

# Clothing Dermatitis and Clothing-Related Skin Conditions

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Clothing can be a cause of occupational dermatitis. The source of dermatitis can be the fabric itself, chemical additives used in processing the fabric and hardware and fasteners. The physical or occlusive effect of clothing can result in dermatitis. Contaminated clothing from workplace chemicals, friction from clothing rubbing the skin, or heat retention from perspiration-soaked clothing in hot working environments can cause distinctive dermatologic conditions.

Textile fiber can be natural, synthetic or a combination of the two materials. Natural fiber is proteinaceous such as silk or wool or made from cellulose plant material such as cotton or linen. Man-made fibers such as rayon and acetate are cellulose polymers. Synthetic polymers include nylon, polyester, fiberglass, rubber and spandex. (1)

All fibers can cause irritant and allergic contact dermatitis although allergic contact dermatitis is rare. For instance, people with atopic dermatitis may find some fabrics such as wool irritating their skin lesions but it is not an allergy. Both irritant and allergic contact dermatitis can have the same morphology and pattern of lesions and may require patch testing to distinguish the difference between the two conditions. The distribution of the skin reaction is usually where the garments fit snugly and is worse in areas of friction and perspiration (2).

Allergic or irritant reactions to clothing is more often a result of the rubber materials, formaldehyde finishing resins, chemical additives, dyes, glues and tanning agents used in processing the fabric or clothing or metallic fasteners (2). Elastic in clothing material such as brassieres and the waistband in underwear or pants can cause contact dermatitis where there is contact of the clothing item with the skin. The areas involved are subjected to friction and perspiration, which contributes to the uncomfortable skin lesions.

Another common example is dermatitis on the hands caused by use of protective latex gloves. The reaction can be an irritant contact dermatitis from occlusion of the skin by the gloves and constant exposure to the irritant effects of hand washing or the less common allergic reaction to the chemicals used in processing latex (rubber additives, anti-oxidants, preservatives, etc.) or the latex protein. The health care industry where frequent handwashing and protective glove use is prevalent has significant problems with occupational irritant and allergic contact dermatitis (3, 4).

Textile formaldehyde resins are used in materials such as cotton or cotton/polyester blend fabrics to make the fabric wrinkle-resistant. There are nine formaldehyde resins in current use in the United States and most do not release a significant amount of formaldehyde as older formulations in the past. An allergic reaction may actually be due to the resin and not the released formaldehyde (1, 5-8).

Allergic reactions to the dyes used in fabrics are more common than a reaction to the fabric material that has been dyed (2). The specific type of fabric to be dyed determines the type of dye used. Most reported allergic reactions have been to dispersal dyes with azo and

anthraquinone structures. These dyes are loosely held on the fabric structure and easily rubbed off on the skin. (2, 9-12)

Disperse Blue 106 and 124 are used in the 100% acetate and 100% polyester blue, black, green and violet liners of women's clothing (2). It is rare for men to react to the liner in their trousers, as the liner is usually white, grey or beige. The reaction to these dyes can cause a severe acute eczematous reaction in the affected areas and may become chronic.

Rarely, there is sensitivity to flame-retardant materials added to clothing. Allergic contact dermatitis from the flame-retardants Tris (2,3-dibromopropyl) phosphate (13) and 2,3-dibromocresylglycidyl ether (14) has been reported. Chronic generalized dermatitis that was a reaction to the Basic Red 46 dye in flame-retardant clothing (15) has been reported. Many flame-retardant clothes are colored using basic dyes.

Nickel dermatitis has been observed from the metal hardware in some form of clothes. The most common is the metal button on blue jeans. Before panty hose stockings were invented in the late 1960s, nickel dermatitis from garter belts was more common. Other materials known to cause dermatitis include chemicals used in processing leather shoes and belts such as dyes, chromium and formaldehyde tanning agents and glue products.

Contaminated clothing can result in skin rashes. Clothing that is contaminated with oils, greases, coal tar, pitch or creosote can cause acne and folliculitis from occlusion, heat and friction. This problem is common in auto mechanics, roofers, asphalt paving workers and workers in the oil industry and coal tar plants (16). Pesticide residues that have soaked clothing or footwear can result in severe dermatitis (17, 18). Solvent-soaked clothing can cause severe chemical burns. Hands contaminated with chemicals before putting on occlusive, protective gloves can also result in severe irritant dermatitis. Urushiol, an oil in poison oak and ivy plants, can leave a residue on clothing and shoes. If the oil is not removed from the clothing by laundering or washing the shoes with soap and water, allergic contact dermatitis can result from handling or wearing the clothing and footwear (19).

Fine metallic dust particles such as antimony trioxide and arsenic trioxide that are capable of imbedding into the clothing fabric can result in irritant skin reactions (20, 21). When there is sweat combined with the metallic dust particles, pruritic, erythematous, papular lesions develop where the clothing is in contact with the skin. Workers at smelting furnaces where there is high heat, dust and using heavy protective clothing are susceptible to these irritant rashes.

Friction from clothing can also cause a condition called intertrigo. This rash is a result of friction and sweating in high heat situations (22). Red, macerated skin is present at the waistband area, under the arms and the inner thighs. This rash can become secondarily infected with yeast or bacterial organisms in hot, humid environments. The rash is more common in heavy individuals. This skin condition can be present in workers in industries such as foundries, farming, bakeries, restaurant kitchens and laundries where there are extremely humid conditions in addition to high heat.

Prickly heat rash, miliaria rubra, develops when workers are not acclimated to hot environments. Fabrics that do not breathe or dry quickly, such as synthetic fabrics, or tight

protective clothing, can become soaked with perspiration. Areas of skin covered by the soaked clothing, especially under the arms and the trunk, develop an erythematous, papular rash. The rash is caused by sweat retention (22, 23). The extreme heat conditions result in swelling of the keratin protein in the sweat ducts with rupture of the ducts (22). Workers need to be careful when miliaria rubra develops, as it is the first sign of heat stress. Showering, changing into dry clothing and remaining in a cool, aerated environment may relieve the pruritis. Miliaria rubra can take a week to clear. Progression of this problem to heat exhaustion and collapse is possible if the worker is not removed from the hot environment. Any working environment, indoors or outdoors, where there is high heat can result in miliaria. High humidity can exacerbate the problem.

## **Conclusion**

Dermatitis from clothing can be obvious or hard to detect. By knowing the physical exposure factors and working environments, it may be simple to figure out the cause of the dermatitis. Heat, humidity and friction may reveal the classic pattern of intertrigo or miliaria rubra. An occupation where there is significant exposure and contamination of clothing with oil or grease would produce a diagnosis of acne folliculitis. Irritant reactions to metallic dusts require knowledge of the worker's specific task and exposure to the dusts. Allergic reactions to nickel metal fasteners may be easy to detect by examining the clothing and specific location of the dermatitis. Allergic reactions to fabric materials, dyes, formaldehyde releasers or fire retardants are challenging and would require more investigative techniques to determine the cause of the dermatitis. The extra work involved in correctly diagnosing the problem could result in a satisfactory resolution of a significant problem for a worker.

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