Dermatitis, Irritant Contact

What is occupational irritant contact dermatitis?

Dermatitis is a localized inflammation of the skin. In general, inflammation refers to a condition in the body when it is trying to react to a localized injury of tissues. Signs of inflammation include some or all of the following: redness, heat, swelling, pain.

Occupational irritant contact dermatitis is an inflammation caused by substances found in the workplace that come in direct contact with the skin. Signs of irritant contact dermatitis include redness of the skin, blisters, scales or crusts. These symptoms do not necessarily occur at the same time or in all cases. This kind of dermatitis is caused by chemicals that are irritating (e.g., acids, bases, fat-dissolving solvents) to the skin and is localized to the area of contact.

Another kind of contact dermatitis, allergic contact dermatitis, is different because it is an allergic response to skin contact with some allergy-causing material (e.g., poison ivy). Another difference is that allergic dermatitis can occur in other places on the body that did not come in contact with the allergy-causing material.

HOW DOES IRRITANT CONTACT DERMATITIS DEVELOP?

In the workplace, irritant contact dermatitis can develop after a short, heavy exposure or a repeated or prolonged, low exposure to a substance. The appearance of irritant contact dermatitis varies considerably according to the conditions of exposure. For example, an accidental contact with a strong irritant causes immediate blisters. Contact with a mild irritant may only produce redness of the skin. However, if the irritation continues, small lesions or sores appear on the reddened area; afterwards crusts and scales form. The skin damage usually heals a few weeks after exposure ends if no complications have arisen (e.g., no infections occurred).

The irritant action of a substance depends on its ability to change some properties of the outer layer of the skin that acts as a protective barrier against toxic substances. Among other changes, some substances can remove skin oils and moisture from the outer layer of the skin. This reduces the protective action of the skin and increases the ability of irritants to enter or infiltrate the skin. The removal of fat or fat-like material from the skin is also responsible for the dryness, cracking and whitening of the skin.

To produce the damage, the irritant substance must infiltrate the outer layer of the skin. Following infiltration, the substance comes into contact with cells and tissues. The substance also reacts with certain chemicals naturally present (endogenous) in cells and tissues. These reactions produce skin damage. The body’s

first reaction to the damage is a localized acute inflammation. The cells and tissues try to repair the damage and set up a defensive response to remove the invading material causing the damage. During the body's defensive response phase, a person may experience pain, warmth, redness and swelling in the irritated area.

Minimal skin damage, as in the thickening of the inner layer of the skin, will not be visible. However, when the damage is severe, the skin shows signs of chapping, scaling, and blistering. Some skin cells also die. Typically, an irritant reaction develops within a few hours from exposure and is at its worst after approximately twenty-four hours.

WHAT ARE FACTORS CONTRIBUTING TO IRRITANT CONTACT DERMATITIS?

Factors contributing to irritation include

- the chemical properties of the substance (for example, is it an acid, an alkali, or a salt),
- the amount and concentration of chemical coming in contact with the skin, and
- the length and frequency of the exposure.

Factors peculiar to individual workers are also important. Hereditary factors influence the variety of reactions seen in different persons when exposed to the same irritant.

The part of the body that comes in contact with an irritant substance is another factor to remember. The penetration of substances varies over different body regions. For example, some substances penetrate the face and the upper back more quickly than the arms.

Environmental factors play a significant role. For example, hot, humid workplaces cause workers to sweat. Sweat can dissolve some types of industrial chemical powders that may come in contact with the skin. This increases their toxic or irritant effects of the chemicals because solutions penetrate the skin more readily than solids. On the other hand, sweating may also have a protective function because it may dilute or wash out substances. Working where the air humidity is low or where the skin is wet for prolonged and repeated periods can cause chapping of the skin that, in turn, can increase the possibility of irritation.

Friction against the skin, occurring while operating grinding machines and other equipment can scrape away the skin, reducing its protective action against irritants. Clothing soaked with irritants is another important factor. Cuts or skin injuries enable irritant substances to penetrate the skin more readily. Table 1 summarizes some factors that contribute to skin irritation.

Table 1
Factors Contributing to the Development of Skin Irritation

Related to Substance	Related to Person	Related to Environment
Properties of the chemical Solubility Form: gas, liquid, solid concentration Length and frequency of exposure	Region of skin (e.g., hands, arms, face) Health of skin (e.g., cuts, rashes, abrasions) Dryness Sweating Age Genetic background	Temperature Humidity, moisture, barometric pressure Friction Contamination

WHAT OCCUPATIONS ARE AT RISK?

Table 2 lists some occupations where irritant contact dermatitis has been seen. Table 2 also gives examples of workplace chemicals that can cause irritant contact dermatitis; however, this list is not intended to be comprehensive. New materials and

processes can present workers with chemical exposures and risks that they have not experienced previously.

Table 2
Irritants Encountered in Various Occupations

Condition	Irritant
Agriculture workers	Artificial fertilizers, disinfectants, pesticides, cleaners, gasoline, diesel oil, plants and grains
Artists	Solvents, clay, plaster
Automobile and aircraft industry workers	Solvents, cutting oils, paints, hand cleansers
Bakers and confectioners	Flour, detergents
Bartenders	Detergents, wet work
Bookbinders	Solvents, glues
Butchers	Detergents, meat, waste
Cabinet makers, and carpenters	Glues, detergents, thinners, solvents, wood preservatives
Cleaners	Detergents, solvents, wet work
Coal miners	Dust (coal, stone), wet conditions
Construction workers	Cement
Cooks and caterers	Detergents, vegetable juices, wet work
Dentists and dental technicians	Detergents, hand cleansers, wet work
Dry cleaners	Solvents
Electricians	Soldering fluxes
Electroplaters	Acids, alkalis
Floor-layers	Solvents
Florists and gardeners	Manure, artificial fertilizers, pesticides, wet work
Hairdressers	Permanent wave solutions, shampoos, bleaching agents, wet work
Hospital workers	Detergents, disinfectants, foods, wet work
Homemakers	Detergents, cleansers, foods, wet work
Jewellers	Detergents, solvents
Mechanics	Oils, greases, gasoline, diesel fuel, cleaners, solvents
Metal workers	Cutting oils, solvents, hand cleansers
Nurses	Disinfectants, detergents, wet work
Office workers	Solvents, (photocopiers, adhesives)
Painters	Solvents, thinners, wallpaper adhesives, hand cleansers
Photography industry workers	Solvents, wet work
Plastics workers	Solvents, acids, styrene, oxidizing agents
Printers	Solvents
Rubber workers	Solvents, talc, zinc stearate, uncured rubber
Shoemakers	Solvents
Tannery workers	Acids, alkalis, reducing and oxidizing agents, wet work
Textile workers	Fibres, bleaching agents, solvents
Veterinarians and slaughterhouse workers	**Disinfectants, wet work, animal entrails and secretions**

HOW IS IT RECOGNIZED?

Victims of irritant contact dermatitis often consult a doctor or nurse. While some

experimental tests can provide an indication of the irritant potential of substances, no single test can reliably identify irritants in specific cases. In the evaluation of occupational irritant contact dermatitis, the best approach is to identify the conditions of exposure by discussing the victim's employment. The information to be gathered includes a detailed list of all chemicals in the individual's working environment; a detailed description of all processes involved in a day's work; and any information about other workers, if any, who have similar skin problems.

HOW IS IT TREATED?

Contact dermatitis may be treated with compresses, creams, ointments and skin cleansers. In general, people should protect their skin from physical trauma, chemical irritation, excessive sunlight, wind, and rapid temperature changes while the dermatitis is active.

HOW COMMON IS IT?

The number of cases of irritant contact dermatitis in Canada at this time is not known. In Ontario, Canada, 1,000 compensation claims are reported for contact dermatitis each year. According to some US statistics, skin disorders comprise more than 35 percent of all occupationally related diseases. Among all occupational dermatitis, irritant contact dermatitis accounts for about 80 percent.

WHAT ARE THE PREVENTIVE MEASURES?

Occupational irritant contact dermatitis can be avoided by the following measures:

- personal hygiene
- substitution of a less harmful substance
- enclosure of the process
- automation of the work procedures
- local exhaust ventilation systems
- good housekeeping
- education
- protective clothing
- barrier creams, skin cleansers
- convenient washing facilities

Personal hygiene, including hand washing, is vitally important in preventing contact dermatitis. Additionally, workers should be aware that excessive exposure to just water alone produces dryness (i.e., removes skin oils) and irritation of the skin. This effect is even greater with the addition of soap and detergents or after exposure to solvents. For skin cleansing, workers should use the mildest soap. For industrial cleaning they should use the mildest detergent. To remove difficult oil and grease stains on hands and arms, workers should use a waterless hand cleanser. If waterless hand cleansers do not remove difficult stains, workers should use abrasive soaps. Waterless hand cleansers and abrasive soaps should be used sparingly and only when necessary.

Engineering control methods include the enclosure of processes to separate workers from the harmful substances that they use. Local exhaust systems should be used where toxic substances may escape into the workroom. Nonhazardous substances should replace hazardous substances when possible.

Even changing the form of the substance may be beneficial. For example, granules are usually less irritating than a fine powder.

Good housekeeping includes proper storage of substances, frequent disposal of waste, prompt removal of spills, and maintenance of the equipment to keep it free of dust, dirt and drippings.

Employers should inform workers about the hazards of substances to which they are exposed and how to use them safely.

Protective clothing such as aprons and gloves should be properly selected to prevent skin contact. Not all protective clothing resists all substances. Manufacturers' specifications (e.g., kind material, duration of exposure/glove contact time with chemical) should be followed. Barrier creams are used as substitutes for protective clothing, especially when gloves or sleeves cannot be safely used. It is important to remember that they do not provide as much protection as protective clothing. Barrier creams should be properly selected for specific purposes to ensure that they offer protection for the type of chemical being used and that they will not contribute to skin irritation problems.

Washrooms, toilets, and showers should be conveniently located and supplied with adequate hot water, disposable towels and soap.

Establishing a good program to avoid exposure of the skin to irritant substances is vitally important for eliminating irritant contact dermatitis.