can affect penetration rates.
- The frequency and duration of contact with the chemical or biological agent.
- The requirement for the glove material to be robust and resistant to physical damage, such as tearing or grazing during lifting or moving objects.
- The requirement of the glove to provide protection against adverse temperatures.
- The need of dexterity and “feel” with the glove on.
- The extent of protection – is it hand only or wrist and forearm as well?

**Glove Selection**

There are two important properties that must be well understood by individuals using gloves for PPE.

1. **One type of glove does not provide universal protection.**

2. **Any failure of the glove may result in potential harm to the wearer.**

**Definitions**

Before looking at the material composition of any glove it may well be useful to define some terms used by manufacturers when they derive tables outlining the performance of any particular glove type.

**Breakthrough time**

The time, in minutes, for a measurable amount of chemical to pass through the glove material. This is determined by immersing one side of the glove (outside) in a particular chemical and calibrating the time taken for that particular chemical to pass through the glove material.

**Permeation**

The units given are in micrograms per square centimetre per minute for any chemical to permeate or pass through the glove material.
Degradation

A change in the tensile strength after fixed periods of immersion (normally 30 mins) with a particular chemical ie loss of physical quality of the glove. Note that this can also occur when gloves are inappropriately stored or left exposed to sunlight or u.v. radiation for prolonged periods.

Useful time

A parameter combining permeation and degradation data.

Type of Gloves

Gloves are either disposable (i.e. they are only worn once and not re-used) or re-usable.

Disposable Gloves

One commonly used component of disposable gloves is natural rubber latex. Latex disposable gloves were introduced originally to protect health workers against the risk of cross-contamination when handling human blood or samples containing bodily fluids. A major attraction was the dexterity offered by these gloves to the wearer and the fact that they were relatively cheap. A major disadvantage that has arisen, particularly with powdered latex gloves, has been the fact that many healthcare workers, perhaps as many as 17%, have developed an allergic reaction to, in particular, unbound latex proteins present in the powder of these gloves. Further information about allergies can be found in the published policy and guidance on “Allergy”.

Powdered latex disposable gloves must not be used in any MRC establishment or by any MRC staff member or visitor. Powdered latex gloves greatly increase the risk that an allergenic reaction will be initiated.

A risk assessment should determine whether latex single use disposable gloves should be used and if used, they must be powder free and with a low latex protein content (<50mg bound latex protein/gram weight). Individuals who are sensitised to natural rubber latex must never use any glove containing the latex protein irrespective of the amount of non-labile protein the glove contains. It must be borne in mind that the chemical accelerators used in glove processing can also promote an allergenic reaction in certain individuals, particularly those with an atopic allergic disease (an allergy to pollen, house dust-mites etc (cf policy and guidance on Allergy).
The most commonly used chemical accelerators are Tetramethylthiuram disulphide (Thiurams), the dithiocarbamates and the mercaptobenzothiazoles. These chemical accelerators are used in the vulcanisation of natural and synthetic rubbers and include products such as tyres, shoes, tubes, cables as well as gloves. The thiurams appear to be more likely to initiate a skin reaction, although all three accelerators can be considered as potential candidates. Allergic contact dermatitis is the commonest skin condition that chemical accelerators may cause. Reportable cases show that thiurams are responsible for about 60% of cases of contact dermatitis, carbamates are responsible for 30% and thiazoles account for 1 to 5%. The use of any type or make of disposable gloves should, therefore, be carefully monitored to ensure that the wearer does not experience adverse reactions.

Disposable gloves that do not contain latex protein include:

Polychloropene (neoprene) – used as surgical gloves and provide good protection against viral agents. These gloves are more resistant to alcohols than latex gloves.

Vinyl (polyvinyl chloride) – used in medical examinations but they are not recommended when handling blood or bodily fluids because they can be punctured and tear more easily than either latex or polychloropene gloves.

Polyethylene – these gloves lack elasticity and can be difficult to achieve a correct fit making them uncomfortable.

Nitrile (acrylonitrile) – these gloves provide a good biological barrier and unlike vinyl gloves are more resistant to puncture or tearing.

Polyisoprene – a well fitting glove that has many of the physical attributes of disposable latex gloves.

Individuals experiencing any adverse reaction, such as dryness of the skin, redness or itching, to wearing any type of disposable glove must:

- Stop using the glove in question immediately.
- Inform their line manager.
- Complete an incident report.
- Seek further advice from the Occupational Health provider.

Re-usable Gloves
Re-usable chemical resistant gloves come in a variety of materials including natural rubber, butyl rubber, polyvinylchlorine (PVC), nitrile etc. It is important to ensure that re-usable gloves are used by only one person. Gloves within this category are required for heavier duty task or for dealing with spillages. Any adverse reaction to any glove should follow the steps outlined above.

Glove Liners

Linen, cotton or nylon glove liners, in some instances, can be useful in offering both skin protection and comfort to the wearer particularly when re-usable gloves are being used.

Persons exhibiting any signs of skin deterioration must not use any glove liner until advice from the occupational health provider has been sought.

**TABLE 2**

This table gives examples of glove materials and their protective properties against various substances.

<table>
<thead>
<tr>
<th>GLOVE TYPE</th>
<th>USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butyl Rubber</td>
<td><strong>Good</strong> for many organics, ketones, esters; <strong>Poor</strong> for aliphatic, aromatic hydrocarbons, halogenated hydrocarbons, gasoline.</td>
</tr>
<tr>
<td>Natural Rubber</td>
<td><strong>Good</strong> for very dilute acids and bases; <strong>Poor</strong> for organics.</td>
</tr>
<tr>
<td>Neoprene</td>
<td><strong>Good</strong> for acids and bases, peroxides, fuels, hydrocarbons, alcohols, phenols. <strong>Poor</strong> for halogenated and aromatic hydrocarbons.</td>
</tr>
<tr>
<td>Polyvinyl chloride (PVC)</td>
<td><strong>Good</strong> for acids and bases, some organics, amines, and peroxides; <strong>Poor</strong> for most organics.</td>
</tr>
<tr>
<td>Polyvinyl alcohol (PVA)</td>
<td><strong>Good</strong> for aromatic and chlorinated solvents; <strong>Poor</strong> for water-based solutions - <em>water destroys the gloves!</em></td>
</tr>
<tr>
<td>Silver Shield™</td>
<td><strong>Good</strong> for wide variety of toxic and hazardous chemicals; provides</td>
</tr>
</tbody>
</table>
the highest level of chemical resistance. Flexible laminate glove;

**Poor fit** – comes in small, medium, large.

<table>
<thead>
<tr>
<th>Material</th>
<th>Resistance</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4H™</td>
<td><strong>Good</strong> resistance to many chemicals; better dexterity than Silver Shield™.</td>
<td></td>
</tr>
<tr>
<td>Nitrile</td>
<td><strong>Good</strong> for wide variety of solvents, oils, greases, some acids and bases.</td>
<td></td>
</tr>
<tr>
<td>Viton™</td>
<td><strong>Exceptional</strong> resistance to chlorinated and aromatic solvents; <strong>Good</strong> resistance to cuts and abrasions.</td>
<td></td>
</tr>
</tbody>
</table>

**How to choose the correct glove**

The nature of the tasks will, in the first instance, determine whether there is a need for a re-usable glove or whether a single use disposable glove is suitable No glove should be used if it does not conform to one or more specific European Standards (cf bibliography-5-9). Each box of protective gloves should be marked with the following information.

1. Name, trade mark or other means of identification that informs who manufactured the glove or who is the authorised representative.

2. Glove designation – this will be a code that allows the user to clearly identify the particular product produced by a certain manufacturer.


4. If glove performance can be affected by ageing, then an obsolesce date will be present.

5. A pictogram indicating type of hazard the glove is suitable for and, its relevant performance level.

Table 3 shows examples of the pictograms used by glove manufacturers and figures 3 and 4 present more detailed information for two specific hazard parameters.

**TABLE 3**

<table>
<thead>
<tr>
<th>Pictogram</th>
<th>Meaning category (eg of)</th>
<th>Pictogram</th>
<th>Meaning category (eg of)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CODE LETTER</td>
<td>CHEMICAL</td>
<td>CLASS</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------</td>
<td>---------------------------</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Methanol</td>
<td>Primary Alcohol</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Acetone</td>
<td>Ketone</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Acetonitrile</td>
<td>Nitrile compound</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Dichloromethane</td>
<td>Chlorinated paraffin</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 4**
Table 4 illustrates the chemicals used in determining the protection offered by any glove type. Under normal circumstances three chemicals will be employed for any one test.

**FIGURE 3** An example of a chemical pictogram for one glove type.

![Chemical Pictogram](image)

A typical chemical pictogram is shown above. In this example the chemicals tested against this glove were methanol, dichloromethane and toluene. This glove, therefore, gives protection against the above three chemicals and also those chemicals having similar properties.

**FIGURE 4** Protective glove for use against thermal hazards.

![Thermal Hazard Protection](image)

0 --- Large molten metal splashes: --- performance level 0
1 --- Small molten metal splashes: --- performance level 1

1 --- Radiant heat: --- performance level 1

2 --- Convective heat: --- performance level 2

3 --- Contact heat: --- performance level 3

1 --- Flammability: --- performance level 1

Figure 4 shows a typical pictogram found on gloves that provide protection against thermal hazards. Each pictogram will display the performance of the glove against various thermal hazards found in workplaces. In the example given in figure 4, 0 is the lowest (no protection) and 3 is the highest degree of protection. Thus the glove type in figure 3 gives protection against contact heat but would not be used for naked flames, radiant heat or small molten metal splashes. The gloves offer no protection against large molten metal splashes.

**Some Rules for Glove Use**

- Select gloves which are resistant to the hazard you may be exposed to. The Material Safety Data Sheet (MSDS) may recommend a particular glove material or give guidance.

- Select gloves of the correct size and fitting; gloves that are too small are uncomfortable and may tear whereas overlarge gloves may interfere with dexterity. Before use, always check gloves (even new ones) for physical damage such as tears or pin holes and for previous chemical damage: this is especially important when dealing with dangerous materials such as organic solvents.

- When working, it may be advisable to wash the external surface of the gloves frequently with water. This is more applicable to heavy duty re-usable gloves.
Some gloves, especially lightweight disposables, may be flammable: therefore, keep hands well away from naked flames and other high temperature heat sources.

When removing gloves, do so in a way that avoids the contaminated exterior of the glove from contacting the skin.

Dispose of contaminated gloves properly.

Do not attempt to re-use disposable gloves that are the single-use, disposable type.

Major manufacturers of gloves provide information on compatibilities, for example Comasec, who manufacture Marigold gloves.

**Hand Care**

It should be clear that wearing any form of protective glove may have an adverse effect upon the skin of the hand and forearm (if applicable). Sensible precautionary measures will help to reduce skin problems.

1) Never wear gloves for excessive times, (greater than 1 hour) particularly single use gloves.

2) Never apply powder or other lubricants to aid in putting on gloves.

3) Never apply barrier cream when wearing any type of protective glove.

4) Always wash your hands using a mild soap. Using soaps too frequently can exasperate a dry skin condition and it can also deplete the skin of natural oils, more especially in combination with hot water. To avoid this, you should try and minimise the use of soap when washing and instead use soap substitutes. Materials such as aqueous cream and emulsifying ointment can be used as soap substitutes when washing.

5) Always dry your hands carefully without being unduly abrasive.
6) During breaks apply a quality moisturiser to return lost oils to the skin. At the end of the day always use a quality moisturiser.

Which type of emollient moisturiser should I use?

Moisturisers come in three different forms and choosing the one most suitable will depend upon personal choice and skin condition.

**LOTIONS** – these are mixtures of oil in water and generally are light, non-greasy formulations that have a cooling effect. They are easily absorbed and good for mildly dry skin or skin that is weeping from an eczema. Lotions are also particularly suitable for hair containing areas of skin.

**CREAMS** – again mixtures of oil in water but creams are slightly thicker than lotions. Generally non-greasy and easily absorbed.

**OINTMENTS** – these are thick, occlusive oil-based moisturisers that are best for very dry areas of skin. They are not easily absorbed and are very greasy.

If you have a particularly sensitive skin, then it may be wise to avoid moisturisers containing any of the following:

Beeswax, Benzyl alcohol, Butylated hydroxyanisole, Butylated hydroxytoluene, Cetostearyl alcohol (also cetyl and stearyl alcohols), Chlorocresol, Edetic acid, Ethylenediamine, Fragrances, Hydroxybenzoates, Imidurea, Isopropyl palmitate, N-(3-chloroallyl) hexminium chloride, Polysorbates, Propylene glycol, Sodium metabisulphite, Sorbic acid and finally, wool fat and related substances including lanolin. All of the aforesaid are known to irritate sensitive type skins and to adversely affect eczemic conditions.

Always seek medical advice if the skin on your hands shows any sign of physical deterioration (cracks, sores, undue redness or drying)

Finally, never wear gloves (disposable or re-usable) away from the work area. Always remove your gloves, wash and dry hands carefully, when the task is finished or when handling telephones, computer keyboards, door handles etc.

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3. Personal Protective Equipment at Work Regulations 1992 (as amended)
5. Protective gloves – General requirements and test methods BS EN 420:2003
6. Protective gloves against chemicals and micro-organisms BS EN 374 – 1:2003
7. Protective gloves against chemicals and micro-organisms BS EN 374 – 2:2003