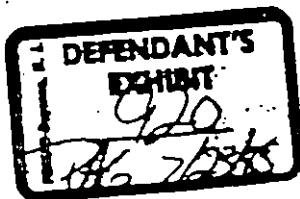


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CHLOROPHENOLS DEPARTMENT 237

INDUSTRIAL HYGIENE MANUAL

DECEMBER, 1979



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Health Hazards - Specific

Hazards for phenol, chlorine and specific chlorophenols are described in Appendix E. Chlorophenols may contain a minute quantity of impurities known as chlorinated dibenzo dioxins ("dioxins"). Special mention is made of these substances as there has been much concern by environmentalists and government officials over their potential health hazards.

To date, very little is known concerning the potential toxicity of dioxins although it is known that exposure to dioxins may result in a skin condition called chloracne. Some reversible liver effects have also been reported. Thus all operators are urged to follow good industrial hygiene practices as outlined in this manual.

Attached also are the results of the Nitro Plant mortality study related to dioxins.

- (1) References: Dow Finds Support, Doubt for Dioxin ideas, Rebecca L. Rawls, Feb. 12, 1979, C&E News.

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TABLE 8. REPORTED OCCUPATIONAL EXPOSURES IN CHLORINATED PHENOLS RESULTING IN HUMAN ILLNESS^a

Year, Place, and chemical(s)	Type of exposure and no. of cases	Effects on the skin	Neurological effects	Effects on the liver and serum lipids	Other effects	References
1936 Michigan Tetrachlorophenol 2-(2-chlorophenyl) phenol	Production 21	Chloracne, hyperkeratosis			Fatigue, weight loss	Butler, 19
1936 Mississippi Tetrachlorophenol	Wood treat- ment 300-400	Chloracne, facial erythema, vesicula- tion, ulceration, hyperkeratosis, hyperpigmentation			Fatigue, colored urine, urinary problems, venous thrombosis	Anonymous, 1936; Sting 1940
1949 West Virginia Trichlorophenol 2,4,5-T	Explosion 117 Production 111	Chloracne, facial erythema, hyper- pigmentation, melanosis	Nervousness, irritability, insomnia, personality change, de- pression, headache, vertigo, pain and weakness lower extrem- ities, paresis, peripheral neuro- pathy, abnormal nerve biopsy (loss of myelin)	Hepatomegaly, ab- normal liver function, toxic hepatitis, elevat- ed triglycerides and cholesterol	Fatigue, weight loss, weakness, decreased libido, impotence, intol- erance to cold, increased sus- ceptibility to infection (es- pecially respir- atory)	Ashe and Suskind, 19 1950; Susk 1953; Susk 1977
1949 Germany Trichlorophenol Tetrachlorophenol Pentachlorophenol	Production, Industrial Laboratory 17	Chloracne, hyperpigment- ation, scarring	Lower extremity pain and weak- ness, paresis without atrophy, paresthesia, polyneuritis	Abnormal liver function, cirrhosis	Fatigue, severe bronchitis, de- creased libido, impotence, bursi- tis, myocardial damage	Baader and Bauer, 1951

1952 Germany
Trichlorophenol

Production
31

Chloracne,
hyperpigmen-
tation

1953 Germany
Trichlorophenol

Explosion
55

Chloracne

1956 France
Trichlorophenol
1966 France
Trichlorophenol

Production
17
Explosion
21

Chloracne

1956 New Jersey
Trichlorophenol

Production
29

Chloracne,
hyperpigmen-
tation, hy-
pertrichosis,
acquired porphy-
ria cutanea tarda

1963 Holland
Trichlorophenol
2,4,5-T

Explosion
106

Chloracne,
facial erythema

Lower extremity pain and weakness, paresthesia, memory and concentration deficits, sleep disturbances, hypersonnolence, abnormal psychological tests (apathy, dulled emotional response)	Toxic hepatitis, abnormal liver biopsy	Fatigue, chronic bronchitis, persistent blepharoconjunctivitis, myocardial damage, intolerance to alcohol	Suskind, J
Sensory impairment of smell, taste, hearing; tendency to orthostatic collapse, limited paresis, peripheral neuropathy, reading difficulties	Toxic hepatitis	Fatigue, drowsiness, bronchitis, laryngitis, blepharoconjunctivitis, hemorrhagic pleuritis, myocardial damage, increased susceptibility to infection	Coldman,
Peripheral neuropathy	Toxic hepatitis, elevated tryglycerides and cholesterol		Dugois et al, 1956; Dugois et al, 1964
Clinical examination normal	Abnormal liver function, abnormal liver biopsies (parenchymal cell degeneration, fluorescence)	Right upper quadrant pain	Bleiberg et al, 1964
No information	Liver function normal	Fatigue	Vos et al,

1964 USSR Trichlorophenol 2,4,5-T	Production 128	Chloracne
1968 England Trichlorophenol	Explosion 79	Chloracne, facial erythema
1965-1968 Czechoslovakia Trichlorophenol Pentachlorophenol 2,4,5,-T	Production 80	Chloracne, hyperpigmenta- tion, hyper- trichosis, scarring, ac- quired porphyria cutanea tarda
1969 New Jersey Trichlorophenol 2,4,5-T 2,4-D	Production 73 Followup of plant studied by Bleiberg (above)	Chloracne in 48, hypertrichosis in 16, hyperpig- mentation in 30, no overt por- phyria cutanea tarda
1978 England Trichlorophenol no longer in production	Followup of 41 workers in 1968 explosion (above) 41	Chloracne

Headache, loss of memory, somnolence, sleeplessness, increased sweating		Fatigue, joint pain, stomach pain	Telegina and Bikbulatov 1970
	Abnormal liver function	Transient glycosuria, mild conjunctivitis	May, 1973; Jensen and Walker, 1972; Jensen et al. 1972
Lower extremity weakness and pain, somnolence, headache, insomnia, emotional and psychiatric disorders, peripheral neuropathy (confirmed by abnormal EMG)	Hepatomegaly, abnormal liver function, abnormal liver biopsies (mild steatosis, periportal fibrosis, fluorescence). Elevated triglycerides, phospholipids, and cholesterol	Fatigue, weight loss, abnormal glucose tolerance, no evidence of myocardial or renal damage or of increased eye inflammation or respiratory infection	Jiraskek et al. 1964; Pazderova-Vejlupkova et al., 1980; Pazderova-Vejlupkova 1981
Lower extremity weakness, correlation between chloracne and hypomania scale on MMPI	No significant abnormalities	Eye irritation, mild uroporphyrinuria in one worker	Poland et al. 1971 (see Bleiberg et al. 1964)
	Elevated GGT, elevated triglycerides, elevated urinary D-glucuronic acid		May, 1982

1949 West Virginia Trichlorophenol 2,3,5-T	226 Followup of plant studied by Ashe and Suskind (above)	Chloracne 70-residual 47-by his- tory	: Abnormal sensory findings in those with chloracne
1949 West Virginia Trichlorophenol 2,4,5-T	204 Followup of plant studied by Ashe and Suskind and Moses et al (above)	Chloracne in 107 Actinic Elastosis	
1976 Seveso Trichlorophenol	No. not given ICMESA workers follow-up five years after explosion		

a

Source: Moses et al, 1984

Elevated GGT
in those with
chloracne

Decreased libido,
sexual dysfunction

Moses et al
1984

History of GI
ulcer
Lower pulmonary
function in
exposed smokers

Suskind and
Hertzberg,
1984

Elevated Alk.
Phos.

Elevated urinary
porphyrins

Chezzi et al,
1984

Table 10. Clinical Symptomology of Yusho Cases, 1969-1972.^a

Effects	Percent
Skin	
Acneform eruptions, distinctive hair follicles, red plaques on limbs, dark brown pigmentation of nail, skin and mucous membranes, itching, sweating of palms.	82-87%
Ocular manifestation	
Increased eye discharge, swelling of the upper eyelids, hyperemia of conjunctives, transient visual disturbance.	83-88
Jaundice	
No abnormalities of liver functions in the majority of cases.	10
Numbness of the limbs, feeling of weakness, spasm of the muscles	32-39
Reduced sensory and motor nerve conduction velocity in few cases	9
Hearing difficulties	18
Headaches, vomiting, diarrhea	17-39
Chronic Bronchitis	
Lower serum Ig A and Ig M. PCB in the sputum	40
Irregular menstrual cycles	60
Dark brown skin pigmentation of newborn, which gradually faded away, retarded growth and abnormal teeth number and shape.	

^aSource: Reggiani, 1980

Table 7. Toxic Effects of 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin in Man.^a

Effects

DERMATOLOGICAL

Chloracne

Porphyria cutanea tarda

Hyperpigmentation and
hirsutism

INTERNAL

Liver damage^b

Elevated serum hepatic
enzyme levels

Disorders of fat metabolism

Disorders of carbohydrate
metabolism

Cardiovascular disorders

Urinary tract disorders

Respiratory disorders

Pancreatic disorders

NEUROLOGICAL

Polyneuropathies
(peripheral neuritis)

Lower extremity weakness

Sensory impairments
(sight, hearing, smell,
taste)

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PSYCHIATRIC

Neurasthenic or depressive
syndromes

^aSource: Huff, Moore, Saracci, and Tomatis, 1980

^bMild fibrosis, fatty changes, hemofuscin deposition and parenchymal-cell degeneration were observed in a few cases.