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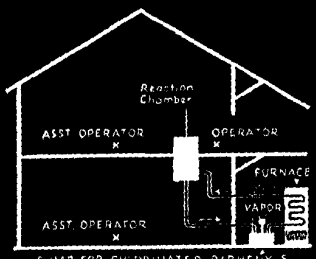
of the Bureau of Industrial Hygiene, Connecticut State Department of Health, was sought and received. A field study under conditions of obvious vapor leakage was said to have shown negligible air concentrations of the chlorinated diphenyls in the actual breathing zones of the workers. In this study, which was four months prior to the dermatological findings reported here, the air concentration of chlorinated diphenyls was reported by the bureau to be 0.1 mg. per cubic meter of air. The recommended maximum allowable concentration is 1.0 mg. per cubic meter. The figure shows that most of the leakage was at points outside the building but under a roof. No one worked regularly at the points of leakage. Nevertheless, repeated attempts were made to control vapor leakage, without complete success. This operation continued for 19 months without incident or recognition of skin or other manifestations of exposure to chlorinated diphenyls. Each employee had a complete physical examination by an internist prior to working in this environment.



Schematic drawing of the local exhaust system in which the chlorinated diphenyl was used and the points at which workers were exposed to fumes.

An operator making organic acid A ('operation,' figure) was sent to one of us because of severe comedonal acnelike of the face. In addition to the comedonal type of dermatitis, there were noted pinhead-sized skin-colored cysts and comedones on both cheeks and the forehead. A diagnosis of chloracne was made, and the source of exposure was determined. Examination of other workers in this working cycle revealed seven additional cases. In all the face was involved especially the cheeks circumauricularly, the forehead, ears, and in one case the periorbital region. All employees were examined carefully by an internist. The seven employees in whom chloracne developed had liver function tests performed. Tests included direct and total bilirubin determinations and 24 or 48 hour cephalin flocculation, thymol turbidities, and cell-free phosphatase determinations. Six of the subjects had completely normal test results. One employee had borderline cephalin flocculation and thymol turbidity. Thirteen months later repeated liver function tests showed an unchanged cephalin flocculation and improved thymol turbidity. Results of complete blood cell counts and urinalysis were normal in all instances. All had normal blood pressures with no other clinical evidence of any chlorinated diphenyl toxicity.

After the recognition of these cases of chloracne all but one of the 21 forced joints in the feed exchanger system, including the cover of the pump, were welded together. A hand hole 6 in. (15 cm.) in diameter was left with a packaged cover so that the system could be opened or filled when necessary. After that time the vapor was visible, and the odor of chlorinated diphenyls was not detectable in the immediate vicinity of the pump cover. Continued careful observation of workers has revealed no new cases of chloracne.

COMMENT

The unusual feature of this outbreak of dermatosis was the long period of exposure before any cases were recognized. The sudden recognition of seven cases after exposure up to 19 months was due to the especially careful examination of the skin of all exposed employees after discovery of the first case. Of 14 men exposed or potentially exposed to the vapors of chlorinated diphenyls, presented clinical evidence of chloracne. There was a very good correlation between the type of exposure and the development of signs of intoxication. For example, a foreman, an assistant foreman and two superintendents whose duties would appear to have exposed them only incidentally to the toxic vapors developed moderate signs. The mean length of exposure of those in whom signs developed was 14.3 months, and of those who did not show signs was 12.4 months. There was considerable overlap, with chloracne developing in one worker after only 5 months of exposure and no signs showing even after 19 months of exposure. Since the manifestations were exclusively on exposed areas of the skin, it appears that the vapors were deposited directly on exposed skin and did not penetrate the clothing. The nature of such factors as susceptibility, appearance or nonappearance of the acne lesions, and pigmentation may be a factor. There are no known cases of Negroes, and none of them had the opportunity to work with perspiration could be made for all of the time covered toward the end of the exposure.

Prevention consisted of complete elimination of the vapors. The fact that test of the air, even in the presence of vapors, showed only negligible amounts of the chlorinated hydrocarbons indicates that this type of dermatosis after fairly long continued "mild" exposure is not severe. The low concentration of the chlorinated diphenyls in the air might account for the fact that the acne developed in only 50% of these involved.

SUMMARY

Seven cases of mild to moderate chloracne of the face and head occurred among 14 chemical workers exposed from 5 to 19 months inclusive to the vapors and concentrations of the vapors of chlorinated diphenyls (Aroclor). Leakage of these vapors from the feed exchanger system occurred chiefly outside the building. The cases observed among men working in the open are of interest in that for all cases the condition cleared after the process change system prevented exposure.

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