

Ansell



**HEALTH EFFECTS OF CHEMICAL:
A CLOSER LOOK AT THE DIFFERENT
ROUTES OF CHEMICAL ENTRY AND
PATHWAYS OF DERMAL EXPOSURE.**

INTRODUCTION



THE ROLE OF CHEMICALS IN VARIOUS INDUSTRIES AND POTENTIAL RISKS

Chemicals play a vital role in various industries, contributing significantly to a wide range of manufacturing processes and work methods. They are integral components in numerous sectors, including pharmaceuticals, agriculture, construction, and many more. However, their usage also brings about several potential exposure situations for workers. It's almost impossible to imagine an industry that doesn't rely on some form of chemical products, each specifically tailored to meet the unique requirements of specific work processes.

This widespread usage also implies an increased risk of exposure to these chemical substances, posing potential health hazards for workers.

“ Without proper precautions and safety measures, workers could be at risk of exposure to these harmful substances, leading to a variety of health complications. ”

exposure to certain chemicals could cause skin irritation,

eye damage, respiratory issues, or even long-term health problems.

UNDERSTANDING THE RISKS ASSOCIATED WITH CHEMICAL EXPOSURE

When chemicals interact with the human body, they can disrupt normal functioning, leading to severe health effects. Some chemicals may have corrosive properties, while others can be toxic or carcinogenic. For instance, exposure to certain chemicals could cause skin irritation, eye damage, respiratory issues, or even long-term health problems. Therefore, understanding these risks and implementing measures to mitigate them is of paramount importance.

EXAMPLES OF COMMON ACTIVITIES EXPOSING WORKERS TO CHEMICAL RISKS

There are several ordinary activities or operations where workers may be exposed to hazardous chemicals, leading to potentially risky situations. Some of these activities include:



EMPTYING CHEMICALS

This process often involves direct contact with chemicals, which can expose workers to potential health risks if not handled correctly.



SPRAYING PAINT

Paint contains various chemicals that can be harmful when inhaled or when they come into direct contact with the skin.



CARRYING OUT SANITATION WORK

Sanitation workers often use chemical cleaning agents that can pose health risks if not handled appropriately.



HANDLING WASTE

Workers handling waste materials may come into contact with hazardous chemicals, especially in industries that heavily rely on chemical processes.



TRANSFERRING CHEMICALS

The process of moving chemicals from one place to another can lead to accidental spills or leaks, exposing workers to potential hazards.



SAMPLING PROCESSES

Workers involved in sampling processes may be at risk of exposure to a variety of chemicals used within their departments.



WEIGHING CHEMICALS

This process could lead to the accidental release of chemical dust or vapours, which can be harmful if inhaled.



STORING CHEMICALS

Improper storage of chemicals can lead to leaks or spills, posing a risk to workers.



PACKAGING CHEMICALS

Workers involved in this process are at risk of exposure to harmful chemicals, especially if the packaging process involves direct contact with the substances.

In each of these scenarios, there is a possibility of exposure to hazardous chemicals,

which underscores the importance of implementing stringent safety measures and protocols in the workplace.

ROUTES OF CHEMICAL ENTRY

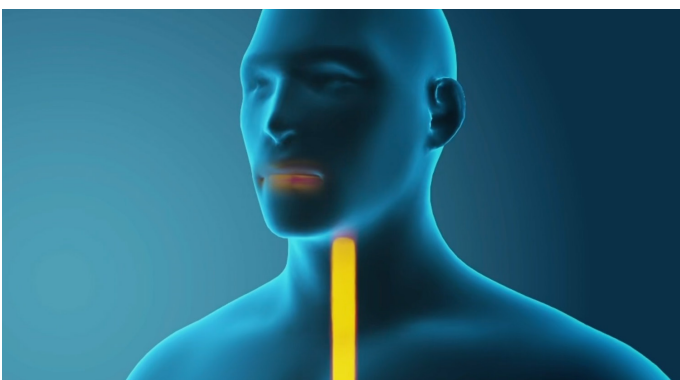
WHAT ARE THE KNOWN ENTRY ROUTES FOR CHEMICALS TO ENTER THE BODY?



Chemicals have several potential entry points into the human body. **Inhalation of contaminated air** is the most common route, particularly in workplaces where chemicals are regularly used. Airborne particles, dust, vapours, and gases can easily be inhaled, introducing hazardous substances into the respiratory system



Direct skin contact is another common route of chemical exposure. Certain chemicals can penetrate the skin, causing immediate effects such as irritation or injury. In some cases, these chemicals can be absorbed into the bloodstream, leading to systemic effects. The National Institute for Occupational Safety and Health (NIOSH) identifies chemicals that can directly damage organs or cause skin diseases, emphasizing the importance of preventing skin exposure.



Ingestion, though less common, is another potential route of chemical exposure. Contaminated hands touching food or cigarettes can inadvertently introduce chemicals into the body. While this is a less likely scenario, it presents a risk that cannot be overlooked.

Surprisingly, many safety efforts focus primarily on preventing inhalation exposure, often overlooking the risks associated with skin absorption. This is despite the skin being the body's most extensive organ and its vulnerability to chemical exposure. It is crucial for industries to understand and address the potential hazards of direct skin contact with harmful substances. NIOSH's skin notations serve as a valuable guide in this respect. More information on skin notation at a later stage of this safety briefing document.

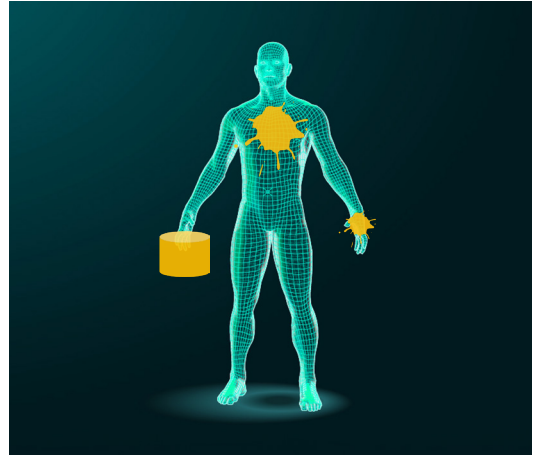
THE 3 PATHWAYS OF DERMAL EXPOSURE

UNDERSTANDING THE RISKS ASSOCIATED WITH CHEMICAL EXPOSURE

Dermal contamination, or the absorption of chemicals through the skin, can occur via three primary pathways.

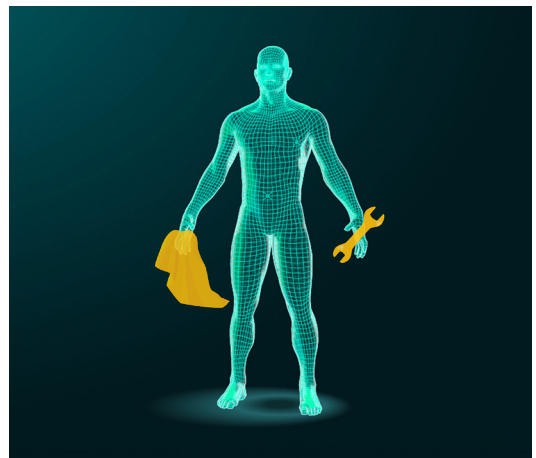
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Firstly, **direct contact** with the contaminant, such as immersion or splashes, can lead to dermal exposure. This can occur when a worker immerses their hand in a container filled with chemicals or when their body is exposed to accidental spills. This direct contact method is common in industries where workers handle chemicals frequently, such as in the manufacturing or chemical processing sectors.



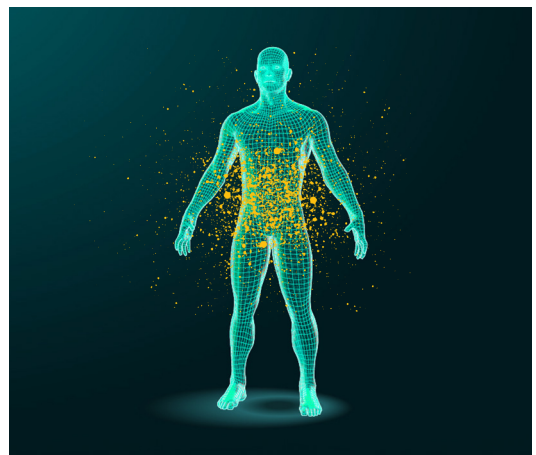
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The second pathway involves **indirect contact** with a chemically contaminated surface. For instance, a worker may indirectly come in contact with chemicals while handling tools in the oil and gas industry or while wiping down workstations with a cloth that has absorbed chemicals. This indirect pathway is prevalent in maintenance workshops or industries dealing with hazardous materials.



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The third route of dermal contamination is **airborne contact**. This typically occurs in industries like automotive manufacturing, where spray work involving chemical substances is common. Workers might inhale chemical particles that settle on their skin, leading to dermal absorption.



CATEGORIES OF CHEMICAL EXPOSURE EFFECTS

CATEGORIES OF CHEMICAL EXPOSURE EFFECTS

The effects of chemical exposure on the skin can be categorised into three types: direct, systemic, and sensitisation effects. Direct effects are immediate manifestations on the skin, such as burns or irritations. Systemic effects refer to the absorption of chemicals into the body system, which can affect various organs. Sensitisation effects relate to allergic reactions, where exposure to a substance causes the immune system to overreact.

Importantly, a single chemical can cause any of these effects individually or in combination. Therefore, industries must prioritize comprehensive safety measures that address all potential routes of exposure, ensuring the protection of their workers.

DIRECT EFFECTS

Understanding the direct effects of dermal exposure to chemicals is vital. These effects can range from mild skin irritation to severe chemical burns, depending on the nature of the chemical and the duration of exposure. Consequently, understanding these effects can help in the development of effective safety measures to protect workers.

Irritation

Irritation is one of the immediate reactions that occur when the skin comes into direct contact with chemical irritants. This can lead to redness, dryness, and cracking of the skin. Common irritants include fibreglass, food products, oils, lubricants, and solvents. While the effects of irritation can be uncomfortable and distressing, they are usually transient. If detected and addressed early, the skin can typically recover without any lasting damage. For instance, industries that frequently handle oils and solvents, such as manufacturing and automotive repair, often have protocols in place to minimise workers' exposure to these irritants.



Corrosion

On the more severe end of the spectrum, corrosive substances can inflict serious damage to the skin, leading to chemical burns and scarring. Strong alkali (basic) materials and acids are common types of corrosive chemicals. Even short-term exposure to these substances can have lasting, potentially permanent effects on the skin. Industries that frequently use these substances, like the chemical manufacturing and cleaning sectors, need to be particularly vigilant about safety protocols to protect their workers.



Pigmentation Changes

Certain chemicals can also lead to permanent changes in skin colour, a phenomenon known as changes in pigmentation. Substances like tar, asphalt products, and certain disinfectants can cause this lasting alteration. Workers in industries such as construction and healthcare, where these substances are commonly used, are particularly at risk. While changes in pigmentation may not be physically harmful, they can have a significant impact on a worker's self-esteem and quality of life, further emphasizing the importance of preventative measures.



Defatting

Another effect of chemical skin exposure is known as defatting or dry skin, which occurs when a chemical strips the skin's natural oils. This can lead to dry, cracked, and uncomfortable skin. Common causes of defatting include soaps, solvents, and moisture exposure. Industries that require frequent handwashing or use of solvents, such as healthcare and painting, are particularly at risk. Fortunately, this effect is usually temporary and will subside once exposure to the chemical ceases. However, continuous exposure without proper protection can lead to chronic skin conditions.

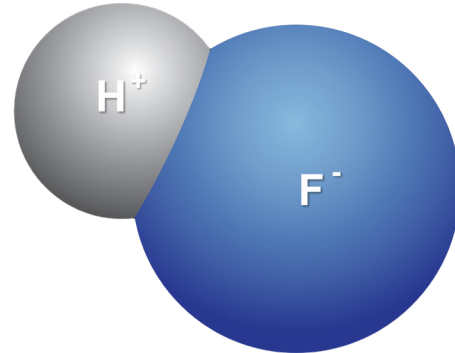


HYDROFLUORIC ACID AND ITS DIRECT EFFECTS

Hydrofluoric acid (HF) is a potent and perilous substance known for its corrosive nature and deep tissue penetration capabilities. When the skin comes into contact with this chemical, the results can be profoundly harmful. The fluoride atoms present in HF can easily infiltrate the skin, causing severe and potentially irreversible damage to the skin and underlying tissues, including bones.

Upon skin contact, HF begins to infiltrate the skin layers, causing destruction that extends far beyond the initial point of contact. Depending on the concentration of the solution, the effects can range from immediate pain and blistering to delayed symptoms that may not become apparent until up to 24 hours later. More concentrated solutions of HF can cause immediate discomfort and the formation of blisters, while solutions less than 20% may not manifest symptoms until much later.

The corrosive nature of HF can lead to serious burns, tissue destruction, and necrosis – the death of cells in an organ or tissue due to disease, injury, or inadequate blood supply. This can result in long-term health effects, such as chronic lung disease, skin scarring, persistent pain, visual defects, and damage to the esophagus and stomach.



SYSTEMIC EFFECTS

Systemic effects differ significantly from direct effects. While the latter are localised, the former have far-reaching implications. When a chemical is absorbed through the skin, it enters the bloodstream, giving it the potential to affect other parts of the body. This can lead to more extensive health issues that go beyond the initial contact area.

Certain chemicals can infiltrate the body through the skin and bloodstream, endangering individual organs or groups of organs.

This poses a risk of injury that extends beyond the surface of the skin. Chemicals that have this ability include, but are not limited to, pesticides and organic solvents. These substances are often found in workplaces, and their absorption through the skin can result in various diseases and disorders, including occupational skin diseases.

To identify chemicals with a high potential for skin absorption, a unique identifier known as a 'Skin Notation' is used. This distinctive label serves to differentiate these chemicals and highlight the potential risks involved in handling them. It's an important tool for ensuring worker safety, particularly in industries where exposure to such chemicals is a regular occurrence. The use of such identifiers helps to underscore the need for stringent safety precautions and proper training in workplaces where these chemicals are handled.

Moreover, the interaction between chemicals and the skin isn't limited to systemic effects or direct impacts. Immune-mediated skin effects are also a concern. These occur when the immune system responds to a chemical, causing symptoms such as hives, ulcerations, or skin flaking. Such interactions further emphasize the need for safety measures and caution when handling chemicals, especially in a workplace setting.

“ ...The interaction between Chemicals and the skin can conduct to a long-term systemic effect...” ”

WHAT IS SKIN NOTATION?

It's important to be aware that chemicals carrying a 'Skin Notation' phrase can lead to a significant increase in exposure and may result in systemic effects. Proper precautions and safety measures should be taken when handling such substances to minimise any potential adverse health outcomes.

The 'Skin Notation' can be found on safety data sheets or on specialised toxicology websites, providing valuable information to users about the chemical's skin absorption properties.

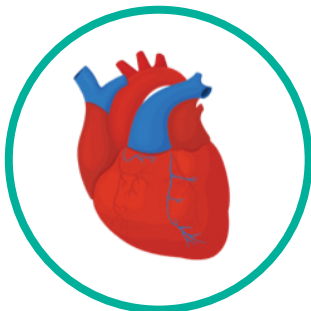
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Some examples of chemicals that have 'Skin Notation' due to their significant potential for skin absorption include Benzene, Aniline and Glycol. The following information explains how those chemicals affect the human nervous system, heart and reproductive systems when absorbed through the skin.

Benzene affects the brain

This compound, commonly found in industries such as petrochemicals, chemicals, perfumes, and even in the production of everyday items like dyes, detergents, and plastics, can adversely affect the brain. The absorption of Benzene through the skin may lead to central nervous system depression and arrhythmias, a condition characterised by irregular heart rhythms

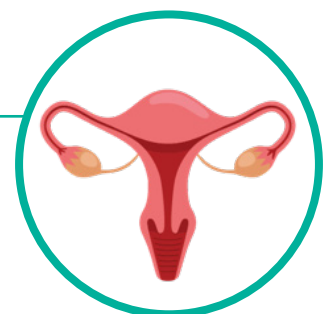


Aniline affects the heart

This chemical is a key player in the production of chemicals and pigments used in the rubber and dye industries. It is also utilised in rubber manufacturing. However, skin exposure to Aniline may lead to circulatory system defects, affecting the heart's function and overall health.

Glycol affects the reproductive system

This compound is widespread across various industries, including the pharmaceutical, micro-electronics, and automotive sectors. It is a component in a variety of products, from coatings and cleaning products to de-icing additives for jet fuel and even brake fluids and perfumes. Nonetheless, exposure to Glycol ether has been linked to negative effects on the reproductive system, including potential damage to the testicles.



SKIN SENSITISATION EFFECTS

Skin sensitisation effects are a key aspect of occupational health and safety, particularly in industries where workers are exposed to various chemical substances. These effects primarily refer to the development of allergic contact dermatitis, which is an immunological response of the skin triggered by exposure to specific chemicals. This condition can result in a range of symptoms, including redness, swelling, itching, and blisters.

CHEMICAL AGENTS AND ALLERGIC CONTACT DERMATITIS

Certain chemicals have the potential to cause allergic contact dermatitis. These include epoxy resins, chromates, rubber chemicals, amine hardeners, and phenol-formaldehyde resins. These substances are commonly used in various industries, including manufacturing, construction, automotive, and chemical production.

Epoxy resins, for instance, are extensively used in coatings, adhesives, and composites due to their excellent mechanical properties and chemical resistance. However, they are known to cause skin sensitisation in some individuals.

Similarly, chromates, commonly found in cement, leather products, and paints, can trigger allergic reactions. Rubber chemicals used in the production of tires, footwear, and other rubber goods can also lead to skin sensitisation.

Amine hardeners, used in epoxy resin systems, and phenol-formaldehyde resins, used in the production of moulded products, insulation, and binders, are other notable chemical agents that can cause allergic contact dermatitis.

SYMPTOMS AND DISCOMFORT

When individuals come into contact with these substances, their skin may develop an allergic reaction. Initial symptoms can include redness and itching, which may progress to more serious signs such as blisters and skin lesions. In severe cases, the skin may become thickened and discoloured over time. These symptoms can cause significant discomfort and affect the individual's quality of life.



IMPORTANCE OF IMPLEMENTING CHEMICAL SAFETY MEASURES AND PROTOCOLS

Given the potential health risks associated with exposure to hazardous chemicals, **it is crucial for companies to prioritize worker safety. This can be achieved by implementing a comprehensive safety program that includes appropriate training, the use of personal protective equipment (PPE), regular health checks, and proper management of chemicals.**

In conclusion, while chemicals are essential in various industries, their potential risks cannot be overlooked. It is incumbent upon companies to ensure that they create a safe working environment that minimally exposes their workers to chemical hazards. Through the proper understanding of the risks and implementation of stringent safety measures, industries can significantly reduce the exposure of their workers to hazardous chemicals.

Ansell invites chemical industry executives to learn more about the AnsellGUARDIAN® Chemical program and the full range of hand protection solutions available to protect their workers. For more information, visit www.ansell.com/en/Campaigns/FeelEquipped.aspx

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