

Effects of Skin Contact with Chemicals

What a Worker Should Know



DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health



NIOSH

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Introduction

Did You Know?

More than 13 million workers in the United States have jobs that result in exposure of the skin to chemicals, such as in these fields:

- Agriculture
- Manufacturing
- Services
- Transportation/Utilities
- Construction
- Sales

Skin problems/diseases are the most common noninjury health issue reported by workers. The costs of work-related skin problems in the United States exceed \$1 billion each year.



Why Be Concerned about Working with Chemicals?

Skin-related health problems may cause or result in:

- Other health problems for you
- Physical discomfort and pain
- Loss of work time and income
- Inability to perform job or loss of job
- Medical costs
- Quality-of-life issues
- Social handicaps
- Embarrassment, self-consciousness, or low self-esteem

Skin-related health problems can be prevented and should not be the price you pay for working with chemicals.

Questions to Ask Yourself

Skin exposure to chemicals can result in very serious and in some cases life-threatening health problems. Exposures to such chemicals are not only a risk to you; they may pose a hazard to your family if carried home from work on your hands or clothing.

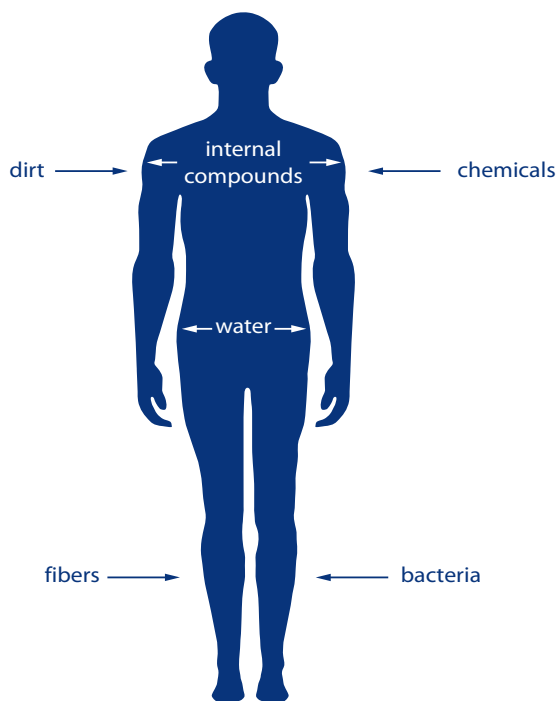
- Do you want to make sure that the hazards you're exposed to at work aren't carried home to your family?
- Are you or your family embarrassed by your skin problems, such as rashes and sores?
- Are you experiencing discomfort or pain as a result of a skin-related health problem?
- Have you lost personal or work time dealing with a skin problem? Does a skin problem affect or limit your daily life?
- Could these skin problems keep you from doing your job?

If you answered **yes** to any of these questions, learn more about how to recognize and control health problems related to chemical exposures to the skin.

The Function of Your Skin

Your skin protects your body from the world around you.

- Your skin limits loss of water and other necessary compounds from your body.
- Your undamaged skin, in most cases, limits unwanted substances from entering your body.



Skin damage as a result of contact with chemicals can reduce your skin's ability to protect you.

Impact of Chemical Exposure on Skin

Chemical exposures to the skin can cause temporary or permanent health damage.

Temporary Damage

Temporary skin damage may occur from exposure to chemicals. For example, many workers may experience dry, red, cracked skin from contact with water, soaps, gasoline, and certain types of solvents. These health problems usually heal quickly when the skin is no longer in contact with the substance.



Permanent Damage

Permanent skin damage may result if the skin is exposed to a chemical that is known to have a severe impact. For example, a chemical burn, as shown, may leave a permanent scar. Exposure to certain chemicals can result in permanent loss of skin color.

Permanent damage may also occur to body organs or systems as a result of chemical exposure to the skin. For example, exposure to certain solvents can result in liver damage.



Images illustrating skin injuries and diseases were selected from *Occupational Dermatoses—A Program for Physicians*. Additional information about this slideshow is available at <http://www.cdc.gov/niosh/topics/skin/occderm-slides/occderm.html>.

Types of Adverse Effects

The four major types of health effects resulting from chemical exposure to the skin are direct, systemic, sensitization, and combined.

Direct Effects

Exposure to chemicals can cause a problem at the point of contact. These effects are called direct effects.



Drying

Some chemicals remove the natural oils from the skin, causing it to become very dry. The most frequent causes of dry skin are exposures to soaps, solvents, and moisture.



Irritation

Some chemicals cause reddening, dryness, and cracking of the skin on contact. These chemicals are known as irritants. Irritation is most frequently caused by fiberglass, soaps, oils/cutting fluids, and solvents.



Changes in Skin Color

A permanent change in skin color may result when certain chemicals contact the skin. Chemicals that can cause this include tar, asphalt products, and some disinfectants.



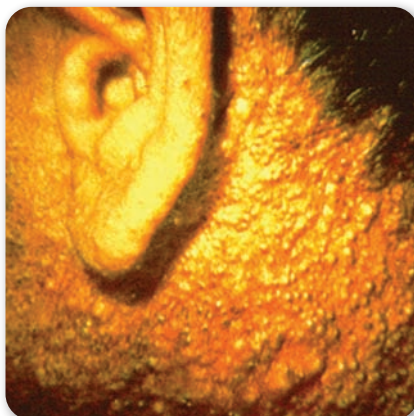
Corrosion (“Eating away of skin”)

Corrosive substances can cause severe or serious damage to the skin. A chemical burn can result from a brief exposure to a corrosive substance. Corrosive substances include strong alkaline (basic) materials or acids. Skin scarring is a common outcome.



Chlorine Acne (Chloracne)

Chlorine acne is a type of acne caused by either direct contact with or absorption of certain chemicals. Chlorine acne may occur after exposure to chlorine compounds and certain pesticides.



Skin Cancer

Some chemicals found in the workplace contain cancer-producing substances (carcinogens). When these come in contact with the skin, a malignant tumor may form at the site of contact. Exposure to coal tar resulted in the skin tumor pictured below.



Systemic Effects

A chemical may enter the body through the skin, be carried by the bloodstream to different organs, and cause or contribute to a health problem somewhere else in the body. When this happens, the result is called a systemic health problem. Systemic health problems can affect either a specific organ (liver, kidney, or bladder) or an entire body system (immune system, nervous system, respiratory system, or reproductive system).

Specific Organs

Chemicals entering the body through the skin can cause damage to the liver, kidney, bladder, or some other organ. For example, paints and coatings contain solvents (such as toluene and xylene), which can cause liver and kidney damage.



Body Systems

Chemicals commonly found in the workplace can enter the body through the skin and damage the immune system, nervous system, reproductive system, or respiratory system. For example, some pesticides can enter the body through the skin and cause damage to the nervous system, and possibly lead to death.



Sensitization Effects

Chemical exposure may cause a person to become unusually sensitive to that chemical or a group of chemicals. Reactions may occur from exposure to very small amounts of the substance. Once sensitized, a person will suffer an allergic reaction when exposed to that chemical. The only way to deal with this problem is to prevent any further exposure or contact with the chemical.

Allergic Contact Dermatitis

Allergic contact dermatitis is an allergic response caused when certain chemicals contact the skin. For example, epoxy resins, chromates, rubber chemicals, amine hardeners, and phenol-formaldehyde resins may cause allergic contact dermatitis. Exposure to a chemical on the wrist rest of a computer keyboard caused this response on the worker's hand shown at right.



Airway Sensitization

An allergic reaction of the mucous membranes or airways may result when certain chemicals are inhaled or are exposed to the skin. For example, skin exposures to isocyanates (contained in many paints and other building materials, like spray-on insulation and roofing materials) can result in airway sensitization.



Combined Effects

Chemical exposure to the skin may cause multiple health problems. For example, individuals working with cement may experience combined health problems. Contact with the cement may result in direct irritation at the point of contact from the ability of the cement to dry out the skin. Workers may also become sensitized to cement due to the chrome salts present in the material.



Work practices that can lead to sensitization and irritation



Sensitization



Irritation

What Do You Need to Know?

With these steps, you can help prevent health problems from chemical exposure to the skin:

- Recognize the hazard
- Manage the risk
- Reduce exposure and prevent injury

Recognize the Hazard

Be aware of how your skin can be exposed to chemicals at work:

- Direct contact with liquid, including spills and splashes



- Contact with contaminated surfaces



- Contact with spray or mist



Obtain information about chemicals:

- Know the names of the chemical you work with



- Read labels and the information provided by the manufacturer



- Learn which chemicals can cause adverse health effects following exposure



Manage the Risk

Prevent chemical exposure to the skin by removing the chemical:

Eliminate

Eliminate unnecessary chemicals from a work process. For example, use disposable brushes rather than cleaning them with a solvent.

Substitute

Replace a chemical or product capable of causing skin problems with one that is less harmful. For example, substitute a water-based product for a solvent-based one.

Reduce Exposure and Prevent Injury

Take action to reduce or control your exposure:

Modify

Modify a process to eliminate chemical exposure. For example, rather than hand-cleaning metal parts during repair operations, use a mechanical cleaner. Modify work practices to reduce or eliminate skin contact with chemicals. For example, rather than applying a solvent with a rag, use a brush.

Ventilate

Reduce airborne exposures by adding local or general ventilation. For example, use ventilation during spray-painting operations to reduce airborne levels of isocyanates.

Maintain skin

Clean skin with mild soap, rinse thoroughly, and use moisturizer. Dry skin is damaged and more affected by chemicals.

Clean up

A clean work area helps prevent contact with chemicals on work surfaces.

PPE

Use personal protective equipment (PPE) when exposure to chemicals is unavoidable. PPE may include chemical-resistant gloves, aprons, coveralls, and boots. For example, use appropriate gloves when mixing epoxy resin, to avoid skin contact. Selection of the correct PPE is critical. Check a source such as the *“Quick Selection Guide to Chemical Protective Clothing.”*

Remember! Preventing skin contact with chemicals will prevent skin problems. Discuss these issues with your safety and health professional or supervisor and report all work-related health problems, including skin problems.

For Information and Help with Your Concerns

NIOSH Hazard-Specific Skin Notations (SK)

NIOSH has developed a new system for the assignment of multiple hazard-specific skin notations (SK) to help workers and occupational health professionals understand the health risks of skin exposures to hazardous chemicals. The hazard-specific SK (see table on next page) will appear in future NIOSH publications, including the *NIOSH Pocket Guide to Chemical Hazards*, and will identify the major health effects associated with skin contact.

Chemicals may be assigned more than one hazard-specific SK when they are identified to cause multiple adverse health effects following skin contact. For example, if a chemical is identified as corrosive and also contributes to systemic toxicity, it will be labeled as SK: SYS-DIR (COR).

Labels

Read labels to identify the chemical contents of materials being used and to be aware of any handling or health warnings.

Material Safety Data Sheets

A material safety data sheet (MSDS) is designed to provide both workers and emergency personnel with the proper procedures for handling or working with a particular substance. MSDSs contain information on physical data, health effects, first aid, reactivity, storage, disposal, protective equipment, and spill/leak procedures.

Safety and Health Professionals

Discuss the potential health effects related to the chemicals you use with available safety and health professionals and your physician.

Union Safety and Health Representatives

Many unions have safety and health representatives to provide assistance and respond to your questions. They also have booklets to help you learn about skin-related problems.

Hazard-Specific Skin Notations

Hazard-specific SK	Health effects	Definition
SYS	Systemic effects	<p>Chemicals may cause systemic damage to areas of the body that are beyond the site of skin contact.</p> <p>Damaged areas may include specific organs (e.g., liver, heart, and kidneys) and biological systems (e.g., nervous system, reproductive system, and immune system).</p> <p>Subnotation of SK: SYS</p>
(FATAL)	Lethal or life-threatening effects	<p>Assigned to chemicals identified as highly or extremely toxic that may be potentially lethal or life-threatening following exposure of the skin</p> <p>Chemicals may cause damage at or near the site of skin contact.</p>
DIR	Direct (localized) effects	Health effects may include skin irritation and corrosion, bleaching or darkening of the skin, or skin cancers.
(IRR)	Skin irritation	Subnotation of SK: DIR
(COR)	Skin corrosion	Subnotation of SK: DIR
SEN	Allergic and other immune-mediated reactions	Chemical may cause allergic contact dermatitis (ACD), sensitization of exposed skin, or airway sensitization following skin contact.

Resources

The Center for Construction Research and Training:
Electronic Library of Construction Occupational Safety and Health
at www.cdc.gov/elcosh

NIOSH's Indexed Dermal Bibliography at
www.cdc.gov/niosh/docs/2009-153/

NIOSH's Current Intelligence Bulletin 61: A Strategy for Assigning
New NIOSH Skin Notations at www.cdc.gov/niosh/docs/2009-147/

NIOSH's Skin Exposures and Effects at
www.cdc.gov/niosh/topics/skin

NIOSH's The Pocket Guide to Chemical Hazards and Web site at
www.cdc.gov/niosh/npg.html

Quick Selection Guide to Chemical Protective Clothing, Fourth
Edition, at www.cdc.gov/niosh/ncpc1.html

OSHA Dermal Exposure Topic Page at
www.osha.gov/SLTC/dermalexposure/index.html

State and local health departments, such as the Washington
Department of Labor and Industries, at www.lni.wa.gov/sharp

British Patient Information at
www.patient.co.uk/showdoc/23068731 or
www.bad.org.uk/public/leaflets/ContactDermatitis_update_2007.pdf

Remember: S - K - I - N

S ocial handicap	Skin problems can affect both you and your family's quality of life.
K nowledge	Information is the key to prevention and the cure to skin-related health problems. Help is available.
I mpediment	Skin problems cause physical discomfort, limitations on your daily life, loss of personal and work time, and possibly the loss of your job.
N ot necessary	A skin-related health problem is not a requirement of your job.

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