

CARR, GOODSON & LEE, P. C.

DISEASE PROFILE

CHLORACNE

I. DEFINITION

A. Dictionary

An acneiform eruption caused by exposure to certain chlorine containing compounds.

B. Symptoms

The condition is characterized by multiple closed comedones (blackheads) and pale yellow cysts that first appear on the skin below and to the outer sides of the eye and behind the ear (the so-called malar crescent). The lesions next spread to the ears, neck, and forehead. As the disease increases with severity, the lesions become more numerous and may involve every follicle in the affected areas. The chest, shoulders, back, ears, and genitalia are often involved. The hands, feet, legs, and nose are rarely affected by the lesions. Other manifestations of the disease include hyperpigmentation, hirsutism, conjunctivitis, itching, and skin reddening.

C. Duration

Chloracne lesions usually occur three to four weeks after exposure to the causative chemical agent and in severe cases have persisted as long as thirty years after exposure to the chemical has ceased. All but the most severe cases, however, usually clear within two to three years. Relapses of the disease may occur even in the absence of further contact with the causative chemical agent.

D. Treatment

Treatment is usually unsatisfactory. It entails the same sort of regimen used for treatment of acne vulgaris (teenage acne), i.e., oral antibiotics, acne surgery, dermabrasion, and oral doses of vitamin A and 13-cis-retinoic acid.

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The general practitioner may not distinguish chloracne from acne vulgaris. Moreover, a dermatologist who has had little experience with occupational dermatoses may also misdiagnose this condition. The microscopic appearance of chloracne lesions is unique. The sebaceous glands of the skin gradually disappear and are replaced with keratinous cysts. The age of the patient can also help in the diagnosis. Acne vulgaris generally occurs between the ages of thirteen and twenty-six, while chloracne can appear at any age.

Environmental and occupational exposure history is an especially important part of the differential diagnosis of chloracne. The particular chemical exposure responsible for causing chloracne, however, cannot be determined by examining a clinical case. Thus, if a patient has had exposure to more than one chloracnegen (chloracne-causing agent), it would be impossible for a clinician to determine which chloracnegen caused the condition.

II. EVIDENCE RELATING DISEASE TO 2,4,5-T, TCDD, or 2,4-D EXPOSURE**A. Human Studies**

1. Industrial Accidents. The major studies of chloracne caused by exposure to TCDD formed in an uncontrolled reaction or industrial accident include:

1949 — Monsanto Plant, Nitro, West Virginia. 122 out of 250 exposed individuals developed chloracne. (1978, K).

1953 — BASF, Ludwigshafen, West Germany. 55 out of 75 exposed workers developed chloracne. (1973, O).

1964 — Dow Plant, Midland, Michigan. 49 out of 61 exposed workers developed chloracne. (1980, F).

1968 — Coalite Plant, Derbyshire, England. 79 out of 90 exposed workers developed chloracne. (1973, N).

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1976 — ICMESA Plant, Seveso, Italy. A reactor explosion spewed TCDD-containing material over a large, heavily populated area in Lombardy, Italy. Thirty thousand persons were screened for chloracne and 187 cases are diagnosed. (1978, L, M).

2. Occupational Exposures

1954 — Boehringer Plant, Hamburg, Germany. 31 workers in the trichlorophenol division of a 2,4,5-T manufacturing plant developed chloracne. (1957, R).

1956 — Diamond Alkali Factory, New Jersey. 29 workers developed chloracne. (1971, P).

1962 — Goldstein diagnosed chloracne in a U.S. Department of Agriculture forest service worker who had sprayed the herbicide, Brush Blitz (containing 2,4,5-T) in the St. Francis National Forest near Ozark, Arkansas. (1962, Q).

1964 — Spolana, Czechoslovakia. 80 workers in a 2,4,5-T factory developed chloracne. (1981, D).

1950 - 1971 — Dow Plant, Midland, Michigan. 13 of 204 workers who were occupationally exposed to 2,4,5-T developed chloracne. These workers were chronically exposed to the manufacture of 2,4,5-T, but were not acutely exposed to TCDD during the 1964 industrial accident at Dow. (1980, G).

3. Veteran Studies

In 1982, the Veterans Administration formed a Task Force to study chloracne among veterans. The Task Force drew up a list of diagnostic criteria to be distributed to all 172 V.A. Hospitals and to be used in examining the veterans complaining of skin conditions. This criteria was reviewed by three eminent dermatologists, Raymond Suskind, M.D., of the University of Cincinnati, Donald Birmingham, M.D., retired from the University Hospital in Detroit, and James S. Taylor, M.D., of the Cleveland Clinic. The criteria are now in use at each of the

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V.A. Medical Centers. In addition, each V.A. Center is now staffed with a full-time consultant dermatologist to examine patients. The V.A. has diagnosed some cases of chloracne among veterans.

4. Other

In 1965, Dow contracted with Dr. Albert Kligman of the University of Pennsylvania to determine the dose of TCDD necessary to produce a chloracne response in humans. Dr. Kligman treated prisoner volunteers with two doses of TCDD ranging in amount from .2 ug to 8 ug. The doses were applied in an alcohol-chloroform solution to a one inch square area of skin. Chloracne was not produced in any of sixty volunteers. Dr. Kligman then, on his own initiative, increased the dosage. Dr. Kligman gave each of ten volunteers a total dosage of 7,500 ug of TCDD over a one month period. Eight of the ten men developed a chloracne condition which lasted from four to seven months. Thus, the threshold dose required to cause chloracne in humans is somewhere between 16 ug and 7,500 ug. It is doubtful that this range will ever be refined. TCDD became known as a suspect carcinogen in the early 1970's and therefore, it is no longer ethical to carry out such human experiments. (1980, E).

B. Animal Studies

1. Primates

Chloracne has been produced in the rhesus monkey by direct application of TCDD. In addition to the characteristic lesions, the animals also have other reactions such as loss of hair on the face and disruption of meibomian glands located near the eye. (1979, I).

2. Mammals

The rabbit is the most sensitive species to TCDD induction of chloracne. The sensitive inner surface of the rabbit ear has been used since 1941 as a standard test for chloracnegenecity. As little as .12 ug of TCDD will produce a

chloracnegenic reaction in the rabbit ear. Chloracne cannot, however, be produced on any other part of the rabbit's skin. (1982, B).

Pure 2,4,5-T has been tested in the rabbit ear model and has not caused chloracne. (1957, R).

3. Rodents

Chloracne can also be produced in the hairless mouse by application of TCDD. However, this species is much less sensitive than the rabbit to the experimental induction of chloracne. (1982, B).

4. Other

A chloracne response has not been produced in any other species. (1981, C).

III. ANALYSIS

It has been conclusively proven that TCDD will cause chloracne in humans (1980, E). The sensitive rabbit ear test has also shown that pure 2,4,5-T is not capable of inducing chloracne (1957, R). No studies have shown that 2,4-D will produce chloracne in humans or animals. Chloracnogens in the gaseous state (fumes) are the most potent inducers of chloracne. Solutions are less potent and solids are scarcely chloracnegenic at all.

Chloracne is recognized as a symptom of systemic poisoning. It is possible, however, for an individual with a mild or moderate case of chloracne to be otherwise perfectly healthy if the amount of chloracnegen in his system is insufficient to cause organ damage. The importance of the chloracne condition lies in the fact that chloracne is the most sensitive indicator of TCDD exposure in humans. Thus, according to noted authorities, if an exposed individual has not received enough exposure to TCDD to develop chloracne, that individual will also not develop any other short or medium term effects from TCDD exposure. The long term effects of TCDD exposure are still unknown, however, and it cannot be assumed that because

an individual was not diagnosed as having chloracne that he could not, in fact, develop a disease with a long latency period such as cancer. Also, as mentioned before, this condition is easily misdiagnosed and mild cases can be overlooked. Thus, an individual who had undiagnosed chloracne could have developed other short or medium term systemic health effects from the exposure.

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A. The following chemicals are also known to cause chloracne.

1. Chlorinated naphthalenes

These are heavy petroleum distillates with attached chlorine atoms. Such compounds, sold under the name Halowax, were widely used until the 1950's when they were replaced by plastics. Today they may still be used in electrical insulating and fire resisting materials, sealing compounds, crankcase additives, penetrating oils, plasticizers, and protective coatings. (1983, A).

2. Polychlorinated Byphenyls (PCBs)

At one time, these chemicals were widely used in many types of industry because of their stability, resistance to acids and bases, and excellent dielectric properties. Over 209 PCB compounds are in existence. Some past uses for PCBs include: hydraulic fluids, gas turbine lubricants, and plasticizers; and use in the manufacture of adhesives, textiles, surface coatings, sealants, printing and photocopying chemicals, and fire retardants. In 1976, the EPA banned the use of PCBs in all but totally closed systems such as capacitors. In 1978, NIOSH estimated that 12,000 U.S. workers still had potential exposure to PCBs, chiefly in the manufacturing and repair of capacitors. In 1983, it was estimated that 95% of the capacitors on telephone poles still contained PCBs. (1983, A).

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In 1968, 1,057 Japanese were poisoned by the inadvertent contamination of rice oil with PCBs and polychlorinated dibenzofurans. Ninety percent of these people developed chloracne, as well as other effects of systemic poisoning. (1983, A).

3. Pentachlorophenols

These chemicals are widely used in the wood preservative industry. Although the pure form of the chemical does not cause chloracne, the chemical is often contaminated with chlorinated dioxins and dibenzofurans, both of which are powerful chloracnegens. (1983, A).

4. Azobenzenes and Azoxybenzenes

These chemicals are intermediates formed in the manufacture of herbicides from 3,4-dichloroaniline. (1983, A).

5. Poly-Brominated Naphthalenes, Biphenyls, and Dibenzofurans

These chemicals have caused chloracne in experimental animals. Poly brominated biphenyls have also caused chloracne in humans systemically poisoned by their mistaken addition to cattle feed in Michigan in 1973. (1983, A).

B. Other Skin Diseases That Can Be Mistaken For Chloracne

1. Tropical Acne

Tropical Acne is a condition which bears a relationship to exposure to tropical climates. The problem of severe tropical acne arising during service in the tropics was first clearly recognized during World War II. As with other forms of acne, black soldiers were much less susceptible than were white soldiers. During the Vietnam War, there was little general agreement on the cause of tropical acne. Some dermatologists felt that exposure to oil and grease in motor pools was significant, whereas others thought that cooks and kitchen personnel were at special risk. Most dermatologists agreed that persons with significant pre-existing acne were more likely to develop tropical acne than were those persons without pre-existing acne. The condition was found to be aggravated by the soldiers' wearing of packs and

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web gear, a practice which inflamed the lesions on their backs. No form of therapy was effective, and medical evacuation from the tropics was the only effective form of treatment. The incidence of severe tropical acne in Viet Nam was never determined, but there is nothing to suggest that this disorder was significant. (1977, Skin Diseases in Viet Nam. Allen, Alfred.).

2. Oil Acne

This condition is caused by exposure to heavy oil and most frequently effects machinists who use insoluble cutting oils and workers in coal tar plants who handle heavy coal tar distillates or coal tar pitch. The affected areas of skin include the extensor surfaces of the arms and thighs and areas which are typically covered by oil soaked clothing. Comedones are invariably present. Later, pustules appear. Other workers who may contract oil acne include: auto, truck and aircraft mechanics, roofers, oil well drillers, coke oven workers, petroleum refiners, rubber workers, and road pavers. (1983, A).

3. Cosmetic Acne

This condition can be caused by covering the skin with moisturizers, creams, and vaseline type hair preparations. (1983, A).

4. Ultraviolet Acne

This acne can be caused by exposure to ultraviolet light. (1983, A).

5. Acne Mechanica

This condition can be caused by local pressure, friction, rubbing, squeezing, and stretching. Dr. Kligman describes the rubbing of the back against seat covers as an occupational source among truck drivers. (1983, A).

6. Medication Acne

Acne can be caused by certain medications such as corticosteroids. (1983, A).

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