CHAPTER 34

OCCUPATIONAL DERMATOSES: THEIR RECOGNITION, CONTROL AND PREVENTION

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INTRODUCTION

Occupational diseases of the skin comprise a broad assortment of skin changes caused by an infinite number of substances or conditions encountered in the work environment. Because of the varied clinical displays, they are appropriately termed "occupational dermatoses," but other titles as industrial dermatitis, occupational eczema, occupational contact dermatitis, and professional eczema are also used. More specifically related to cause are such descriptive titles as cement eczema, chrome dermatitis, chrome holes, fiberglas dermatitis, oil acne, rubber itch, and tar cancer, among others.

These disorders have plagued mankind since antiquity, but little was written about them until 1700 when Ramazzini published his classical text entitled, "De Morbis Artificum," (A Treatise of the Diseases of Tradesmen). Contained within this book are descriptions of occupational skin diseases which remain remarkably accurate today. In 1755, Percival Pott described cancer of the scrotum among chimney sweeps. This was probably the first report dealing with an occupationally induced cancer. Throughout the 18th and 19th century, interest in occupational diseases of the skin was prominent in England, France, Italy and Germany. As industrialization spread to other countries, more people were employed and occupational diseases, including those affecting the skin, occurred in greater numbers. With the advent of World War I, industry expanded enormously in the United States and with it there developed a strong interest in diseases of occupation which has led to better understanding of the work hazards, the diseases they produce, and what could be done to control them.

That occupational skin disease is an important sector in dermatology is without question. However, these disorders are equally important in the field of occupational medicine, industrial hygiene, occupational health nursing and to the insurance companies. This is readily understood because dermatoses are by far the most common of the occupational diseases, numbering no less than one-half to three-fourths of all industrial illnesses reported. They are no less important to the working population, who number between 73 and 80 million. About one-third of this number, 23 million, work in big industry. The remaining 40 to 50 million work in small plants (500 employees or less). Anyone who works is a potential candidate for an occupational skin disease. If he works in a large industrial plant, the chance of developing a skin ailment is less because the medical, nursing and hygienic services are keyed to prevent occupational diseases. Conversely, work in a small plant often is attended by greater risk to health because protective measures generally are poor in quality, if present at all. In any event, it has been estimated that 1% of the working population suffers from occupational skin disease during the course of the year. Thus, with our present employment level, we can expect the occurrence of between 730 and 800 thousand cases. The resulting economic impact of this disease frequency is unknown, but it is estimated that the amount of money required to compensate for lost time and medical care associated with occupational dermatoses each year is in excess of 150 million dollars. Further, there is no way of calculating the dollars lost because of occupational diseases which result in job changes, loss of efficiency and production, or the rehiring and retraining of help.

DEFENSE MECHANISMS OF THE SKIN

The skin is the largest organ of the body. It has approximately 20 square feet of surface area for potential contact with foreign substances in nature and in the industrial environment. It is a multi-functioning organ whose anatomical and physiologic properties subserve protection by regulating body heat, receiving sensations, secreting sweat, manufacturing pigment, and replenishing its own cellular elements. Each of these functions is important in the maintenance of a healthy skin and any deviation from normal can alter the health of the skin and sometimes that of the entire body.

The structure or anatomical design of the skin is protective because of its thickness, resiliency, and the capacity of certain of its layers to inhibit the entrance of water and water-soluble chemicals. Its thickness and elasticity protect the underlying muscles, nerves and blood vessels. Additionally, the thickness and color of the skin afford protection against the effects of sunlight and other sources of physical energy.

Structurally, skin is composed of two layers — the epidermis and the dermis. Epidermis has two essential levels — an outermost stratified layer of horn cells called the "stratum corneum" and the inner living cells from which the horn cells arise. Stratum corneum cells are shed, yet replenished continually because the inner living epidermal layer keeps reproducing cells which eventually become stratum corneum cells. In short, the epidermis has its own self-support system. The stratum corneum layer is essential for protection,

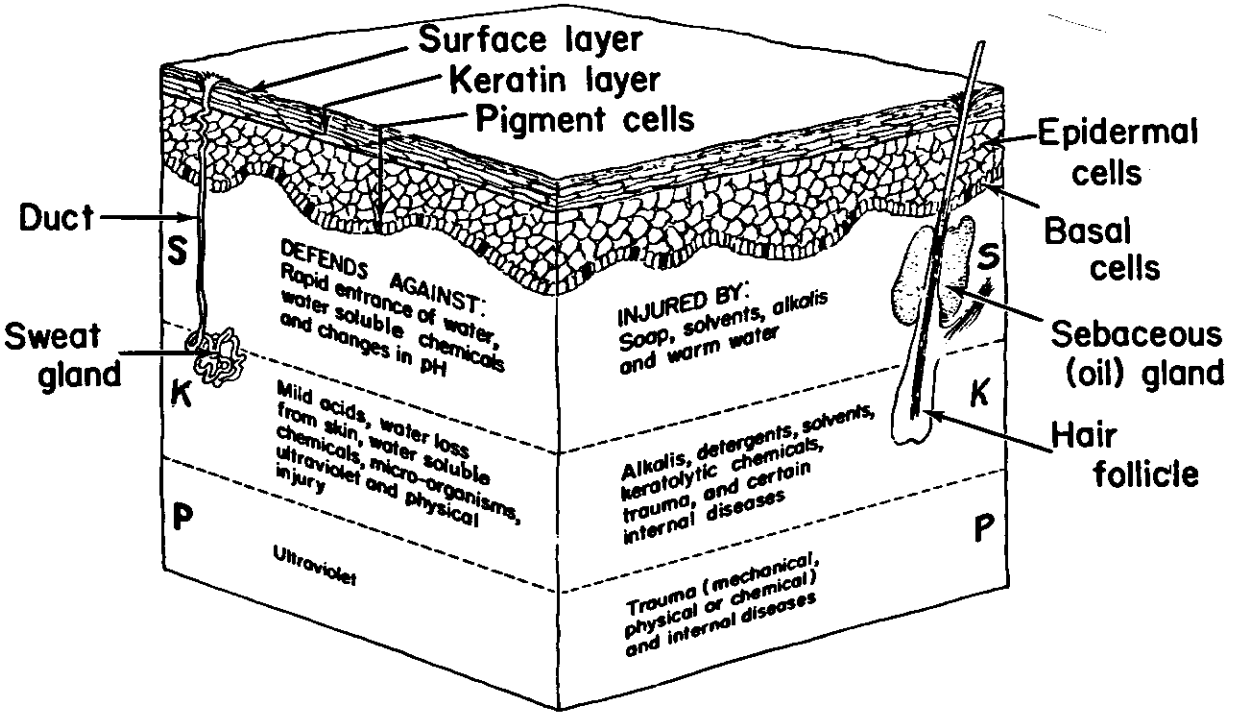

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Figure 34-1. Diagram of the Skin's Protective Layers.

being thickest on the palms and soles. Chemically, it is a complex protein structure which is relatively resistant to mild acids, to water and water-soluble chemicals; but vulnerable to alkaline agents, strong detergents, desiccant chemicals, and solvents (Figure 34-1).

In the lowermost region of the epidermal layer are the basal cells from which all of the epidermal cells arise. Nestled within the basal cell layer are melanocytes or pigment-producing cells which furnish protection against ultraviolet radiation. This comes about through a complex enzyme reaction leading to the production of pigment or melanin granules which are engulfed by the epithelial cells which, in turn, migrate to the upper level of the skin and eventually are shed. Melanin serves as a protective screen against sunlight because the granules absorb photons of light. This mechanism occurs naturally throughout the lifetime of an individual. Sunlight and certain chemicals stimulate pigment formation and, at times, its activity can be inhibited.

Dermis is thicker than epidermis and is composed of elastic and collagen tissue which provide the skin with its resiliency. Invested also in the dermis are sweat glands and ducts which deliver sweat to the surface of the skin; hair follicles in which hairs are encased; sebaceous or oil glands which excrete their products through the hair follicle openings on the skin; blood vessels; and nerves.

Body temperature is regulated by the excretion of sweat, circulation of the blood, and the central nervous system. Blood is maintained at a relatively constant temperature even though the body can be exposed to wide ranges of temperature variations. Sweat facilitates greatly the cooling of the overheated skin surface by evaporation. At the same time, dilation of the blood vessels within the skin also permits heat loss. Conversely, when the body is exposed to severe cold, blood vessels will contract to conserve heat. Nerve endings and fibers present in the skin participate in the receptor and conduction system which allows the individual to differentiate between heat, cold, pain and sense perception. This latter quality allows one to discriminate between dryness or wetness, thickness or thinness, roughness or smoothness, hardness or softness.

Secretory elements within the skin are the sweat glands and the sebaceous glands. Perspiration or sweat contains products from the body's metabolic function, but 99% of sweat is water. Excessive or inadequate sweating can be harmful not only to the skin, but to the general health. Sebaceous or oil glands are situated in the dermis and connect to hair follicles which exit on the surface of the skin. They manufacture an oily substance called "sebum," whose precise physiologic function is not well-understood. Present in normal amounts, it appears to offer some surface protection to the skin. Over-function of these glands is associated with acne.

Coating the outer surface of the keratin layer is a waxy type of mixture composed of sebum, breakdown products of keratin, and sweat. It is

believed that the emulsion-like mixture impedes somewhat the entrance of water and water-soluble chemicals, but its actual protective quality is minimal. It does assist in maintaining the surface pH of the skin, which is normally in the range of 4.5 to 6. Its protective capability is minimized because it is easily removed by soaps, solvents and alkalis. None the less, it is continually replenished under normal conditions and does constitute an extra layer of protection which must be removed before keratin cells can be attacked.

Absorption of materials through the skin occurs when the continuity of the skin is disrupted by an abrasion or a laceration or a puncture. Absorption of fat-soluble chemicals, fats and oils can occur via the hair follicle which contains the hair bulb and a portion of the hair shaft. Some substances as organophosphates are absorbed directly through the intact skin; further, skin permits the ready exchange of gases, except for carbon monoxide. Sweat ducts offer little, if any, avenue for penetration. From the above it is evident that the skin has its own built-in defense mechanism. However, many direct and indirect causes of occupational skin disease can alter this normal defense pattern.

CAUSES OF OCCUPATIONAL DERMATITIS

Indirect or predisposing factors which lead to the development of an occupational dermatosis are generally associated with race, age, sex, texture of the skin, perspiration, season of the year, lack of cleanliness and allergy.

An outstanding example of how racial characteristics predispose to the development of an occupational dermatosis is seen in the marked reaction of the red-head or blond, blue-eyed, light complexioned individual to sunlight. The converse is seen in the resistance to sunlight or ultraviolet displayed by dark or melanotic skin. This racial difference is true in the case of sunlight and in the handling of certain chemicals as tar and pitch which react with sunlight, but dark skin is not universally resistant to the industrial environment.

It has been noted that young workers develop occupational dermatoses more readily that the older workers. This is not a predisposition associated with any peculiar structure of their skin, rather it is the direct result of their frequent disregard for exercising caution in handling injurious materials at work.

Women are just as prone as men to develop occupational skin diseases. In manufacturing plants they work at many of the same jobs and come into contact with chemicals — organic and inorganic, solvents, machine oils, plastics, etc. Women have a natural tendency to be more fastidious in their cleansing habits at work; but, as a group, they also experience additional exposure to cleansers, detergents, waxes and other agents in the household.

Workers with naturally dry skin are less able to tolerate the action of solvents and detergents. Those with oily skins can resist solvents more readily, however, they also are predisposed to developing acne-like lesions induced by cutting oils. Insoluble oils collect within the hair follicle openings and irritate that area sufficiently to cause an inflammation of the hair follicle. Permitted to continue, oil acne will result.

Although sweating is a normal physiologic action, in excess it is often detrimental. Increased perspiration in the armpits and in the groins may cause a breakdown of the skin surface which allows chemicals and bacteria to be more active at those sites. Excessive perspiration also can cause prickly heat, particularly among workmen exposed to high degrees of temperature.

Occupational dermatitis is generally more common during warm weather. When the work area is hot, workmen become lax in the use of protective clothing and, thereby, overexpose themselves to hazardous substances. Warm weather also means greater exposure to sunlight, poisonous plants and insects, the effects of which may or may not be related to the job.

Keeping the skin free of harmful agents encountered at work is readily accomplished by frequent washing and the proper use of protective devices. However, workmen with poor cleansing habits are prone to develop an occupational skin disease. These same individuals tend to wear soiled work clothing for prolonged periods of time. This practice enhances the amount of contact between the skin and chemical contaminants in the soiled clothing.

It is a natural tendency on the part of many people to believe that all dermatitis is based on allergy. Among the working population, allergy accounts for about 20% or less of all the occupational dermatoses seen. Certain individuals known as "atopics" are born with a predisposition for the development of allergic diseases such as hay fever, asthma, hives and eczema. However, these people are no more disposed to allergic contact dermatitis in industry than are nonallergic workmen. Certain industrial or environmental substances are well-known allergens, but these materials can cause a contact allergy in anyone. When one develops an occupational contact allergy it does not mean that he has to quit work. By using good protective measures, he can generally continue at his job. However, there are certain people who develop such a high level of allergic reaction that they must seek other types of work.

Direct Causes

In order of their importance and frequency, the direct causes of occupational dermatitis can be classified as chemical, mechanical, physical and biological.

Chemical

Organic and inorganic chemicals are the major dermatoses hazards present in the work environment. They constitute a never-ending list because each year the chemical spectrum gains additional agents capable of injuring the skin. Chemicals act as primary irritants or allergic sensitizers or photosensitizers. A primary irritant is a substance which, if permitted to contact the skin in sufficient concentration for a sufficient length of time, will produce a demonstrable effect upon the skin at the site of contact. In short, a primary irritant

will affect the skin of anyone. Some irritants are strong or absolute in their action; for example, chromic acid, nitric acid, sodium hydroxide or chloride of lime can produce their effect within moments after contact, or at least within a few hours following initiation of contact. Other substances act as relative or marginal irritants and require several contacts before any of their effects are seen; for example, prolonged exposure to soap and water or to soluble cutting fluids or mild solvents as acetone.

About 80% of all occupational dermatoses are caused by primary irritants. Most inorganic and organic acids act as primary irritants. Certain inorganic alkalis as ammonium hydroxide, calcium chloride, sodium carbonate, sodium hydroxide are skin irritants. Organic alkalis, particularly the amines, also are active irritants. Metallic salts, notably the arsenicals, chromates, mercurials, nickel sulphate and zinc chloride, produce severe irritant effects on skin. Organic solvents represent a large number of substances, such as the chlorinated hydrocarbons, petroleum base compounds, the ketones, the alcohols, terpenes, among others, which irritate skin because of their solvent qualities.

Primary irritants damage skin because they have an innate chemical capacity to do so. Many primary irritants are water-soluble and, thereby, actively able to react with certain tissue within the skin. Even the water-insoluble compounds which comprise many of the solvents react with the lipid elements within skin. We do not know the precise mechanism of primary irritation on the skin, but some useful generalizations serve as indices to explain the activity of groups of materials in the irritant category.

Keratin Solvents

All of the alkalis, organic and inorganic, injure the keratin layer when concentration and exposure time is adequate. These agents soften the keratin cells and succeed in removing many of them. At the same time, they bring about considerable water loss from this layer resulting in dry, cracked skin which prepares the way for secondary infection and also, at times, for the introduction of allergic sensitization.

Fat and Oil Solvents

Just as organic solvents dissolve oily and greasy industrial soils, they remove the surface lipids and disturb the keratin layer of cells so that they can no longer maintain their water-holding capacity. Workmen exposed each day to the action of the organic solvents develop exceedingly dry and cracked skin.

Protein Precipitants

Several of the heavy metal salts precipitate protein and denature it. Best known for this action are the salts of arsenic, chromium, mercury and zinc.

Reducers

Salicylic acid, oxalic acid, urea, as well as other substances, in sufficient concentrations, can actually reduce the keratin layer so that the latter is no longer protective and an occupational dermatosis results.

Keratin Stimulants

Several chemicals stimulate the skin so that it undertakes peculiar growth patterns which may lead to tumor or perhaps cancer formation. Certain petroleum products, a number of the coal tar based materials, arsenic, and some of the chlorinated hydrocarbons can stimulate the epidermal cells to produce these effects.

Primary irritant chemicals are commonly encountered in industry; they account for about 80% of all of the occupational dermatoses seen; they attack the skin in various ways; strong irritants can injure the skin in a matter of moments or hours; weak or marginal irritants may require several days. Because a workman must come into contact with a primary irritant does not mean that he will necessarily develop an occupational dermatitis. Exposure to irritant materials can be controlled when proper precautions are taken.

Sensitizers

Chemicals which cause allergic contact dermatitis are far fewer in number than are the primary irritant substances. Best known among the allergenic agents are such plant toxins as poison ivy, poison oak, and poison sumac. Other well-known cutaneous sensitizers are the alkaline dichromates, epoxy resin systems, hexamethylene tetramine, phenolformaldehyde resins, among others. A sensitizer does not cause visible change on the skin following first contact; but after several contacts, which may require days or sometimes months, it causes specific changes in the skin so that further contact on the same or other parts of the body will induce a dermatitis. Allergic contact dermatitis is rarely seen amongst workers before the fifth or seventh day after exposure is initiated, whereas primary irritant dermatitis can occur within a few hours or a few days. Only in a few instances, as for example, when exposed to poison ivy or epoxy resin systems or phenol-formaldehyde plastics, do large numbers of workers become allergically sensitive.

Photosensitivity

There are two forms of photosensitivity dermatitis — phototoxic and photoallergic. Excess exposure to sunlight or artificial ultraviolet can injure the skin through a phototoxic effect. Many workmen are exposed to various forms of natural and artificial light, for example, farmers, policemen, road builders, telephone and electric linemen and sailors. Additional to exposures from natural and artificial light sources are numerous chemicals, plants and drugs which react with selected wavelengths of natural and artificial light to cause phototoxic or photoallergic dermatitis. The best-known industrial chemicals with this capacity are derivatives of coal tar, as anthracene, phenanthrene, and creosote; and certain dyes — acridine, eosin and rose bengal. Further, a host of topically applied and ingested drugs can interact with specific wavelengths of light to produce these effects. Examples of these are certain chlorinated compounds (present in soaps for antibacterial purposes), tranquilizers of the phenothiazine type and drugs related to sulfonamid and some antibiotics.

Mechanical Causes

Anyone who works experiences some type of a mechanical trauma involving friction or pressure. Friction may result in an abrasion or, more commonly, a callus, produced by repetitive types of hand motions or through using a certain type of tool. Those who work with pneumatic tools may experience untoward effects of the hands and forearms, depending on the type of tool being used. High frequency tools can produce what is called "painful white fingers," a disorder accompanied by spasmodic pain in the fingers of the hand operating the tool. Heavier pneumatic instruments, like hammers, riveters and chisels, can cause painful tendinous or muscle or bone injury to the hands and forearms.

Physical Causes

Heat, cold, sunlight, artificial ultraviolet and ionizing radiation are capable of injuring the skin. Jobs involving exposure to high temperature induce excessive sweating and prickly heat. High levels of heat may also cause systemic symptoms and signs as heat cramps, heat exhaustion and even heat stroke. Burns of the skin can result from electric shock, sources of ionizing radiation, molten metals and glass, and solvents or detergents being used at elevated temperatures.

Low temperatures may induce frostbite and permanent damage to blood vessels. The ears, nose, fingers and feet are common sites for this type of cold injury. Electric and telephone linemen, highway maintenance workers, farmers, fishermen, policemen, postmen, among other outdoor employees, may experience this type of skin injury.

Many people who work outdoors are exposed to sunlight and increasing numbers come into casual or prolonged contact with artificial ultraviolet sources as molten metals and glass, welding operations and the plasma torch. A newer light source is found in operations using the laser apparatus. Since these monochromatic beams can injure skin and other biologic tissue, appropriate protective devices should attend their use.

Numerous ionizing radiation sources are being used in industry. Alpha radiation, though not injurious to skin, is dangerous if inhaled or ingested. Beta radiation can injure skin and the body in general if inhaled or ingested. Gamma radiation and x-rays are well-known skin and systemic hazards when sufficient exposure occurs. X-ray diffraction instruments pose a potential source of skin injury to those employed in the operation of these devices.

Biologic Causes

Bacteria, viruses, fungi and parasites attack the skin and sometimes produce systemic disease of occupational origin. Animal breeders, agricultural workers, bakers, culinary employees, florists, horticulturists, laboratory technicians and tannery workers are among the ones who may develop an occupational dermatosis or a systemic disease caused by one of the biologic agents. Where these substances are known to be connected with the work, all necessary precautions for preventing disease must be exercised. A common type of skin infection seen among workmen is caused by staphylococci invading the site of a previous wound.

Clinical Types of Occupational Dermatoses

Several clinical variations of occupational skin disease are known to occur; however, the lesions produced on the skin rarely are characteristic of a specific chemical. Nevertheless, certain types of skin changes do suggest contact with certain classes of agents, for example: (a) Acute contact dermatitis is generally caused by a primary irritant or a sensitizing chemical, a poisonous plant or a photosensitizing agent. (b) Acne-like skin diseases usually mean contact with petroleum oils and greases, tar or pitch or certain chlorinated hydrocarbons which induce chloracne, for example, chlorinated diphenyls and triphenyls, chlorinated diphenyl oxide, among others. (c) Pigment changes in which there is a loss or gain in pigmentation. Several complex phenolic compounds present in germicidal agents have caused loss of skin pigment. Some examples are tertiary butyl phenol, tertiary amyl phenol, tertiary butyl catechol. Conversely, petroleum oils, asphalt, pitch, photoreactive chemicals and sunlight produce gains in pigment formation. (d) New growths. Sunlight, x-ray, tar, arsenic trioxide, impure paraffins and certain shale oil fractions are known to cause skin tumors, which may become cancerous. (e) Ulcers. Arsenic trioxide, chromic acid, sodium chromate, potassium dichromate, lime, thermal burns and forceful injury can cause ulceration of the skin.

These five examples of occupational skin changes (dermatoses) are presented in a decreasing order of frequency. To recognize them and understand their causation requires a familiarity with diseases of the skin and the environmental factors which influence their development. It involves understanding the nature of the lesion, the site of the eruption, the course of the disease and the correct interpretation of any clinical tests found necessary to aid in the diagnosis. Occupational skin problems are best managed by physicians familiar with them.

PREVENTION OF OCCUPATIONAL SKIN DISEASE

Dermatoses caused by substances or conditions present in the work environment are largely preventable, but only through the conjoint effort of management, supervision and the workman. That such can be accomplished is best demonstrated in large industrial plants, while the converse is demonstrated in hundreds of small work establishments where little, if any, interest is shown in preventive measures. Two major approaches to the control of occupational diseases, in general, or dermatoses, in particular, are: (a) environmental control measures and (b) personal hygiene methods.

Engineering Controls

The best time to introduce engineering controls is when a plant is being designed. At that

time, control measures can be integrated more readily into the operations than after the plant has been built. Ideally, operations would be conducted in entirely closed systems, but not all industrial processes lend themselves to this approach. When closed systems are used, raw materials can be brought to the manufacturing site in sealed cars or containers and their contents emptied into storage tanks or bins, and later cycled through retorts or other reaction apparatus, meanwhile preventing contact with the material being processed. If this type of control system is unattainable, it is generally possible to install local systems which collect the irritant dusts, vapors, fumes and mists. In any event, it is recognized that elaborate ventilation systems are costly and most plants cannot afford this method of control. Smaller plants may have many devices intended for control purposes, but experience shows generally that small plants depend more upon personal hygiene practices than on environmental control measures.

Personal Hygiene

If a workman is to minimize contact with harmful agents, he must have access to facilities for washing his hands and be furnished other means of keeping clean at work. It is up to the plant to provide adequate washing facilities and good cleansing materials. Washbasins must be well designed, conveniently located and kept clean, otherwise they will be used infrequently, if at all. The farther a workman must walk to cleanse his skin, the less likelihood there is of his doing so. Inconveniently located washbasins invite such undesirable practices as washing with solvents, mineral oils or industrial detergents, none of which were intended for skin cleansing. For workmen to keep their skin reasonably free of injurious agents, they must use washing facilities at least three times a day — during work, before lunch, after lunch and before leaving the plant. Working with toxic chemicals and radioactive substances requires the daily use of showers.

Many industrial hand cleansers are available as plain soap powders, abrasive soap powders, abrasive soap cakes, plain soap cakes, liquids, cream soaps and waterless hand cleaners. Workmen generally like powdered soaps because they gain a sense of having removed soils because of the frictional element. Most powdered cleansers with abrasives will remove tenacious soils, but waterless cleaners have become very popular because they remove greases, grimes, tars, paint and some plastics with relative ease. However, care must be exercised in selecting waterless cleaners because many of them contain excess alkalis and solvents, which cause excessive drying of the skin and sometimes contact dermatitis.

Management should have more than a passing interest in providing good washing facilities and good cleansing products. All too frequently, the cleansing agents are purchased by people having no familiarity with their quality. The practice usually results in procuring industrial hand cleansers which are cheapest in price.

Disposable hand towels are desirable because they can be discarded after use. They are an excellent replacement for the old fashioned machinist waste.

Protective Clothing

It is not necessary that all workmen wear protective clothing, but for those jobs in which its use is required, good quality clothing should be obtained. Manufacturers now provide a large selection of protective garments of rubber, plastic films, leather, cotton or synthetic fibers designed for specific purposes. For example, we now have access to different clothings which protect against acids, alkalis, extreme exposures of heat, cold, moisture, oils and the like. When such garments must be worn, management should purchase and control the use of the protective gear. They should see to it that the clothing is serviced and laundered often enough to keep it protective. When workmen are required to purchase their own protective clothing, they generally buy the cheaper materials with little thought being given to the purpose for which it is intended. Further, if work clothes are laundered at home, it can cause contamination of family wearing apparel with chemicals, fiberglas or other dusts.

Protective clothings include hair covers as caps and nets, coveralls, smocks, aprons, sleeves, gloves and shoes. Protective sleeves and gloves are helpful devices, but care must be exercised in their use. Unless they are made of tear-away fabric or film, a sleeve or glove may cause serious injury to an arm or a hand. Cotton or leather gloves are useful for protecting the hands against friction and dusts. Synthetic rubber gloves are used for protection against acids and alkalis. Neoprene dipped cotton gloves will protect against most liquid irritants. Some workmen do not like to wear rubber gloves because the rubber causes the hands to perspire excessively. Gloves with built-in liners are probably less efficient and comfortable than plain plastic or rubber gloves which can be worn over replaceable cotton liners. Each workman requiring this type of protective gear can have three or four pairs of washable cotton liners which can be changed when his hands become saturated with perspiration. Major manufacturers of protective clothings have descriptive catalogs which provide useful information in selecting the best protective apparel for certain exposures.

Barrier Creams

Generally speaking, a barrier of protective cream is the least effective way of protecting skin. Nevertheless, there are instances when a protective cream may be the best method available for preventing contact with harmful agents, for example, if the face cannot be covered by a shield or gloves cannot be worn. There is no all-purpose protective cream. Several manufacturers compound a variety of products, each designed for a certain type of protective purpose. Thus, there are barrier creams for protecting against dry substances and those which protect against wet materials. Using a barrier cream to protect against a solvent is not as effective as using an impervi-

ous glove; however, there are compounds which offer some protection against solvents, providing the creams are used with sufficient frequency. To use a protective cream correctly, it must be applied on clean skin at the beginning of the work shift, removed and reapplied at the break, removed at lunch, reapplied after lunch, again in the afternoon and, of course, removed at the close of the work shift. When barrier creams are used, they should be selected because of a particular need by workmen who cannot wear other types of equipment. They should not become the substitute for protective clothing.

In summary, management is responsible for furnishing the facilities and products required to keep the work-place safe. Similarly, the workman has certain responsibilities in a prevention program. He must wear protective clothing if it is required; he must wash with frequency if he is working with irritant or toxic chemicals. If he develops an occupational dermatitis in spite of his attempts to prevent its occurrence, he should report immediately to the plant dispensary or to his physician for prompt diagnosis and medical treatment.

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