Epidemiologic Notes and Reports

Trichloroethylene Exposure – Pennsylvania

On July 17, 1979, a pipe leading to an outdoor storage tank at a metal-tube manufacturing plant in Montgomery County, Pennsylvania, ruptured and released 1,900 gallons of trichloroethylene (TCE), a solvent commonly used in industry for removing grease. The TCE drained through the soil into ground water and flowed over the surface into Perkiomen Creek, killing many fish. Several subsequent investigations by CDC illustrate the problems resulting when industrial toxins cross factory boundaries, causing environmental contamination, and show that responsible action by workers and plant management can sharply reduce toxic chemical exposure at its source.

The Pennsylvania Department of Environmental Resources found TCE in 70 of 100 well-water samples in Montgomery County. Ten of these samples contained TCE in concentrations of >500 parts per billion (ppb), and 5 contained >1,000 ppb; the Environmental Protection Agency (EPA)-suggested no-adverse-response level* for chronic exposure to TCE in drinking water is 4.5 ppb. The widespread contamination of ground water in the area suggested that TCE had been spilled or dumped on previous occasions.

*The so-called "SNARL" level—a calculated limit for exposure over various time periods.

(Continued on page 231)

TABLE I. Summary – cases of specified notifiable diseases, United States
[Cumulative totals include revised and delayed reports through previous weeks.]

DISEASE	19th WEEK ENDING May 16 1981	May 10 1980	MEDIAN 1976-1980	CUMULATIVE, FIRST 19 WEEKS May 16 1981	May 10 1980	MEDIAN 1976-1980
Aseptic meningitis	86	60	53	1,220	1,156	703
Brucellosis	5	2	6	51	54	54
Chickenpox	8,826	7,289	7,221	122,540	109,313	112,473
Diphtheria	-	-	-	3	2	29
Encephalitis: Primary (arthropod-borne & unspec.)	13	10	11	255	219	213
Post-infectious	1	7	5	32	67	67
Hepatitis, Viral: Type B	370	306	306	7,023	5,902	5,568
Type A	433	576	596	9,106	9,884	10,752
Type unspecified	218	215	166	4,059	4,008	3,229
Malaria	29	38	8	475	550	161
Measles (rubeola)	150	809	975	1,397	7,691	13,288
Meningococcal infections: Total	69	83	46	1,696	1,243	1,049
Civilian	69	82	45	1,692	1,233	1,039
Military	-	1	-	4	10	8
Mumps	92	323	485	1,968	5,081	8,626
Pertussis	15	21	20	366	387	387
Rubella (German measles)	89	163	617	1,110	2,002	7,343
Tetanus	2	-	-	17	16	17
Tuberculosis	600	561	598	9,489	9,354	10,129
Tularemia	7	3	3	51	40	40
Typhoid fever	8	16	8	163	117	130
Typhus fever, tick-borne (Rky. Mt. spotted)	35	20	24	112	55	59
Venereal diseases:						
Gonorrhea: Civilian	17,345	20,241	18,061	350,265	344,317	344,317
Military	667	623	616	10,410	9,882	9,882
Syphilis, primary & secondary: Civilian	528	500	457	10,770	9,562	8,804
Military	8	4	4	126	129	112
Rabies in animals	140	189	80	2,563	2,279	1,060

TABLE II. Notifiable diseases of low frequency, United States

	CUM. 1981		CUM. 1981
Anthrax	-	Poliomyelitis: Total	-
Botulism(Md. 1, Calif. 1)	21	Paralytic	-
Cholera	-	Psittacosis (Minn. 1, Ga. 1, Calif. 2)	34
Congenital rubella syndrome	4	Rabies in man	-
Leprosy (Md. 2, Tex. 1, Calif. 1)	78	Trichinosis (Mass. 1)	73
Leptospirosis (Calif. 1)	15	Typhus fever, flea-borne (endemic, murine)	6
Plague (Ariz. 1)	3		

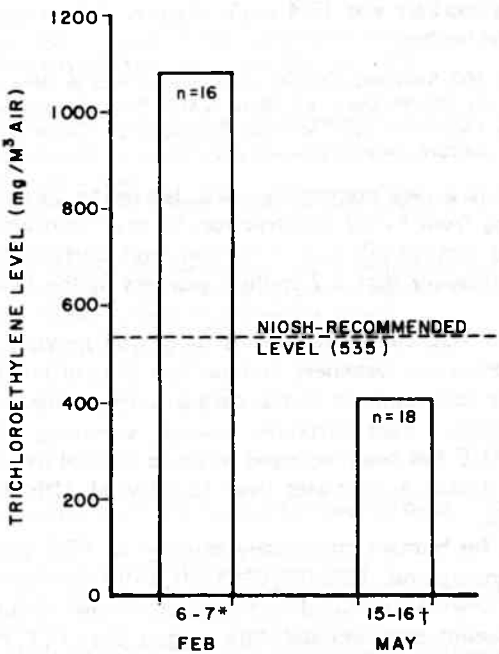
All delayed reports and corrections will be included in the following week's cumulative totals.

Trichlorethylene Exposure – Continued

In November 1979, to assess community exposure to TCE, investigators from CDC screened 13 residents of Montgomery County and, later, 117 residents of neighboring Bucks County for urinary metabolites of TCE. Although TCE metabolites were detected in the urine samples of 2 (15.4%) of the 13 Montgomery County residents and in samples of 7 (6.0%) of the 117 persons surveyed from Bucks County, levels were generally low. These low levels may reflect the residents' use of alternate water sources and the long period of time between the TCE spill and the survey; most TCE ingested after the spill would already have been excreted. The highest urinary concentration (615 milligrams/liter [mg/l]) of TCE metabolites was that of a man who worked at a grease-removing (degreasing) station in the plant at which TCE had been spilled in July. That finding prompted further investigation of the tube plant.

Investigators from the National Institute for Occupational Safety and Health (NIOSH) evaluated the exposure at the plant on February 5-7, 1980. They obtained personal (breathing-zone) and area air samples in order to measure TCE vapor (Figure 1), reviewed work practices, conducted medical interviews with workers, and obtained urine samples at the beginning and end of each work shift in order to measure TCE metabolites. NIOSH found that the time-weighted-average (TWA) exposure to TCE vapor for the operator at 1 degreasing station was 205 milligrams per cubic meter (mg/M^3) of air; measured values at that site ranged from 117-357 mg/M^3. NIOSH recommends that TWA exposure

FIGURE 1. Average results of analyzing 5- to 15-minute breathing-zone air samples for trichloroethylene, Pennsylvania, February 6-7 and May 15-16, 1980



n = number tested.

*Range 413-2000.

†Range 56-1520.

Trichlorethylene Exposure – Continued

to TCE not exceed 134 mg/M^3. Short-term peak exposures at the same degreasing station ranged as high as 2,000 mg/M^3; NIOSH recommends a short-term exposure limit of 535 mg/M^3. TWA and peak exposures to TCE of other workers tested were within recommended limits.

Measured exposures of workers to other solvents used were also within recommended limits. Seven of the 9 workers exposed to TCE reported symptoms of sleepiness, lightheadedness, nausea, cough, and eye irritation. None of the 9 unexposed workers had had any of those symptoms. The concentration of total TCE metabolites in the urine of the 9 exposed workers rose from 297.5 mg/l pre-shift to 479.9 mg/l post-shift, indicating that TCE had been absorbed by workers during work hours.

As a result of those findings, NIOSH made recommendations to plant management in late February and again in April for improving work practices and ventilation. As a secondary measure, NIOSH made recommendations regarding the proper use of personal respiratory protective equipment.

In May 1980, after most of those recommendations had been implemented, NIOSH reevaluated TCE exposures. All TWA exposures to TCE had fallen to within recommended limits (range: 37-114 mg/M^3). However, TCE vapor concentrations in 4 of 18 short-term samples still exceeded the recommended short-term exposure limit. Seven of 11 workers exposed to TCE reported persistent fatigue and respiratory irritation, as did 2 of 9 controls. However, symptoms were less severe, and the average number of symptoms per degreasing-station worker had declined from 4.2 in February to 1.5 in May. The level of urinary excretion of TCE metabolites had declined to 69.2 mg/1 pre-shift and to 94.9 mg/l post-shift for exposed workers. The post-shift excretion level of TCE metabolites for unexposed workers was 16.4 mg/l. Results of liver and kidney-function tests were all within normal limits.

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Editorial Note: TCE is a very commonly used degreasing agent in American industry. In operations ranging from heavy construction to the manufacture of microcomputer circuits, it is used to remove oils and impurities from surfaces to be soldered, welded, or coated. NIOSH estimates that 2.7 million workers in the United States may be exposed to TCE (*1*).

Acute exposure to TCE causes symptoms of central nervous system depression, including drowsiness, dizziness, weakness, tremor, loss of coordination, and mental confusion. Severe exposure can result in coma, cardiac arrhythmias, and death. Other toxic effects include respiratory-tract irritation, nausea, vomiting, abdominal cramps, and liver abnormalities. TCE has been reported to cause alcohol intolerance, which leads to flushed skin. Also, alcohol potentiates liver toxicity of TCE in mice and alters TCE metabolism in humans.

The toxic effects for humans chronically exposed to TCE, particularly at low levels, are not adequately understood. TCE ($Cl_2C{=}CHCl$) is structurally similar to vinyl chloride ($H_2C{=}CHCl$) and to other halogenated hydrocarbons known or presumed to be carcinogens (*2*). However, recent experimental data suggest that TCE may be a much weaker carcinogen than vinyl chloride (*3*); the only carcinogenicity tests that have been positive are those done with mice (*4*). A recent cohort mortality study of workers exposed to

Trichlorethylene Exposure — Continued

TCE revealed no excess cancer mortality, although, because of the small number of deaths, that study cannot be considered definitive (*5*).

References

1. National Institute for Occupational Safety and Health. National occupational hazard survey. Vol. 3. Survey analysis and supplemental tables. Cincinnati: National Institute for Occupational Safety and Health, 1977. (DHEW publication no. [NIOSH] 78-114).
2. Infante PF, Marlow PB. Evidence for the carcinogenicity of selected halogenated hydrocarbons including ethylene dichloride. In: Ames B, Infante PF, Reitz R, eds. Banbury report #5—ethylene dichloride: a potential health risk? New York: Cold Spring Harbor Laboratory, 1980:287-308.
3. Laid RJ, Stockle G, Bolt HM, Kunz W. Vinyl chloride and trichloroethylene: comparison of alkylating effects of metabolites and induction of preneoplastic enzyme deficiencies in rat liver. J Cancer Res Clin Oncol 1979;94:139-47.
4. National Cancer Institute. Carcinogenesis bioassay of trichloroethylene. Bethesda, Md.: National Cancer Institute, 1976. (Technical report series; NCI-CG-TR no. 2) (DHEW publication no. [NIH] 76-802).
5. Axelson O, Andersson K, Hogstedt C, Holmberg B, Molina G, de Verdier A. A cohort study on trichloroethylene exposure and cancer mortality. J Occup Med 1978;20:194-6.

International Notes

Quarantine Measures

The following changes should be made in the "Supplement-Health Information for International Travel," Morbidity and Mortality Weekly Report, Vol. 28, July 1979:

AMERICAN SAMOA
Yellow fever - Delete: None. Insert code II > 1 yr. ALSO on page 10 delete: None. Insert code II.

AUSTRALIA
Yellow fever - Under code insert > 1 yr.
Smallpox - Delete all information. Insert: None. ALSO on page 10 delete code. Insert: None.

BANGLADESH
Yellow fever - Africa: Delete: Central African Empire. Insert: Central African Republic.
Smallpox - Delete all information. Insert: A certificate is required ONLY from travelers (except tourists) leaving Bangladesh. ALSO on page 10 delete code. Insert*.

INSERT: BHUTAN. ALSO insert on page 10.
Cholera - None.
Yellow fever - None.
Smallpox - None.

BOTSWANA
Yellow fever - Under code insert > 1 yr.
Smallpox - Delete all information. Insert: None. ALSO on page 10 delete code. Insert: None.

BURUNDI
Yellow fever - Delete note. ALSO on page 11 delete *.
Smallpox - Delete all information. Insert: None. ALSO on page 11 delete code. Insert: None.

CENTRAL AFRICAN EMPIRE
Change name to CENTRAL AFRICAN REPUBLIC. ALSO on page 11 change name to Central African Republic.
Smallpox - Delete code. Insert: None. ALSO on page 11 delete code. Insert: None.

CENTERS FOR DISEASE CONTROL

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MMWR

MORBIDITY AND MORTALITY WEEKLY REPORT

Epidemiologic Notes and Reports

Spectinomycin-Resistant Penicillinase-Producing *Neisseria gonorrhoeae* – California

The David Grant U.S. Air Force (USAF) Medical Center at Travis Air Force Base (AFB), California, has reported the first known infection caused by spectinomycin-resistant penicillinase-producing *Neisseria gonorrhoeae* (PPNG). Spectinomycin is the antibiotic of choice for the treatment of most PPNG infections.

The patient, a 20-year-old man, had been stationed at Clark AFB, Republic of the Philippines. From April 24-30, 1981, he was seen 3 times at the Clark AFB Clinic for treatment of persistent gonococcal urethritis. During each visit he was given an intramuscular injection of spectinomycin, 2.0 g the first time and 4.0 g each of the next 2 times, but he remained symptomatic. Although he had had sexual contact with 3 women in the Philippines from March 6 through April 19, he denied being re-exposed after he began treatment. Cultures of the urethral discharge grew PPNG.

He returned to the United States, and on May 3 he was seen at the David Grant USAF Medical Center because of a persistent urethral discharge. Gram-stain examination was consistent with gonorrhea; he received tetracycline hydrochloride, 500 mg orally every 6 hours for 5 days. Culture of the urethral discharge that had been taken before treatment was begun grew PPNG. The growth of this isolate was not inhibited by a disc containing 100 μg of spectinomycin. The patient's symptoms resolved completely, and cultures of posttreatment urethral specimens were negative. He denied having had any sexual contact in the United States since his return.

CDC has confirmed that a subculture of the gonococcal isolate is PPNG, resistant to more than 2,048 μg/ml of spectinomycin. Minimal inhibitory concentrations of other antimicrobials for this isolate included tetracycline, 1 μg/ml; cefoxitin, 1.0 μg/ml; gentamicin, 2.0 μg/ml; and sulfamethoxazole/trimethoprim (SMX/TMP), 9.5 μg/ml of SMX and 0.5 μg/ml of TMP, when the combination was tested in a 19:1 ratio. Studies to characterize the mechanism of spectinomycin resistance in this isolate are in progress.

Surveillance for PPNG strains is ongoing at Clark AFB and will be extended to include testing for spectinomycin resistance.

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Editorial Note: Although 4 isolates of spectinomycin-resistant *N. gonorrhoeae* have been reported previously–2 from Denmark, 1 from Holland, and 1 from the United States–none was penicillinase producing (*1-3*). Of more than 1,000 PPNG isolates tested at the CDC since 1976, this is the first to be resistant to spectinomycin.