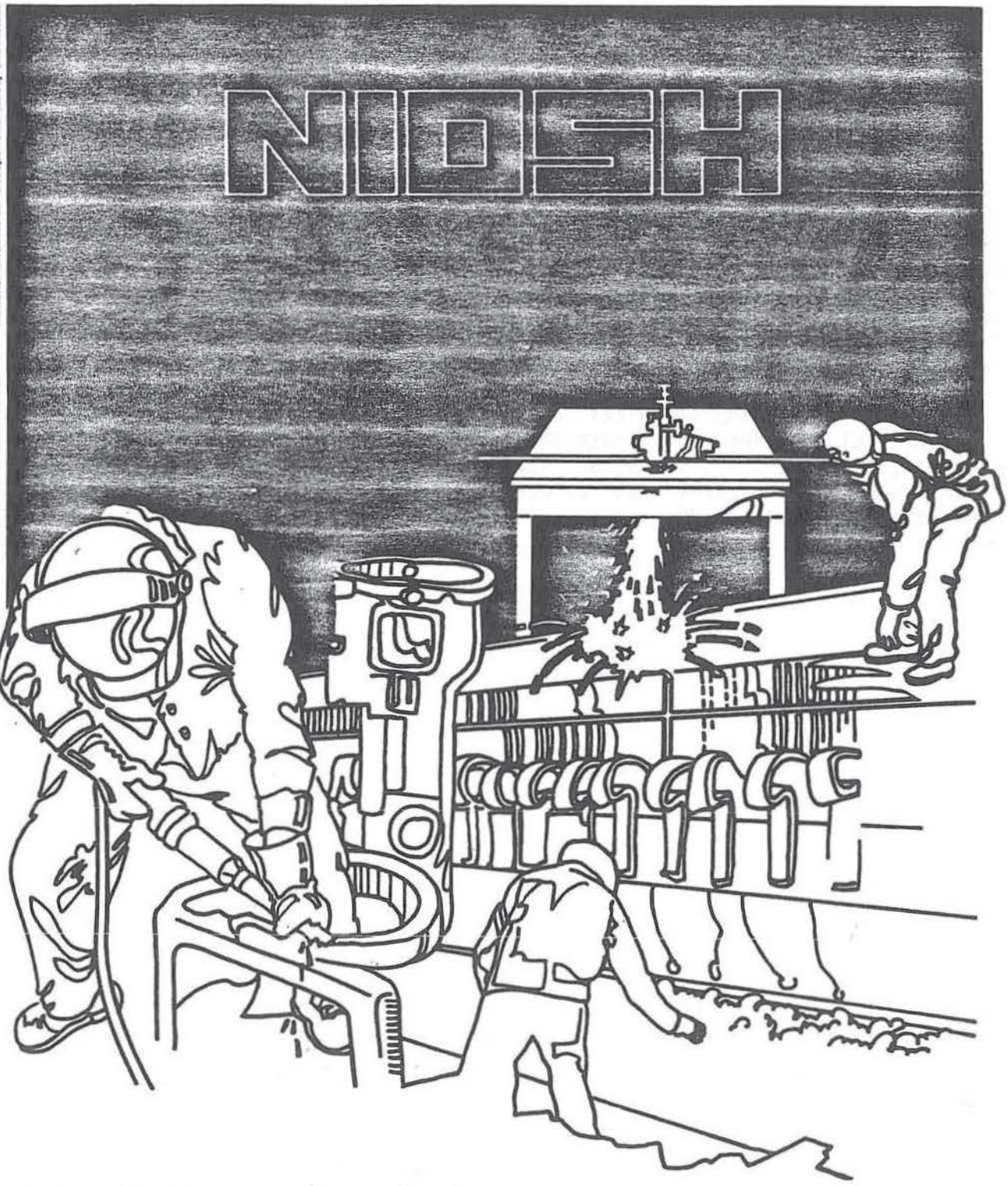
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
Centers for Disease Control ■ National Institute for Occupational Safety and Health



Health Hazard Evaluation Report

HETA 80-039-1179
LONG ISLAND RAILROAD
NEW YORK, NEW YORK

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

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I. SUMMARY

In November, 1979 the National Institute for Occupational Safety and Health (NIOSH) received a request for a Health Hazard Evaluation from maintenance employees working for the Long Island Railroad. (LIRR) The requesters were concerned that there had been an excess number of birth defects among the children of these maintenance employees and that these defects had been caused by exposure to 2,4,5-trichlorophenoxy-acetic acid (2,4,5-T), a herbicide used for weed control along the tracks of the LIRR.

To assess the possible health hazard, NIOSH investigators compiled a list of all live births from 1973 to 1979 among the members of the Union Local. Medical insurance claims for this list of live births were obtained from the union health insurance system, and all claims for problems which may be congenitally related, diagnosed during the first year of life, were extracted. Comparative data for all major birth defects combined are for all other defects observed more than once in the study population, were obtained from the Centers for Disease Control Metropolitan Atlanta Birth Defects Monitoring system and/or the Prenatal Collaborative Project.

A total of 170 live births were observed among the study population. Forty-two of the live births had at least one non-infectious health problem during the first year of life. All major birth defects combined and inguinal hernia were underrepresented in the study population (3 observed versus 3.81 expected for major birth defects and 2 observed versus 2.3 expected for inguinal hernia). Metatarsus adductus (8 observed versus 3.47 expected) and tear duct obstruction (2 observed versus 0.22 expected) were both significantly overrepresented in the study population. However, these latter defects may be overrepresented in the study population due to diagnostic bias.

No definite excess of birth defects related to 2,4,5-T exposure was found in the evaluation. Recommendations to control exposure to 2,4,5-T are found in Section VIII of the report.

KEYWORDS: SIC 4010; birth defects, 2,4,5-T, herbicides

II. INTRODUCTION

On November 15, 1979, the Teamsters Local 808, Woodside, Queens, New York, requested that NIOSH conduct a Health Hazard Evaluation to assess the frequency of birth defects among the children of Local 808's members who work on maintenance for the Long Island Railroad (LIRR). The requester was concerned that there has been an excess number of birth defects and that these defects had been caused by exposure to 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) a herbicide used for weed control along the tracks of the LIRR.

The NIOSH investigation was intended to ascertain whether or not an excess number of birth defects occurred in the Teamsters' children.

III. BACKGROUND

A. Exposure

The LIRR maintains a regular program of weed control along its rights-of-way. The brush spraying program for the years 1974 through 1976 included the spraying in the Spring of 2,4,5-T in down graded fuel oil or water. Numerous other herbicides have been used for weed control prior to, during, and since that three year period. All spraying is performed by contractors with assistance from a small number of LIRR employees. Additionally, once a year a soil sterilant is applied along the rights-of-way.

Teamsters Local 808 is composed of approximately 1400 members of whom approximately 800 are employees of the LIRR and work on track maintenance. Track maintenance involves routine operations such as renewing and repairing ties, rails, and road bed switches, and large scale reworking and rebuilding of the tracks. Approximately 100 other Teamsters work on bridge and building maintenance which includes rebuilding, repair, and repainting of bridges, buildings, and platforms.

Through their usual track maintenance activities, the LIRR employees from this Teamsters local could have contact with the herbicides, including 2,4,5-T, used for weed control. The exposure would occur during maintenance activities after spraying had occurred. Because a variety of herbicides are used in the LIRR spraying program, each worker has potential for exposure to multiple chemical agents.

B. 2,4,5-T: Use, Chemistry, and Toxic Effects

2,4,5-T is an herbicide effective in broad leaf control. It has been widely used in the U.S. since the 1940's in forestry, agriculture, and for maintenance of railroad and highway rights-of-way. Since 1979, its use has been temporarily and partially suspended by the U.S. Environmental Protection Agency.

2,4,5-T is contaminated during its production with variable, although generally small quantities of the highly toxic compound 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). Concerns about exposure to 2,4,5-T are usually related to the concomitant exposure to TCDD.

Assessments of the reproductive effects of both TCDD alone and 2,4,5-T contaminated with TCDD have been carried out in laboratory animals. Additionally, a number of observations and studies have been made with human populations. In summary, 2,4,5-T with TCDD contamination, and TCDD alone, have produced teratogenic effects when female mice were exposed during gestation. Exposure of male mice to 2,4,5-T and TCDD (in addition to 2,4-dichlorophenoxyacetic acid [2,4-D]) resulted in no observable effects in their offspring.

In humans, evidence is inconclusive for reproductive effects after female exposure to 2,4,5-T, and no definitive studies of male-mediated effects have been conducted (summarized in reference 1.).

IV. METHODS

A list of all live births among the Teamsters Local 808 members who work for the LIRR for the years 1975 through 1979 was compiled. The source of this list was a birth premium list maintained by the union which awards $100.00 to each union member who has a child. For this list of live births, insurance claims files were obtained from the union's health insurance system.

The insurance claims files for each recorded live birth were reviewed by a physician. All notations of problems which may be congenitally related, diagnosed during the first year of life, were extracted.

From the total list of health defects, all "major" defects as medically defined by the Centers for Disease Control's Metropolitan Atlanta Birth Defects Monitoring System (2) and/or the Perinatal Collaborative Project (3) were identified. Comparative data for all major defects combined, and for all other defects observed more than once in the study population, were then obtained to ascertain if an excess of any particular problem exists.

Data sets utilized for comparative or expected data (Table 5) are the following:

1. The Metropolitan Atlanta Congenital Defects Program. Jointly directed by the Centers for Disease Control, The Georgia Mental Health Institute, and Emory University School of Medicine, this on-going program establishes a case registry of defects from a defined geographical region for study (4).

2. The Collaborative Perinatal Program. During the years 1959-1965, a cohort of over 50,000 mother-child pairs were recruited in 12 centers in the U.S. for a study of the possible teratogenic role of drugs, and rates for numerous birth defects were established for the entire cohorts (3,5).

3. A Study of Congenital Anomalies in the Newborn Infant, Including Minor Variations. From June, 1960 until May, 1962, the 4,412 newborn infants born at a hospital in Wisconsin were examined at birth for defects with a focus on minor as well as major defects (6).

VI. RESULTS

A total of 170 live births were observed among the Teamsters members during the years 1975 through 1979. Table 1 presents data on these births by year and sex.

Forty-two of the live births had at least one non-infectious health problem during the first year of life noted on an insurance claim. Three are classifiable as "major" defects (Table 2). The remainder of the health defects (Tables 3 and 4) are classified as "minor," and are not recognized as congenital problems, especially in the case of the orthopedic problems which can be explained as normal developmental variation (7,8) or childhood illnesses.

Table 5 presents data on the defects observed two or more times among the study population. All "major" defects combined and inguinal hernia were observed at a lesser frequency than would be expected. Metatarsus adductus/varus (8 cases) and tear duct obstruction (2 cases) were both significantly overrepresented in this study population. Hydrocele is significantly overrepresented in comparison to one data set, and underrepresented when compared to another. And finally, no comparative data could be obtained for phimosis, congenital subluxation of the hip, and tibial torsion. Both cases of congenital hip subluxation did receive orthopedic follow-up with correction reported.

VI. DISCUSSION AND RECOMMENDATIONS

Insurance records provide an accessible data set for the epidemiologic study of defined populations. In the past, life insurance records have been used to assess mortality among applicants with recorded atrial fibrillation (9). In this investigation, the health insurance records of the Teamsters were available for an inital evaluation of problems in the Teamsters' children on the assumption that serious problems would be noted in an insurance claim. Conversely, it is possible that insurance claims will provide a record of medically non-serious problems in the population because the insurance company requires a diagnosis to be recorded in order for reimbursement of the fee for a visit to a physician. It is not unlikely that specific diagnoses were made in marginal circumstances in order to facilitate compensation by the insurance carrier.

This problem is especially possible in the category of orthopedic defects as listed in Table 4. Many of the problems noted there did not have orthopedic follow-up or, even, a second visit to further assess the problem. It might be assumed, then, that the physician saw what can be described as normal variation in the infant (7,8).

The issue of "minor" defects is also important here. Most birth defects surveillance systems or studies look only for medically defined "major," or life threatening defects. In fact, in this cohort, the number of major defects was about what is expected for this size population. "Minor" problems are usually described as not life threatening, and are ususally omitted from reviews of birth defects because of the variability and subjectivity involved in diagnosis (5,10). Most of the problems observed here are medically categorized as "minor." This factor also explains why comparative data from other surveys of birth defects do not exist for phimosis, congenital subluxation of the hip, or tibial torsion, even though, in particular, the two cases of congenitally subluxed hip required orthopedic follow-up and would not have been considered minor problems by their families.

With regard to the results of this survey, there is no excess of "major" birth defects present in this population of Teamsters children. It is unlikely that serious problems, if they occurred, would have been omitted from the insurance claims. Two "minor" problems, metatarsus adductus and tear duct obstruction, are present in significant excess. In the case of metatarsus adductus, this excess is most likely explained by diagnostic variability which is common for "minor" problems, or by the source of data as described above which could force a diagnosis. The excess of tear duct

obstruction could be explained by diagnostic variability, underrepresentation in the comparison population, a causal association, or by chance. Hydrocele is significantly in excess when compared to one data set, and underrepresented when compared to another. This illustrates the problem of ascertainment of "minor" defects, and variability which can exist in diagnosis.

VII. CONCLUSIONS DISCUSSION

1. No excess of "major" birth defects is present among Teamsters children born 1975 - 1979.
2. A significant excess of two "minor" problems, metatarsus adductus and tear duct obstruction, is present.

VII. RECOMMENDATIONS

1. Because of other suspected health problems, such as cancer, associated with exposure to 2,4,5-T and other herbicides, the exposure of the Teamsters to these substances should be controlled.

2. Other studies in populations with more clearly defined exposure data should be conducted to address the question of the reproductive effects of human exposure to 2,4,5-T.

IX. REFERENCES

1. JRB Associates. Review of Literature on Herbicides, Including Phenoxy Herbicides and Associated Dioxin, Vol. I, 1981. Veterans Administration Contract Number V101(93) P 823.

2. Edmonds, L. Personal Communication, 1980.

3. Heinoen, O.P. et al. Birth Defects and Drugs in Pregnancy. Publishing Sciences Group, Little, Mass., 1977.

4. Centers for Disease Control. Congenital Malformations Surveillance Report April 1977 - March 1978, issued November 1978.

5. Myrianthopoulos N.C., Chung, C.S. Congenital Malformations in Singletons: Epidemiologic Survey. Stratton Intercontinental Medical Book Corporation, New York and London, 1975.

6. Marden P.M. Congenital Anomalies in the Newborn Infant, Including Minor Variations. The Journal of Pediatrics 1964;64:3:357-371.

7. Dunn P. M. Congenital Postural Deformities. British Medical Bulletin 1976;32:1, 71-75.

8. Sharrard W.J.W. Pediatric Orthopedics and Fractures. Oxford and Edinburgh, Blackwell Scientific Publications, 1971.

9. Gajewski J., Singer RB. Mortality in an Insured Population with Atrial Fibrillation. JAMA 1981;245:15, 1540-44.

10. Christianson R.E. The Relationship Between Maternal Smoking and the Incidence of Congenital Anomalies. American Journal of Epidemiology 1980;112:5:684-695.

Table 1. Distribution of Live Births in Study Population

Year	Male	Female	Total
1975	13	20	33
1976	20	22	42
1977	14	16	30
1978	19	10	29
1979	21	15	36
Total	87	83	170

Table 2: "Major" Defects

Type	No. in Study Population	Sex	Year of Birth
pyloric stenosis	1	male	1976
anal stenosis	1	female	1978
uretero pelvic junction obstruction	1	male	1978
Total	3		

Table 3: "Minor" Health Defects

Miscellaneous

Type	No. in Study Population
gamma globulin deficiency	1
hyperbilirubinemia	1
jaundice	1
labial adhesions	1
protein intolerance	1
anorexia	1
enlargement lymph node	1
anemia	1
meatal ulcer	1
tear duct obstruction (stenosis)	2
heart murmer	1
Erb's Palsy	1
inadequate weight gain from birth	1
rectal hypotonia	1
epicanthus	1
hydrocele	2
inguinal hernia	2
hemangioma (left ear)	1
phimosis	7

Table 4: "Minor" Health Defects

Orthopedic

Type	No. in Study Population
flat foot (pes planus)	1
bilateral hammertoes	1
slight resistance to abduction	1
congenital subluxation hip	2
tibial torsion (external or internal)	7*
tibia vara	1
metatarsus adductus/varus	9*
"inversion of feet"	1
"4 toes rt. adduction foot left leg"	1

*includes 4 cases of internal tibial torsion in conjunction with metatarsus adductus/varus

Table 5: Analyses of Defects Occurring More Than Once In Study Population

Type	Observed #	Expected #	Reference for Expected #	1-tailed Fishers Exact Test p value
inguinal hernia	2	2.3	(3)	
hydrocele	2	0.03 6.17	(3) (6)	0.0007
metatarsus adductus (varus)	8	3.47	(5)	0.024
tear duct obstruction (stenosis)	2	0.22	(5)	0.021
phimosis	7	*		
congenital subluxation hip	2	*		
tibial torsion (external or internal)	7	*		
all major defects**	3	3.81	(4)	

*No comparative, expected data available for these minor defects
** includes pyloric stenosis, anal stenosis, uretero pelvic junction obstruction