U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION REPORT
HE 80-5-651

DUPONT PHOTO PRODUCTS DEPARTMENT
CHEESEQUAKE ROAD
PARLIN, NEW JERSEY

JANUARY 1980
(Revised April 1980)

I. SUMMARY

The National Institute for Occupational Safety and Health (NIOSH) received a request on October 1, 1979 to evaluate dermatitis caused by skin contact with triethylene glycol diacrylate (TDA) at DuPont Photo, Parlin, New Jersey. To investigate this problem, NIOSH representatives toured the work areas; talked with management, workers and the plant physician; and reviewed records of dermatitis cases for the last five years.

We found that since January, 1975, 56 (21%) of 263 employees in the Photopolymer-East Area have had at least one episode of irritating dermatitis. Six employees on line 2 (Dycril-Cyrel) where exposure is less intense and more intermittent, and 19 other employees (pipe fitters, maintenance, etc.) with sporadic exposure to TDA also have been affected. Dermatitis usually affected the hands, wrists and forearms. In the majority of instances, no lost time was incurred due to dermatitis. The number of cases peak in March, June and July.

On the basis of information obtained in this investigation, NIOSH determined that a dermatitis hazard due to TDA contact exists. Recommendations on wash-up routines, educational programs and warning signs have been incorporated into this report.

II. INTRODUCTION*

On October 19, 1979, The National Institute for Occupational Safety and Health received a request from employees of DuPont Photo Products, in Parlin, New Jersey to supply assistance in controlling skin burns which they believed were caused by contact with triethylene glycol diacrylate (TDA) which has been used in the plant for aproximately 20 years. TDA is a watery, clear or slightly amber liquid (melting point $\cong 0^{o}C$); which is odorless or may have a slightly sweet smell. Vapor pressure is less than 1mm at $0^{o}C$. Therefore, minimal hazard exists via the airborne

route of exposure. Because TDA can undergo violent exothermic polymerization with exposure to sunlight, heat or free radicals, it is inhibited with 100 parts per million of hydroquinone monoethyl ether. TDA is water soluble and easily washed from the skin with water. Referral to standard reference works and consultation with NIOSH's Clearinghouse for Occupational Safety and Health Information indicated that no information about acute or chronic toxicological effects of TDA are known. No OSHA or other recommended standard exists at the present time for TDA.

III. BACKGROUND

TDA is used in two areas of the plant. Both areas produce ultraviolet sensitive photography plates which are used in the printing industry. The processes are similar, with the majority of the dermatitis cases originating in the East line. In this area, the operations are: weighing, mixing and milling (batch operation); granulating, mixing, extruding, chipping, calendering and cutting, which are automated, and the "West Side" operation, which consists of sheeting, curing and final trimming.

IV. MEDICAL EVALUATION

The dermatitis associated with the exposure to the triethylene glycol diacrylate (TDA) is essentially an irritant (chemical burn) effect. There has been only one case at this plant in over ten years of an allergic response to the exposure. However, some workers have increased skin susceptibility to the exposure and about two workers per year have been restricted from the TDA areas because of such susceptibility.

At the time of both NIOSH visits, 11/7/79 and 11/29/79 there was no one with the dermatitis. The skin effect was described as varying in degree from erythema (redness of the skin) to vesiculation (blister formation) to scab formation. When multiple lesions occur, the dermatitis was noted to resemble "poison ivy." When the TDA contacts the skin, there is no warning of its presence and if it is not washed off, the burn apears. At times the burn may not become manifested until after several hours have elapsed. The lesions occur at the points of contact being primarily on the fingers, hands, wrists or forearms. Occasionally the lesions have been more widespread including the lower extremities, but such involvement has occurred after exposure from other than usual operations, e.g., in a pipefitter working in his work shop on pipes contaminated with TDA or in a worker standing in contaminated water from flooding after stoppage of a drain in the work room.

*Section 20 (a)(6) of the Occupational Safety and Health Act of 1970 29 U.S.C. 669 (a)(6), authorized the Secretary of Health, Education, and Welfare, following a written request by an employer or authorized representative of employees, to determine whether any substance in the place of employment might have potentially toxic effects as it is used or may be found.

About three-fourths of the cases have occurred in the Photopolymer-East operation (including milling, mixing, extrusion and calendering areas), but the remainder have occurred in the employees in research and development, maintenance and engineering, all of whom have only intermittent exposure to the TDA. In addition, on line 2 of the separate Dycril-Cyrel area where TDA has been used for a few years, but to a lesser extent and only intermittently, there have been six incidents of TDA burns from 1977-1979 in line operators, and four in pipefitters, painters and truck drivers exposed to line 2, TDA contaminated materials.

Cases of the dermatitis have occurred every year since the inception of TDA use for (at least 20 years ago). Since January, 1975 in or related to the TDA exposure from the Photopolymer-East area, there have been 96 instances of skin burns involving 75 workers. Of the latter, 19 workers had two epidsodes each and two had four episodes. Included in the 75 Workers are 56 operators, who have had full-time employment and potential TDA exposure in the Photopolymer-East operations. The total number of such employees since 1975 has been 263, giving an attack rate of 21%

The dermatitis responds well to topical application of steroid ointments and leaves no scars. None of the dermatitis has resulted in lost time from work although a few workers have been restricted from the Photopolymer-East area for a few days because of the burns. The majority return to work immediately after they are seen in the medical department.

As noted in the accompanying chart, in 1975, most of the burns (26 of 32) required one or more visits for medical treatment (OSHA reportable cases) with only six first aid cases. Since then the number and severity of the cases has decreased so that in 1978 and 1979 to date, there have been 18 and 11 cases respectively of which two and three have been OSHA reportable cases and 16 and 8 first aid only. The number of cases has consistently increased sharply in the early summer months, with a smaller peak in March as well. (Table I) New employees and summer help are affected to a larger extent but older employees also have sustained the burns.

Long gloves covering the forearms have been tried in the past but were cumbersome and increased the incidence of burns because of material getting under the gloves and not being washed off. Similarly, long sleeve coveralls were used in the past but the incidence of burns increased for similar reasons so that the sleeves have now been cut to short length allowing for better washing. Fresh uniforms and gloves are issued daily and

laundered at the plant. Barrier creams have not been tried because of the concern for contamination of the Dycril product and interference with its photo-sensitive properties.

The workers are informed on starting work in the Photopolymer area as to the need for wash-up but there is no set routine for such. The workers are instructed, however, to wash frequently and particularly after each batch of mix is made. A Job-Instruction Manual is given to all employees in areas where TDA is used and includes the recommendations for frequent washing. There are no signs in the areas indicating the need for caution and washing. A monthly safety meeting is held but TDA is not particularly emphasized. Weekly staff notes are distributed noting the occurrence of injuries and illnsses among the employees, but TDA burns are not always covered or emphasized.

V. DISCUSSION AND RESULTS

During the past 5 years, aproximately 100 cases of dermatitis were caused by contact with triethylene glycol diacrylate. Since numerous maintenance, engineering and other personnel are occasionally exposed, the total poulation at risk is difficult to estimate. A five year attack rate of 21% among the plant operators in the most vulnerable jobs (in the Photopolymer-East Area) indicates the seriousness of the problem. Although TDA washes off the skin, it gives no warning signals to alert a worker that he/she has been in contact with it. Various combinations of protective clothing and gloves have been tried. The present combination of short sleeved garments, short gloves and frequent washing gives a certain amount of protection. The peaking of incidence in March, June and July identifies periods when emphasis should be placed on preventative measures. While a few individuals may be sensitized to TDA, the main problem is a chemical burn dermatitis which can be combated with an awareness program and increased washing.

During a tour of the Photopolymer-East area, a worker said that he thought he might have recieved a burn from some TDA contaminated material dripping from overhead pies. Several wipe samples were taken to determine if TDA contamination of the area has occurred. The material on the pipes was sticky/resinous. It is doubtful that dripping could occur. Also, periodic steam cleaning of the weighing/milling area was discontinued several years ago with no resulting increase in dermatitis. Our laboratory has indicated that development of an analytical method for TDA would take several months. Following the results of the analysis, an addendum to this report will be made on the possibility of area contamination.

VI. RECOMMENDATIONS:

The following measures are recommended to strengthen and add to the control measures noted above that have been already instituted.

1) Institute a fixed routine for workers in the mill area to wash after each mix (aproximately every 30 minutes) and, in addition, whenever skin contamination is believed to have occurred.

2) In addition to (1), the use of a silicone cream on the exposed areas at the beginning of the work shift should be considered if one can be found that will not interfere with the photo-sensitive properties of the film.

3) All employees, before employment in the TDA areas should be proerly informed as to the nature of the hazard, the need to avoid skin contamination, and the need for wash-up. This worker education should include all new employees and summer help as well as older employees who transfer to these areas. In addition, any employees who may be exposed intermittently to the TDA should also be informed of the hazard and the need for wash-up.

4) The hazard associated with TDA should be mentioned at monthly meetings of the employees and particular emphasis should be given to the problem just prior to March and in June and July, the two peak seasons. In addition, it is suggested that the incidence of dermatitis be recorded and publicized in the Polymer-East area similar to that which is now being done for occupational injuries generally.

5) Review of TDA hazards should be communicated to employees through "weekly notes" during periods of historically high incidence of TDA dermatitis.

6) Post signs at the entrance to the Polymer-East area and in all work areas where TDA is present indicating the need for caution to prevent skin contamination and the need for wash-up.

7) In the Dycril-Cyrel area - line 2, all leaks in equipment should be repaired and the drip pans and equipment kept free of TDA contamination.

8) Investigate the possibility of substitution of TDA with a less toxic chemical.

VII. DISTRIBUTION - AVAILABILITY

Copies of this report are currently available upon request from NIOSH Division of Technical Services, Information Resources and Dissmemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be avilable through the National Technical Information Service (NTIS), Springfield, Virginia, 22161. Information regarding its availability from NTIS can be obtained from NIOSH's Publication Office at the Cincinnati address. Copies of this report have been sent to:

1) DuPont Photo, Parlin, New Jersey
2) The requestor of the Health Hazard Evaluation
3) Local 527, International Chemical Workers Union
4) U.S. Department of Labor, OSHA, Region II
5) U.S. Department HEW, NIOSH, Region II
6) New Jersey Commissioner of Health
7) New Jersey Office of Epidemiology

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Table I

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept	Oct.	Nov.	Dec.	OSH* Rep.	FA** only	Total
1975	4	0	3	3	0	8	4	3	3	1	2	1	26	6	32
1976	0	2	1	0	1	2	0	1	3	2	2	0	7	7	14
1977	0	0	3	0	4	0	7	2	1	1	2	1	5	16	21
1978	0	1	3	2	0	1	4	2	0	2	1	2	2	16	18
1979 (to date)	0	0	1	0	0	3	6	1	0	0	0	0 as of 12/7	3	8	11
Total	4	3	11	5	5	14	21	9	7	6	7	4			96

*OSH Rep. - OSHA Reportable Cases
**FA - First Aid only