

# Industrial Dermatitis in the United States\*

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IN some countries, especially England and Germany, more attention has been paid to industrial dermatitis than in the United States. Since the promulgation of Workmen's Compensation Laws, the problem of industrial dermatitis has become of greater importance than ever in this country. Industrial dermatitis or occupational eczema contributes about 50 per cent of all claims for compensation due to conditions classified as industrial diseases. Even this does not represent the real incidence of occupational eczema because the majority of cases of industrial dermatitis do not incapacitate the worker, and only those workers put in claims for compensation who must stay away from work for one week or longer.

In our inspection of plants, we noted workers at their jobs affected with varying degrees of occupational dermatitis. Most of these cases were not reported, either because they were not serious in nature, or because the workers feared that a claim for compensation might militate against their retaining their positions. There were a few severe cases of dermatitis in men who were working because the compensation they might receive was less than they could earn.

We found some workers not reporting their condition because other workers

had told them that many new employees were affected in the same way, and that if they kept on with the work, they would become hardened and no longer be troubled.

## FREQUENCY OF OCCURRENCE

Skin diseases are associated with many occupations, the rubber industry causing rubber itch, tanning of leather chrome sores, oil refineries oil acne, dyeing establishments dye dermatitis, etc.

The amount of industrial dermatoses reported by the hospitals is very small. In one hospital in New York where there are over 20,000 new skin cases treated a year, there were only 53 cases per year of industrial dermatitis; in another having 5,000 new skin cases per year, only 5 cases per year of industrial dermatitis. In a private industrial clinic servicing various manufacturing establishments in Greater New York, out of 33,000 cases of all kinds treated over a period of one year, there were 103 cases of dermatitis.

According to statistics gathered from the States of New York, Missouri, Connecticut, Massachusetts, Wisconsin and Ohio, of 19,428 occupational diseases reported during the period covered by the records, 9,621 were occupational dermatitis, or about 50 per cent. In these states there was an average of 2,944 cases of occupational dermatitis per year—an annual rate of 48 per 100,000 of the industrial population.

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These include only the more severe cases of dermatitis, and it is safe to say that if the minor cases which are not reported, or which are not disabled for a period of one week or more, were counted, it would be shown that there are many times this number of cases actually occurring per year in the United States.

#### CASES FOUND IN THE PRESENT STUDY

In the present study the industries examined were selected at random and not because of any undue prevalence of dermatitis. They included dyeing establishments, rubber works, oil refineries, candy makers, linseed oil works, and chemical manufacturing. Out of 18,567 workers examined, there were 285 occupational skin diseases found, a rate of prevalence of 1½ per cent.

#### CAUSATIVE AGENTS OF INDUSTRIAL DERMATITIS

The chief causes of industrial dermatitis differ in the various localities according to the prevailing types of industry present.

In New York State of 232 industrial dermatitis claims about 26 per cent were due to general irritants, such as acids, alkalis, chrome and turpentine, 13 per cent were due to plant and vegetable poisoning and 10 per cent were to dyes. Gasoline, benzine, oil and naphtha account for about 10 per cent.

In Missouri out of 1,020 cases, 69 per cent were due to lime and cement, 6 per cent to lye, 15 per cent to poison ivy, 1½ per cent to petroleum and 9 per cent to caustics and sulphuric acid.

In Wisconsin in the past ten years, of 1,909 cases of dermatitis, 17 per cent were due to toxic vapors, 42 per cent to toxic fluids, 20 per cent to irritating dusts and 15 per cent to poisonous dusts.

In Ohio, irritating dusts associated with the rubber industry have led the

list of causes of industrial dermatitis. Oils and cutting compounds, including lubricants, have been a close second, and at the present time, according to Dr. Hayhurst, undoubtedly lead the procession of skin irritants.

From these statistics, it can be stated that the majority of occupational skin diseases in these states are caused by acids, alkalis, caustics, oils, greases and solvents.

Plant poisoning by ivy, oak, sumac, primrose and wood dusts occurring among florists, gardeners, and carpenters, constitute a considerable percentage of cases of occupational dermatitis. In New York State out of 449 cases, 14 per cent, and in Ohio, out of 4,600 cases, over a 5-year period, 2 per cent were due to this cause.

#### COMPENSATION FOR INDUSTRIAL DERMATITIS

Only 11 of our states compensate for industrial skin diseases. The compensation laws in these states are not all the same. Some compensate for any occupational disease arising out of and in the course of employment; others specifically name the causative agent. Dermatitis is not specifically mentioned in some while in others the causative agents for which occupational dermatitis is compensated are named.

What is reportable or compensable in one state may not be so in another. This makes it very difficult to compile reliable statistics from the records.

#### CLASSIFICATION OF CAUSES OF OCCUPATIONAL DERMATITIS

To give a list of substances causing industrial dermatitis would be to give a list of almost every known chemical or substance, because idiosyncrasy or hypersensitivity or allergy can be developed towards almost any substance. The causative agents can be classified in various ways. One manner is as follows:

1. Physical Agents—such as heat and cold, radiation, etc.
2. General Irritants—such as acids, alkalis and caustics, etc.
3. Specific Irritants—These do not affect everybody but cause skin rashes in a considerable percentage of people. Such are paraphenylenediamine, hexamethylenetetramine, benzene, and certain oils and plants.
4. Fat Solvents—These act by dissolving the fat and oil from the skin and making it more sensitive to irritation.
5. Dehydrators — Crystalline substances which act by absorbing the moisture from the skin, such as salt and sugar.
6. Biologic Agents—Bacteria and pathogenic fungi.

Then there is a group of substances which affect only the skins of hypersensitive people. If these are met with at the place of employment, then the dermatitis is an industrial dermatitis due, partially to the substance and, partially, to the hypersensitivity of the individual.

There is still another group of people who, at first, are not sensitive to the materials with which they work, but after exposure to them for varying lengths of time, become sensitized or allergic and develop a dermatitis. These allergic forms of occupational eczema are related to hay fever, asthma and serum sickness.

#### CLINICAL FORMS OF OCCUPATIONAL DERMATITIS

Occupational dermatitis is, in its acute form, a dermatitis venenata, and does not have any characteristic appearance except when caused by a few substances such as arsenic and poison ivy.

Fat solvents cause the skin to become dry and cracked, and dehydrators give a parchment-like, scaly appearance. Aside from the few general characteristic appearances caused by a few skin irritants, the appearance of the skin gives no clue to the irritant causing the condition.

Occupational dermatitis in its acute

stage is characterized by erythema, edema, papules and vesiculation of the exposed parts. Other parts of the body may also be affected, especially when the clothes are penetrated by the offending material. Later on crusting and desquamation may occur. Complications such as pus formation and parasitic infections may entirely change the picture of the original disease.

The first attack of occupational dermatitis may disappear while the person is working and it may never appear again. It may disappear after the person stops working and not appear again upon resuming work, or it may disappear upon stopping work and reappear when resuming the work, or it may become chronic with acute exacerbations.

It is characteristic of a typical occupational dermatitis that it appears when the person is exposed to the offending substance, disappears after the exposure has ceased and reappears when the person is again exposed. This is a classical picture and is not always met, because other conditions complicate the matter.

There are some people who, when they first begin work, develop a mild dermatitis which, after a while, disappears, leaving them immune. There is another class in whom the dermatitis develops in so severe a form that it necessitates staying away from work, and when they return to work the condition reappears. Such people are likely to discontinue that occupation of their own accord. There is still another class who develop an immunity while working but this is short lived, and if they discontinue working for a week or two, then come back to work, they again contract the dermatitis and again may develop an immunity. In other words, continuous exposure among such people develops an immunity which lasts a short time.

Some workers have alternating re-

missions and exacerbations of dermatitis while at work. These cases are difficult to explain. It may be possible that the conditions under which they work are not constant although they appear to be. The dermatitis itself may exhibit a periodicity due to variations in the resistance of the patient or to variations in his sensitivity.

There is still another group of cases described by Rudolph L. Mayer, in which the primary dermatitis is followed by frequent relapses and, finally, a chronic condition persists even after elimination of the offending substances; that is after giving up the employment. Mayer explains that in these cases there gradually develops a nonspecific polyvalent sensitivity of the skin to many things that are encountered in the course of daily life. Secondary infections with pus organisms and molds may also take place in these cases, and the resultant sensitivity may complicate the disease. It is very difficult in such cases to prove that occupation was the original cause of the condition.

#### DIAGNOSIS OF INDUSTRIAL DERMATITIS

In making examinations of workers, many skin conditions such as psoriasis, lichen planus, impetigo, scabies, etc., were found which had no relation to the occupation. In making a diagnosis of industrial dermatitis, it must be determined whether or not the man is exposed to a general irritant, and if he is, whether the eruption developed before or after beginning the occupation. If there is no exposure to a general irritant, it must be determined whether there is a sensitivity to any of the materials with which the person comes in contact in the course of his employment. This can be done by means of patch tests, applied as follows:

Eight thicknesses of gauze  $\frac{1}{2}$  inch square are saturated with the material suspected of causing the dermatitis, and placed on a clear portion of the

skin. It is best to select, if possible, a clear portion of skin immediately adjacent to the eruption on the theory that the portion of the skin nearest to the eruption is most sensitive to the chemical. The gauze is covered by a piece of dental rubber about 1 inch square so as to keep in the moisture. This is covered by a piece of cotton flannel about  $1\frac{1}{2}$  inches square, in order to keep in the heat, and covered with a piece of adhesive plaster 2 inches square. The patches may be removed at the end of 24 hours and the skin underneath inspected. If the skin is sensitive to the material, there will be a reaction varying from an erythema designated as +; to an erythema with edema designated as ++; erythema, edema and vesiculation, designated as +++; to an erythema, edema and ulceration designated as ++++.

In cases where materials are used which are innocuous to a normal person, the patch may sometimes be left on for as long as five or six days in order to obtain the reaction. Care must be exercised in doing patch tests with general irritants. If hypersensitivity to dilute solutions of these materials is suspected, then such dilutions of them are to be used as will not ordinarily affect the normal skin. For instance, a 1 per cent solution of potassium bichromate has been found not to affect the non-sensitive skin but does produce a reaction in people sensitive to chromium. In the case of turpentine sensitivity, 1 part of turpentine to 9 parts of olive oil may be used. I have found cases in the candy industry so sensitive to the oil of cinnamon that a solution of 1 drop of oil in 49 drops of olive oil produces a marked reaction after 24 hours.

In doing patch tests, it is best to have controls, using an individual who is doing the same work as the patient but who shows no skin eruption. A blank control patch or one with some other

substance can also be used. Sometimes there is no reaction found under the patch when taken off, but a day or two later a reaction develops at the site of the patch. These are called delayed reactions and also indicate a hypersensitivity.

Patch tests, if properly done, are reliable in showing either acquired or natural hypersensitivity. If they do not give positive results, intradermal tests similar to those done for asthma may be tried, but these are of less diagnostic value.

#### EPIDERMOPHYTOSIS AS AN OCCUPATIONAL DISEASE

Fungus infections and epidermophytids offer a serious problem in the diagnosis of industrial dermatitis. It is often very difficult to say whether the condition is due to a man's occupation or not.

In our inspection of the workers in the various plants, we often came across cases of fungus infection of the hands and of apparent allergic reactions called epidermophytids or trichophytids on other parts of the body due to absorption of substances from the localized fungus infection. These were, in many instances, wrongly diagnosed as occupational dermatitis. There are, however, certain occupations which predispose to fungus infections because, during the course of employment, the person is exposed to pathogenic fungi or because the skin becomes moist, hot and macerated, and forms a favorable site for the growth of fungi. Barbers and bathhouse attendants are examples in which there is a special exposure to the action of fungi, and among them fungus infections of the hands, feet and nails are often seen. Among stokers, firemen and men who work in rubber vulcanizing pits, there develops, on account of heat and moisture, a soggy condition of the skin in the interdigital spaces, and this favors the development of fungi. We

have also found an unusual prevalence of tinea of the hands and feet among workers with raw wool.

#### CANCER AND OTHER GROWTHS IN INDUSTRY

Certain industries predispose to the development of carcinoma. Carcinoma of the bladder occurs with unusual frequency among workers in synthetic dyes. Arsenic has also been blamed as a cause of cancer. We are all familiar with the carcinomatous degeneration taking place in X-ray and radium burns among physicians and technicians handling X-rays and radium. Cancer of the scrotum among chimney sweeps in England has been known for many years, and a similar condition has been discovered among arsenic smelters.

In workers in some of the oil refineries in this country, we have noted carcinoma of the cheek and of the lip, and among paraffin pressmen, of the hands and of the scrotum. We have also noted an unusual prevalence of small, flat, pigmented papillomata on the dorsum of the hands, the forearms and legs of workers in oil refineries and among machinists and mechanics who handle oils and greases. More than 10 per cent of such workers were found to have these growths.

Among mule spinners in England there is reported an unusual prevalence of carcinoma, but in a large woolen mill in this country, we found no cases of carcinoma. It may be that the oil used in softening the wool in this country is different from that used in Europe. The factory in which our examinations were made used vegetable oil.

#### PREVENTION OF INDUSTRIAL DERMATOSES

The ideal prevention would be so to safeguard the industries which are dangerous that the injurious chemical could not come in contact with the skin of the worker. This is impossible in a

great many cases. Protection of the worker against irritating substances such as acids, alkalis, caustics, etc., by the wearing of suitable rubber gloves and clothes will often keep down the number of cases of industrial dermatoses.

In factories where such irritating substances as the irritant dyes, paraphenyldiamine, etc., are used, or the rubber industry where certain irritants in the form of accelerators and anti-oxidants are used, patch tests may be done on applicants for employment to determine their susceptibility to the materials which they will be called upon to handle, and those found to be hypersensitive should be rejected. Those workers who become sensitized after a long period of occupation should be shifted to other departments.

In factories where the skin hazard is great, personal hygiene must be emphasized. Workers must take baths and change clothes before leaving the plant, and for this purpose adequate toilet and washing facilities should be provided. Supplying clean towels daily to workers in oils and greases with instructions to wipe the hands and arms frequently has, according to Dr. Hayhurst, kept down the number of cases of dermatitis. Chemists and engineers should constantly strive to substitute harmless substances for the irritants which are now used. The installation of proper ventilation, exhaust hoods, totally enclosed dust-proof and gas-proof units

will, by allaying dust and fumes, play a large part in preventing the occurrence of industrial dermatoses. Protective ointments smeared over the exposed parts have, in some instances, been advocated.

#### TREATMENT OF INDUSTRIAL DERMATOSES

A person who is sensitive to the materials with which he works should seek some other occupation. Industrial dermatoses if uncomplicated will disappear when the person is away from the substance which has irritated his skin so that a cessation of work will usually cure the condition. If complications in such forms as suppuration or parasitic infection have set in, they must be treated and they may not be easily amenable to treatment. If a man must go back to his work after he is cured, he should be told to protect the parts by wearing long sleeves or gloves or by rubbing in protective ointment, as advocated by Dr. J. S. Millard of the Goodyear Rubber Company.

Desensitization by injecting minute quantities of the offending material underneath the skin has been tried but with no great success.

New synthetic chemical compounds are constantly being discovered and used in new industrial processes and many of these compounds are skin irritants. This constantly increases the industrial skin hazards and challenges the ingenuity of the sanitarian in devising preventive measures and cures.