

# Prevention of Skin Problems when Working with Metal Working Fluids

---

Safety & Health Assessment & Research for Prevention Technical Report: 55-7-2001  
Washington State Department of Labor and Industries July 2001

1-888-66-SHARP

[www.lni.wa.gov/sharp/derm](http://www.lni.wa.gov/sharp/derm)

## Introduction

Metal working fluids (MWFs) are industrial coolants and lubricants used to reduce friction and heat generated with the machining, grinding and fabrication operations of metal products and to lubricate during metalworking operations. The fluids prolong the life of machines, carry away metal chips and protect the surfaces of the metal being processed.

There are three main types of MWFs:

- insoluble fluids (straight or neat oils),
- soluble oils (oil in water emulsions) and
- synthetic fluids.

These fluids can have additives that are corrosion inhibitors, emulsifiers, anti-foaming agents, preservatives and biocides. The formula of oil used depends on the raw material or cutting operation to be carried out. Straight or neat oils are not commonly found in machine shops as they once were.

## Skin Problems

MWFs can be irritating to the skin. Skin problems include mechanical trauma to the skin, infections, oil acne, folliculitis and irritant and allergic dermatitis.

### Mechanical Trauma

Small cuts to the skin from metal shavings (swarf) are a common injury. These cuts can become infected as a result from contact with MWFs fluids contaminated with microbial organisms.

### Folliculitis and Oil Acne

Exposure to straight oils can result in folliculitis (inflammation of the hair follicles) after having direct contact of oil with the skin. Exposed skin or skin under clothing heavily contaminated with oil results in blocked skin follicles. Blocked follicles can range in appearance from red irritation around hair follicles, small black plugged pores to large pustules. This problem can be found on the neck, hands, arms and thighs. If a worker has acne when starting a job working around MWFs, the fluids on the skin may make the acne worse.

### Irritant Dermatitis

This is the most common type of skin problem due to exposure to MWFs. Soluble and synthetic metal working fluids are strong alkaline solutions (pH of approximately 9—very basic) containing numerous additives and solvents. These solutions remove protective oils in the skin and damage proteins in its outer layer. The result is damage to the natural skin barrier, which causes a decrease in the water content of the skin. This can cause dry, thickened, fissured and inflamed skin,

especially on the palms of the hands. The hands and forearms can develop dry, scaly and inflamed patches. Infrequently, very small fluid-filled blisters can also develop on the hands and fingers. Small cuts in the skin from metal pieces allow more penetration of irritant fluids and contribute to irritant dermatitis. The type and concentration of fluid used, duration of exposure during the work period, and the presence of pre-existing skin disease (eczema or severe dry skin) all contribute to the development of dermatitis.

### **Allergic Dermatitis**

This is less common than irritant dermatitis. The additives in MWFs such as biocides, preservatives, corrosion inhibitors, amines and the impurities from metal (chrome, nickel), act as allergens and can cause an allergic reaction in some susceptible individuals. When skin is irritated, these allergens can penetrate more easily through the damaged skin barrier. A person who has developed an allergy to additives or impurities can have lesions that resemble irritant dermatitis, usually on the fingers and hands, but, the lesions do not clear when the person is away from the job (vacation) or with treatment. This person needs to be evaluated with patch testing to the components of MWFs (additives and metal impurities) to see if there is an allergen responsible for the persistent skin reaction.

### **Prevention of Dermatitis**

A primary method for the prevention of skin problems is to avoid contact with MWFs. Although it is impossible to avoid all contact with the fluids, the contact can be minimized and the irritancy of the fluids can be controlled.

#### **Environment**

Here are some ways to decrease contact with the fluids:

- keep the work area clean, including the machines, from machining fluids and grime, and
- have functioning splashguards on the machines.

The irritancy of the fluids can be minimized by:

- changing to a less irritating MWF if feasible,
- correct dilution of the additives in the fluids,
- maintaining MWFs at the manufacturer-specified concentration and pH,
- ensuring the cleanliness of the fluids by recirculating and filtering/straining them to remove swarf and other solid contaminants, and
- avoiding the use of fluids that have become contaminated with excessive microbial organisms.

#### **Workers**

Those working with MWFs can also help prevent developing dermatitis by:

- wearing clean clothes while on the job,
- laundering clothing that becomes contaminated with MWFs,
- avoiding placing MWF-soaked rags in pockets,

- wearing protective aprons, and
- wearing protective nitrile gloves (avoid latex because of the potential of developing an allergic reaction). Because of the nature of some jobs (fast rotating parts on a machine), wearing gloves may not be possible.

Personal cleanliness is necessary to remove irritating fluids before skin problems develop. This can be accomplished by the following measures:

- Washing hands with mild, nonabrasive soaps to remove fluids. Soiled skin areas should be washed at least twice during the workday.
- Never use cleaning solvents to wash the skin to remove fluids. These solvents increase the damage caused by irritating MWFs by removing even more protective oils in the skin.
- Wiping off hands during the day with towels that are not contaminated with fluids or swarf. Disposable paper towels should be considered.

Protecting the skin from the irritant effects of MWFs also requires keeping the skin in good shape.

- Use moisturizers before and after work. Products that are thick creams or ointments work best. These products may seem greasy but can heal the skin faster and offer more protection than thinner, water-based formulations. Working the moisturizer cream into the skin and wearing clean, thin cotton gloves for a couple of hours or wearing the gloves to bed can also speed the recovery of dry, fissured, irritated skin. Inexpensive 100% petroleum jelly works as a good moisturizing agent and has no added fragrance or preservatives. There are products on the market that are creamy petroleum jelly formulations and are easier to apply to the skin.
- Skin barrier creams have not shown to be as effective as claimed in preventing penetration of irritants and avoiding hand dermatitis. Silicone-based barrier creams are available but require vigilant use every few hours to help decrease contact of irritants with the skin.
- Using a mild soap at home can protect the skin from further damage.

## **Treatment of Skin Problems from Metal Working Fluids**

Prevention is the key to avoiding skin problems. But despite all efforts, skin problems from MWFs may develop. The longer the skin problem has been present, the harder it is to treat and to clear. Therefore, it is important to seek medical evaluation early if problems develop.

The following skin problems may require the evaluation by a dermatologist or occupational medicine physician:

- severe oil acne or folliculitis,
- skin infections,
- severe irritated or fissured skin,
- persistent eczema or blisters, which may be irritant or allergic dermatitis. Occasionally, a person may require patch testing to determine if there is an allergic component to the skin problem. This usually is required when the skin problem does not respond to treatment.