

Diseases, Disorders and Injuries

Dermatitis, Allergic Contact

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What is occupational contact dermatitis?

Occupational contact dermatitis is a local inflammation of the skin. Symptoms of inflammation include itching, pain, redness, swelling, and the formation of small blisters or wheals (itchy, red circles with a white centre) on the skin. The inflammation is caused by an allergy or irritation as a result of substances found in the workplace that come into direct contact with the skin. Approximately 3,000 substances are recognized as contact allergens yet only 25 of these substances are responsible for almost half the cases of allergic contact dermatitis (ACD).

How does allergic contact dermatitis develop?

Allergic contact dermatitis associated with the workplace develops in stages. There is a period during which an individual may be continually in contact with allergenic substances without developing any skin reaction. This period can last a lifetime or only a few days. The allergenic action of a substance depends on its ability to change some properties of the outer layer of the skin. This layer acts as a protective barrier against toxic substances. Some substances can remove fats, oils and water from the outer layer of the skin. These substances diminish the protective action of the skin and make it easier for substances to penetrate the skin.

The skin allergy begins with a process called sensitization. It starts with the penetration of allergenic substances into the outer layer of the skin. The process lasts from four days to three weeks. During this period there are no signs of skin damage.

Once penetrated, the allergenic substance combines with natural skin proteins. The combination formed by the allergenic substance and skin proteins is then carried throughout the body by white blood cells called lymphocytes.

Lymphocytes are part of the immune system which guards the body against germs or alien substances. The immune system has a "memory" to recognize and neutralize germs or substances encountered more than once.

When sensitized workers are re-exposed, lymphocytes recognize the allergen and react with it. But they also release tissue-damaging chemicals called lymphokines. These cause itching, pain, redness, swelling, and the formation of small wheals or blisters on the skin.

This inflammation is usually confined to the site of contact with the allergen, but in severe cases it may spread to cover large areas of the body. It usually starts within twelve hours from exposure and is at its worst after three or four days. It slowly improves in about seven days. The allergic sensitization may remain with the individual throughout life. If there is no further contact with the allergen, the level of sensitivity may gradually decline, or it may not change.

What are the contributing factors?

The most common factors contributing to the development of allergic contact dermatitis are pre-existing skin conditions such as [irritant contact dermatitis](#). Cuts or scratches into which allergenic substances can enter also contribute to the development of allergic contact dermatitis. The chemical nature of the substance is important (for example, whether it is an acid, an alkali, or a salt), as are the amount and concentration that comes into contact with the skin, and the length and frequency of the exposure.

Important individual factors include the resistance of the skin, which increases with age. Hereditary factors influence the variety of reactions in different persons exposed to the same allergen.

Environmental factors play a significant role. For example, hot workplaces cause sweating, which can dissolve some types of industrial chemical powders, increasing their toxicity for the skin. But sweating may also provide a protective function because it may dilute or "wash out" substances. Dry air can cause chapping of the skin, increasing the possibility of allergies.

Friction against the skin (for example, from operating grinding machines and other equipment), can abrade or scrape away the skin. This action can reduce the protective action of skin against allergens.

What occupations are at risk?

Some of the occupations where allergic contact dermatitis has been seen are listed in the following tables. Some substances which can cause allergic contact dermatitis may not be listed. New materials and new processes introduce new exposures and create new risks.

List of Allergens Encountered in Various Occupations

Occupations	Allergens
Agriculture workers	Rubber, oats, barley, animal feed, veterinary medications, cement, plants, pesticides, wood preservatives
Artists	Turpentine, pigments, dyes, colophony, epoxy resin
Automobile and aircraft industry workers	Chromates, nickel, cobalt, rubber, epoxy and dimethacrylate resins
Bakers and confectioners	Flavours and spices, orange, lemon, essential oils, dyes, ammonium persulphate and benzoyl peroxide.
Bartenders	Orange, lemon, lime, flavours
Bookbinders	Glues, resins, leathers
Butchers	Nickel, sawdust
Cabinet makers and carpenters	Stains, glues, woods, turpentine, varnishes, colophony
Cleaners	Rubber gloves
Coal miners	Rubber boots and masks
Construction workers	Chromates, cobalt, rubber and leather gloves, resins, woods
Cooks and caterers	Foods, onions, garlic, spices, flavours, rubber gloves, sodium metabisulphite, lauryl and octyl gallate, formaldehyde
Dentists and dental technicians	Local anesthetics, mercury, methacrylates, eugenol, disinfectants, rubber, dental impression material.
Dry cleaners	Rubber gloves
Electricians	Fluxes, resins, rubber
Electroplaters	Nickel, chromium, cobalt
Embalmers	Formaldehyde
Floor-layers	Cement, resins, woods, varnish
Florists and gardeners	Plants, pesticides, rubber gloves
Foundry workers	Phenol-and urea-formaldehyde resins, colophony
Hairdressers	Dyes, persulphates, nickel, perfumes, rubber gloves, formaldehyde, resorcinol, pyrogallol
Homemakers	Rubber gloves, foods, spices, flavours, nickel, chromates, polishes

Jewellers	Epoxy resin, metals, soldering fluxes
Mechanics	Rubber gloves, chromates, epoxy resin, antifreeze
Medical personnel	Rubber gloves, anesthetics, antibiotics, antiseptics, phenothiazines, formaldehyde, glutaraldehyde, liquid chloroxylenol, hand creams
Metal workers	Nickel, chromates, additives in some cutting oils
Office workers	Rubber, nickel, glue
Painters	Turpentine, thinners, cobalt, chromates, polyester resins, formaldehyde, epoxy resin, adhesives, paints
Photography industry workers	Rubber gloves, colour developers, para-aminophenol, hydroquinone, formaldehyde, sodium metabisulphite, chromates
Plastic workers	Hardeners, phenolic resins, polyurethanes, acrylics, plasticizers
Printers	Nickel, chromates, cobalt, colophony, formaldehyde, turpentine
Rubber workers	Rubber chemicals, dyes, colophony
Shoemakers	Glues, leather, rubber, turpentine
Tannery workers	Chromates, formaldehyde, tanning agents, fungicides, dyes
Textile workers	Formaldehyde resins, dyes, chromates, nickel
Veterinarians	Rubber gloves, medicaments

How is it recognized?

People with allergic contact dermatitis often consult a doctor. The evaluation of occupational allergic contact dermatitis includes the identification of conditions of exposure. Evaluation begins with a discussion of the person's employment, and requires a detailed description of all the processes involved. It also requires a detailed list of all chemicals in the individual's working environment. It is also helpful to know whether other workers are affected.

Diagnosis of allergic contact dermatitis is confirmed by patch test. Minute amounts of suspected substances are applied to the skin, usually on the upper back. Inflammation at the site of application indicates that the person is allergic to a specific substance.

How is it treated?

Sensitized workers should avoid further exposure to the allergen. This avoidance alone is an effective remedy. Allergic contact dermatitis may be treated with anti-inflammatory drugs, and with ointments and skin cleansers. In general, the affected skin should be protected from physical trauma, excessive sunlight, wind, and rapid temperature changes while the dermatitis is active.

How common is it?

The National Institute for Occupational Safety and Health indicates that contact dermatitis (irritant and allergic combined) represent 90%-95% of the occupational skin diseases in the United States. . Among all cases of occupational dermatitis, allergic contact dermatitis accounts for about twenty percent.

What are the preventive measures?

Establishing a program to avoid exposure of the skin to allergens is will help to eliminate allergic contact dermatitis.

As with all hazardous conditions in the workplace, the best control is at the source of the problem. The Canadian Hazardous Product Regulations and the applicable provincial Workplace Hazardous Materials Information System (WHMIS) Regulations require workers to be informed about the nature of the products they are exposed to and how to work with them safely. SDSs should be reviewed to identify ingredients that may lead to sensitivities. Additional information may be needed from the manufacturer or through available texts or research articles.

To address the issue of chemical sensitization, WHMIS 2015 includes the Respiratory and Skin Sensitization hazard class. Products that are skin sensitizers would be classified in this class and the hazard would be signalled by the exclamation mark and the statement “May cause an allergic skin reaction”. The SDS would indicate precautions and control measures to take when working with such chemicals.

Occupational allergic contact dermatitis can be avoided by elimination or substitution (e.g., using products not known to cause dermatitis) , engineering control methods, good housekeeping, personal protection and personal hygiene.

Nonhazardous substances should be substituted for hazardous substances. Engineering control methods involve the enclosure of processes to separate workers from the harmful products they work with. Local exhaust systems should be used where toxic substances may escape into the workroom. Good housekeeping includes proper storage of products, frequent disposal of waste, prompt removal of spills, and maintenance of the equipment to keep it free of dust, dirt and drippings.

Personal hygiene, including hand washing, is very important to prevent contact dermatitis, but workers should be aware that excessive hand washing with soap and detergents can also damage the skin. Washrooms, toilets, and showers should be conveniently located and supplied with adequate hot water, disposable towels, and soap.

Protective clothing such as aprons and gloves should be properly selected. Not all protective clothing resists all substances. Manufacturers' specifications should be followed. Barrier creams may be used where appropriate, especially when gloves or sleeves cannot be used safely, but they do not shield as well as protective clothing.

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