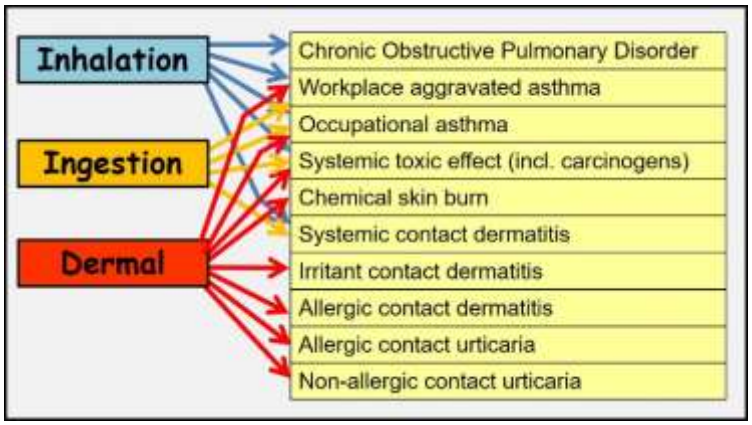
# Risk assessment for skin exposure according to the Control of Substances Hazardous to Health regulations – an overview

This document provides a brief overview of what a COSHH risk assessment should include. Note that it is concerned only with skin exposure and not the other two routes – inhalation and ingestion. Be aware also that treating each route in isolation ignores the potential for cross reaction that might not be identified if each is treated as a discrete, isolated route. The diagram shows the cross reactions that can exist between the three routes.




As part of any risk assessment for risks of damage to health due to workplace skin exposure we need to identify the properties of any chemical that is present when a task is being carried out. This is not quite as simple as many assume. Traditionally much reliance has been placed on the information contained in the safety data sheet. However, in a large number of cases this is inadequate for a comprehensive skin exposure risk assessment. It is almost always the case that chemicals are purchased to use for a particular task. In the process of using them we may well change their properties, and therefore the hazard that contact between chemical and skin represents.

Thus what is essential in any skin exposure risk assessment is to identify the real hazard of the chemical as used.

The first step is to decide what chemicals are present and used when a task is carried out and how they are used.

We need to recognize that the safety data sheet is only required to contain information on those constituents that have been classified as hazardous, that is, have been assigned one or more Hazard Statements.

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|---|---|
| H310 | Fatal in contact with skin |
| H311 | Toxic in contact with skin |
| H312 | Harmful in contact with skin |
| H314 | Causes severe skin burns and eye damage |
| H315 | Causes skin irritation |
| H317 | May cause an allergic skin reaction |
| EUH066 | Repeated exposure may cause skin dryness or cracking |
| EN Hazard statements relevant for skin exposure | |

A word of caution: There are many chemicals that will not have been assigned a Hazard Statement relevant to skin exposure.

Many of the chemicals not assigned one of these Hazard Statements may, under certain circumstances, cause damage to health should contact between the chemical and the skin occur. Thus, it is possible for a chemical to be shown on the safety data sheet with no indication of its potential to cause damage to health due to skin exposure. The chemical may quite legally not appear on the safety data sheet at all.

This is recognized in the Control of Substances Hazardous to Health (COSHH) regulations which contain the following as one definition of a substance hazardous to health:

> "(e) which, not being a substance falling within sub-paragraphs (a) to (d), because of its chemical or toxicological properties and the way it is used or is present at the workplace creates a risk to health" - *COSHH Regulation 2 (1) Interpretation*

Technically, everything is either a chemical or a combination of chemicals. It is irrelevant at this stage whether it is in liquid, gas or solid form. In the latter case there may still be the potential for a skin hazard to exist.

For example, a nickel-plated object may be capable of releasing nickel when handled with bare skin, and nickel is one of the most common causes of allergic contact dermatitis. Our ultimate aim is to determine what the real chemical hazard is that is present during the execution of the task. This can very different from the chemical that was received from the supplier.

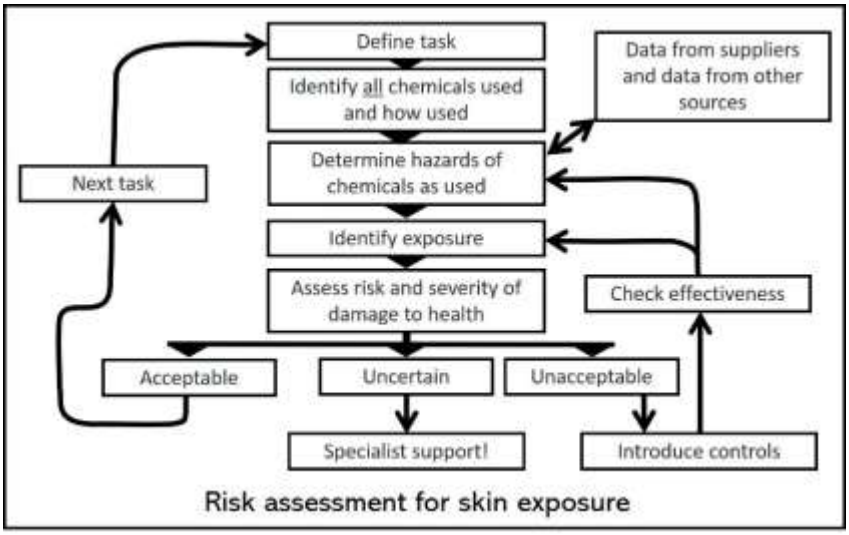
In the U.K. the Approved Code of Practice (ACoP) for COSHH now recognizes this. Paragraph 10 states:

> "Employers should regard a substance as hazardous to health if it is hazardous in the form in which it may occur in the work activity. A substance hazardous to health need not be just a chemical compound, it can also include mixtures of compounds, micro-organisms or natural materials, such as flour, stone or wood dust."

As indicated above, it is not just chemicals in any form that are present at the start of the task that need to be included when conducting a risk assessment, but also those that may occur as a result of the activity during the task.

This means that we need to include what happens to any material, whatever its form, regardless whether officially classified as hazardous or not, should it be present during the task and should there be any possibility that this might result in contact between any person involved in the task, or present at the time, in a form that might meet the criteria in the ACoP paragraph 10 quoted above.

The word 'material' has been used to ensure that it is not just what popular conception might consider as a 'chemical', e.g. liquids, or perhaps powders, that we need to identify. For each material we should record in detail how it is used during the task and what happens to it once the task has been completed.



Risk assessment for skin exposure

The result of this is that a COSHH risk assessment does not start with a list of those chemicals on site, whether or not they appear of a safety data sheet. A COSHH risk assessment starts with the task, identifying what happens during the task, all chemicals involved in the task (whether on a safety data sheet or not) and how they are used. The diagram shows a sequence of steps that at EnviroDerm Services we believe represent the correct approach to a COSHH risk assessment.

| | |
|---|---|
| Contamination | e.g. in cleaning chemicals, solvents used for degreasing items |
| Mixing/diluting | If we mix two or more chemicals together this may change the effect should skin contact occur. |
| Reaction | between two or more chemicals, e.g. mixing bleach and acid based toilet cleaner can produce chlorine |
| Processes | that change the properties of the chemicals, e.g. vulcanising rubber |
| Heating | can affect the properties of the chemical and cause release of sensitiser, e.g. solder flux |
| Metabolisation | within the skin, e.g. methanol can metabolise in the skin to formaldehyde, a sensitiser |
| Oxidisation | changes in the chemical introducing sensitisers, etc. |
| Other changes | that occur over time, e.g. biocides that are formaldehyde releasers |
| Physical changes | such as leaching of metals into metalworking fluid, grinding dust, etc. |

The next step in our risk assessment process is to determine the hazards to health represented by the materials present and used during the task.

Almost always, when we purchase a chemical it is to use it for a particular purpose. In using it we may change its properties and in doing so change the hazard. The table shows some of the changes that may occur.

So what we started with may not be what is critical when assessing the potential for exposure to the chemical during the execution of the task to cause damage to health. Furthermore, the hazard may change not only as the task progresses, but also where the chemical may be used more than once. An example of the latter is a degreasing tank, used to clean items of mechanical equipment that have been returned to the manufacturer for repair or updating. Perhaps the tank contains toluene as a solvent. However, the moment that the first component is degreased the content of the tank is no longer just toluene. Each time a component is degreased the constituents of the liquid will change. Some of the contaminants may be potent sensitizers, or, if they can be absorbed into the body, capable of causing damage to internal organs. If the components being degreased are arriving from an environment where the composition of the soiling is not known, how should the potential hazard be assessed?

This is also recognised in the 6th edition of the Approved Code of Practice (ACoP) for COSHH:

> *Paragraph 10* - Employers should regard a substance as hazardous to health if it is hazardous in the form in which it may occur in the work activity. A substance hazardous to health need not be just a chemical compound, it can also include mixtures of compounds, micro-organisms or natural materials, such as flour, stone or wood dust.

What happens when an organisation purchases two chemicals from different suppliers and then mixes them? Even assuming that each supplier is aware of what the customer will be doing, which of them is responsible for advising the customer of the new hazard that the mixture may present? It can be argued that since it is the customer's action in mixing the two chemicals that has resulted in a new chemical product it is also the customer's responsibility to determine the hazard (and presumably produce a new safety data sheet or possibly even register this under REACH!). How many SME's will have the knowledge and expertise to do this?

There is also the issue of skin sensitisers, i.e. those chemicals that in contact with the skin can elicit an excessive immune reaction which can be diagnosed as allergic contact dermatitis. The standard clinical test for diagnosing allergic contact dermatitis is the patch test. In his book on patch testing, arguably the most comprehensive work on this topic, Anton de Groot lists 4,350 chemicals that are sufficiently well established as sensitisers by dermatologists that there is a patch test protocol for them. Only a minority will have been assigned '*H317 – may cause an allergic skin reaction*'. The others will not be identified as skin sensitisers on the safety data sheet. Indeed, they may not appear at all.

From the above it should be clear that basing the risk assessment on the information in the safety data sheet is not a reliable approach. <u>Identifying the real hazard is often the most difficult aspect of a skin exposure risk assessment and may require assistance from those with specialist knowledge of industrial chemistry and toxicology.</u>

Having identified the hazard the next step is to ascertain whether skin exposure occurs, or might occur, and the extent of such skin exposure. Here, again, the task is not quite as simple as many assume. Here, again, this is not quite as simple as many assume. Firstly, there is no practical method of measuring skin exposure in a workplace.

> "However, there is no scientific method of measuring the results of the body's exposure to risk through dermal contact. Consequently no dermal exposure standards have been set." - *from "Occupational skin diseases and dermal exposure in the European Union (EU-25):policy and practice overview - European Agency for Safety and Health at Work*

This raises an interesting situation in that if there are no dermal exposure standards to comply with how can we demonstrate compliance?

There is a number of reasons why measurement is not feasible. Firstly, what would we measure? As the table shows, there are several possible parameters. How we combine these is not clear.

Secondly, where would we measure? The skin responds differently on different areas. So we have different exposure measurements on different areas of the body. How will we decide how to assess the potential effect of these?

Thirdly, ambient conditions, i.e. temperature and relative humidity also can influence the effect of any chemical in contact with the skin. And fourthly, we need to recognise that each person's skin is unique to them and that its resistance to damage will depend on a number of factors, one of which is the overall skin condition. This can vary by time of day and year, non-occupational exposures affecting skin barrier property, general health condition and how the individual cares for their skin.

| | |
|---|---|
| What lands on the skin? | Arguably the actual exposure, but how relevant is it to the risk of damage to health? |
| What remains on the skin? | May cause direct damage to the skin tissue, i.e. corrosion or irritant damage. (acute/chronic) |
| What is absorbed into the skin? | May activate the immune system and elicit allergic contact dermatitis or urticaria. |
| What penetrates through the skin? | May damage internal organs or systems. |
| A combination of these? | Mixtures? |

Finally, during the normal day the skin will be in contact with a range of different chemicals, some of which will not be associated with the workplace. There may well be a cumulative or synergistic effect on skin barrier properties as a result.

Suppose one person carries out a number of different tasks during a normal working day, each of which carries with it a different level and nature of risk of damage to health. How will be correlate the overall cumulative effect of these?

Consider also that unlike a physical accident, which tends to be acute, i.e. immediate, and thus, it can be argued, more easily envisaged, damage to health is frequently chronic. The consequences of exposure may not be apparent for some considerable time. Thus, is it not always easy to appreciate the damage that may be occurring from the skin exposure.

There is no simple means of combining all these factors into a simple method or formula to product a quantitative value for the consequences of the exposure during the task undergoing risk assessment. So a risk assessment will remain, at least for the time being, a subjective judgement based on the assessor's knowledge and experience. Thus it is essential that whoever is tasked with the risk assessment for skin exposure will need to be someone with the appropriate knowledge and expertise and, perhaps, access to scientific and other sources of information.

## The outcome of the risk assessment

What do we mean by risk assessment? A useful definition is provided in the following definition from the EU Agency for Safety and Health at Work:

> "A risk assessment is nothing more than a careful examination of what, in your work, could cause harm to people, so that you can weigh up whether you have taken enough precautions or should do more to prevent harm."

What are we trying to achieve? Presumable this is to understand the potential for those carrying out the task to suffer damage to health due to workplace skin exposure so that where needed we can introduce the necessary exposure management methods.

Will one person on their own, tasked with the risk assessment, possess a sufficiently wide range of knowledge and expertise, or should the be a team exercise, involving different disciplines as needed and including those directly involved in the actual work being assessed? If so what training will they need? Will they have access to sufficient technical information and, if needed, specialist support?

## Exposure management

Assuming that our risk assessment indicates that there is a risk of damage to health due to workplace skin exposure that we judge to be excessive, then we need to consider how we can manage this risk so as to reduce it to a level that we judge no longer unacceptable.

Note that, whilst it is desirable to completely eliminate any such risk in real life this is usually impracticable. Indeed neither the Health and Safety at Work etc Act 1974, nor COSH require this.

So how should we approach skin exposure management?

There is a general acceptance of a hierarchical approach. One way of describing this is shown in the table.

The basic principle is that we should aim to control the process rather than to control people. There are several good reasons for this.

| | |
|---|---|
| 1 | Design workplace, process and equipment to eliminate or minimise exposure |
| 2 | Select chemicals for minimum hazard |
| 3 | Install engineering/process/technical controls |
| 4 | Provide handling equipment |
| 5 | Establish safe working procedures |
| 6 | Minimise effect by rotating tasks, skin care, etc. |
| 7 | Monitor skin condition |
| 8 | Control exposure with personal protective equipment |

Hierarchy of exposure control methods

| **Control the process (items 1, 2, 3 in the table)** | **Control the person (items 4 – 7 in the table)** |
|---|---|
| Here we design premises, processes and equipment so that those in the workplace cannot be exposed, whatever they should do. We can call this 'protection by design'. This suggests that those concerned with health and safety, and particularly in our case with skin exposure issues, are involved in any new project to ensure that this occurs to the highest practicable standard. We should also aim to ensure that our design is such that it is fail-to-safe, i.e. a failure of any sort does not result in persons being exposed. Of course, in many occasions we will be dealing with existing facilities and here we will need to identify solutions that can be retrofitted. | Here we are relying on the person engaged in a task to behave in a prescribed manner such that exposure to a chemical hazard is avoided or reduced to an acceptable level.<br>In this situation we cannot claim that ultimate control lies with management and compliance with the required standard of behaviour cannot be guaranteed.<br>Furthermore, it is probable that any failure on the part of the worker will result in skin exposure with the resultant consequences.<br>Effectively our system is fail-to-danger. Effectiveness will depend largely on operator training and management supervision. |

Controlling the process may involve some additional investment, particularly when retrofitting an existing process or item of plant. However, generally this is a one-off process. Controlling the person will require training for all those involved, not only operators but also management. It will also require on-going supervision. This represents management time and associated cost. Furthermore, protection using personal protective equipment will be an on-going cost.

## How will we know if we are being successful?

One way, of course, is to assume that, as there is no immediate and obvious effect, we have everything under adequate control. More sensibly we will have a system that monitors the effectiveness of our control measures. This is what skin health surveillance can help us achieve. Given the uncertainties associated with risk assessment, as described, would it not be advisable to have in place a system that monitors skin condition to detect at the earliest possible stage any damage to health due to skin exposure? Consider what the 6th edition of the ACoP for COSHH now states:

Paragraph 237, in particular, indicates where skin health surveillance is required.

> Examples where health surveillance is appropriate under the criteria in regulation 11(2)(b) are:
>
> where there have been previous cases of work-related ill health in the workforce/place;
>
> where there is reliance on PPE, eg gloves or respirators, as an exposure control measure; eg printers wearing gloves to protect against solvents used during press cleaning, or paint sprayers using two-pack paints wearing respirators to prevent asthma. Even with the closest supervision there is no guarantee that PPE will be effective at all times;

> where there is evidence of ill health in jobs within the industry; eg frequent or prolonged contact with water (termed 'wet-working') causing dermatitis in hairdressers and healthcare workers, or breathing in mists from chrome plating baths causing chrome ulcers in platers.

Paragraph 238 amplifies this:

> This is not a definitive or exhaustive list and there will be many other instances where health surveillance is required. Employers will need to seek information or advice on the specific health risks identified in the risk assessment, or through any topic-specific HSE guidance, trade associations or other professional sources.

In EnviroDerm Services' view there are few workplaces where a properly structured, effective skin health surveillance system should not be an integral element in any occupational skin management system.

## Summary

From the content of this short document it should be apparent that skin exposure risk assessment involves more than simply consulting the safety data sheets. Of course, in some situations it can be very simple. However, we counsel against assuming this as if the potential complexities are ignored there will always be the potential for one or more to create a situation where the hazard and risk have not been properly recognised.

In this document we have only been able to provide an overview of some of the main aspects associated with risk assessment for skin exposure. We caution against the assumption that it provides a blueprint for someone to conduct effective risk assessments and their management.

Of course, each organisation will have its own special characteristics, and probably individual tasks or situations, requiring solutions that are appropriate. At EnviroDerm Services we have considerable experience in both risk assessment and exposure management for skin in the working environment. We will be happy to discuss how we can help an employer to achieve what can be described as 'best practice'.

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