

7/23/82

LONG TERM HEALTH EFFECTS OF EXPOSURE TO 2,4,5-T

AND/OR ITS CONTAMINANTS

D00061

237738

TABLE OF CONTENTS

	<u>Page</u>
1. Summary of Findings	1
2. Historical Review	5
3. Objectives of Study	7
4. Study Design	7
5. Methods and Materials	9
6. Subjects of the Study	11
7. Results	13
Demographic Information	13
Alcohol and Smoking Use	13
Family History of Illness	14
History of Medical Problems	14
History of Medical Problems in Populations With and Without Chloracne	14
History of Upper Gastrointestinal Ulcers	15
Physical Examination Findings	18
Clinical Laboratory and Other Test Findings	20
Lipids	20
Pulmonary Function	21
ECG and Chest x-rays Findings	23
Clinical Laboratory Results	23
Nerve Conduction Velocity Data	24
8. Reproduction and Birth Defects	25
9. The Trichlorophenol Runaway Group	26
10. Other Work Exposures of the Study Population	29

	<u>Page</u>
11. Discussion and Conclusions	31
12. References	33
13. Tables	34
14. Appendices	

Summary of Findings

A clinical and epidemiological study of 436 subjects from a plant making 2,4,5-T from 1948-69 was carried out. The subjects in the data analysis consisted of 418 white males: 204 subjects were defined as exposed, 163 not exposed, and there were 51 subjects whose exposure was questionable. The remaining 18 who were not included in the epidemiological comparisons were 5 black males, 10 white females, 1 male American Indian, 1 male of Hispanic origin, and 1 male not employed at Monsanto but exposed to material of the runaway reaction as a child. Since the number of this group was too small for comparisons they were not included in the statistical analysis.

The data on each subject included historical information about illness from childhood to 1979, results of a comprehensive physical examination, clinical laboratory tests, organ function tests and x-rays.

The analysis of the data on 418 subjects indicates the following:

1. Chloracne is the dramatic clinical hallmark which clearly separates the exposed from the not exposed or those of questionable exposure; 86% of the 204 exposed developed chloracne and this condition persisted in 52% of the exposed. There were no cases of chloracne in the not exposed or those of questionable exposure.

2. Actinic elastosis, a degenerative condition affecting the elastic tissues in the dermis is known to be related to the degree of exposure to sunlight and is age and skin coloration dependent. In this study the frequency of actinic elastosis was 59% in the exposed as compared to 30% in the not exposed. When corrected for age there was still a significant difference between the exposed and not exposed. A biologically significant observation indicates that actinic elastosis in the exposed is found predominantly in subjects with persistent

chloracne largely in and around the site of the chloracne and that the elastosis is more severe when found with chloracne.

3. There were 15 cases of hirsutism; 11 cases of malar hirsutism were observed in the exposed group associated with chloracne.

4. An historical finding which deserved critical analysis was the statistically significant relationship between exposure and history of upper gastrointestinal ulcers even when adjusted for age. The innate deficiencies in the data which limit drawing conclusions from these data are:

- a. The information is based on interview history not medical records or current examination.
- b. The data provide prevalence information not incidence. No comparisons can be made with incidence of upper gastrointestinal ulcers in the region or the national population for the age groups encountered.

The data is therefore suggestive and not conclusive.

5. The information assembled about cardiovascular effects indicate that the historical occurrence of hypertension, coronary artery disease and cerebrovascular accidents obtained by interview are age related, not exposure or chloracne related. The blood pressure findings on physical examinations reveals no significant differences between the exposed and the not exposed group when the criteria for abnormal levels were defined by age.

The few abnormal findings elicited by ECG examination included statistically significant differences in occurrence of PVC's and PAC's when the exposed were compared to the not exposed. These were found to be age, not exposure related.

6. When the data about pulmonary effects were assembled it was found that there was a greater frequency of pulmonary granulomatous disease on x-ray

examination among both the exposed and the not exposed groups when the ≥ 50 year old were compared to the < 50 year old. The pulmonary function examination revealed consistent differences in all parameters (FEV, FVC, FEV₁/FVC, and MMEFR) between the exposed and not exposed groups only if they are present smokers. The confounding factors were that the exposed group was 10 years older than the not exposed and that 13 of the exposed were coal miners before they started to work for Monsanto. Among current smokers with no coal mining experience however, there were significant differences in FEV₁, FVC and MMEFR between the 2,4,5-T process exposed and the not exposed.

7. When clinical laboratory data other than lipids were reviewed no differences were found between the exposed vs. the not exposed, the chloracne vs. no chloracne group.

8. Lipid findings were considered separately and in relation to exposure, age, and the presence of chloracne. When exposure alone was considered there were no significant differences in the frequency of abnormal levels in all parameters tested. Frequency of abnormal HDL levels however were somewhat greater in those with persistent chloracne than those who never had or formerly had chloracne and there was a greater frequency of abnormal LDL levels among those who only had a history of chloracne. Since the total number of abnormal values is small, the biological significance of these statistical differences is uncertain.

9. In the neurobehavioral aspects of the study no differences in neurological examination findings between the exposed and not exposed groups were found that were not age associated or with other known etiologies such as extensive burns, W.W.II injuries, cervical nerve damage, cervical spurs, etc.

In full recognition of the inherent problems associated with carrying out and interpreting nerve conduction velocity tests, a critical analysis of the qualified subjects was made. No significant differences in motor and sensory

functions were observed between the exposed and not exposed groups, between those who had chloracne and those who did not, after adjusting for age.

In the interview, questions were asked about nervousness, decrease in libido and impotence. Nervousness was reported more frequently among the older exposed group than the younger exposed group. Recognizing the cultural considerations which influence replies to questions about sexual matters, decreased sexual desire was reported more frequently among the exposed than the not exposed. However, it should be noted that there was a 10-year difference in mean age between the exposed and not exposed. When the two groups were compared on the basis of age, the differences in sexual desire and impotence were age related not exposure related.

10. Reproduction considerations

Again recognizing the inherent defects in the method of eliciting clinical information, no significant differences in the frequency of birth defects, stillbirths and miscarriages were found when the exposed group was compared with the not exposed group.

11. An unusual problem encountered only among the exposed were three cases of Peyronie's Disease. This problem is characterized by induration and subsequently fibrous scarring of the corpus cavernosum of the penis producing distortion on erection. This problem is not known to have any relationship to toxic exposure.

LONG TERM HEALTH EFFECTS OF EXPOSURE TO 2,4,5-T
AND/OR ITS CONTAMINANTS

Historical Review

In 1949, at a plant of the Monsanto Chemical Company, Nitro, West Virginia, a runaway reaction occurred involving one of three autoclaves in Building 41 in which trichlorophenol was being prepared. This process accident occurred on March 8, 1949, when under abnormal temperature and pressure conditions the safety valve and pipe connection of this autoclave blew out and the contents scattered throughout the interior of the building as well as the surrounding terrain and structures.¹ The employees who were asked to clean-up the building and repair the damaged autoclave were the first to develop symptoms. They were chemical operators, pipe fitters and other maintenance personnel. The acute symptoms included irritation of the respiratory tract and eyes, headache, dizziness, nausea and a severe irritant reaction of the exposed skin. After the initial acute symptoms subsided, within 10 days to 3 weeks, an acneform eruption and other health effects were noted. The clinical findings, at that time, were acneform lesions, severe muscle pains affecting the upper and lower extremities, thorax and shoulders on exertion, easy fatigue, nervousness and irritability, the complaint of decreased libido, dyspnea, vertigo, and intolerance to cold. Of the four workers who were hospitalized in Cincinnati in 1949 for study, all had enlarged and tender livers, one manifested sensory loss in a foot. Clinical laboratory findings included severely delayed prothrombin time and a slight increase in total serum lipids. Histological examination of a nerve biopsy in the worker with pedal sensory loss demonstrated myelin degeneration. Follow-up examinations were conducted in April of 1950¹ and subsequently, in 1953.² In April of 1950 the original four and five additional subjects were seen. In 1953

a total of 35 subjects were examined, seven of those having been seen in 1949 and 1950. After four years had elapsed, those symptoms and findings observed initially which were referable to the nervous system and liver were no longer found. Those with moderate to severe chloracne had improved considerably; there was some persistence of the acne in those so affected.

In 1977-78 a mortality study³ of the group known to have been exposed to the material of the runaway reaction was conducted. This population consisted of 121 males. The follow-up was 100% complete for death certificate information. Standard mortality ratios for all causes of death were determined.

In 1957, 2,3,7,8 tetrachloro-dibenzo-p-dioxin (TCDD) was identified as a toxic and acnegenic contaminant of trichlorophenol synthesis.^{4,5} Since that time a considerable amount of scientific data has accumulated about the toxicologic and clinical effects associated with exposure to the trichlorophenol process, to 2,4,5-T synthesis and to the contaminant TCDD in man, experimental animals, and in vitro research models. The sub-acute effects which have been repeatedly observed in humans include chloracne, the most consistent clinical marker, liver function impairment, peripheral neuropathy, nervousness and irritability, sensation impairment, personality changes, porphyria cutanea tarda as well as hypertrichosis and hyperpigmentation. Elevation of serum cholesterol, triglycerides, GGPT and alkaline phosphatase have been reported.

Toxicologic examination of TCDD has revealed hepatotoxic effects and teratogenic effects in rodents, suppression of cell-mediated immunity in mice and guinea pigs and the induction of hepatic carcinoma in rats.

Some of the clinical reports appear to have been concerned with the association of cardiovascular disease and an increased risk for cancer in populations exposed to TCDD.

OBJECTIVES OF STUDY

The objectives of this clinical study were to determine and identify the possible long-term health effects of chemicals associated with the making of 2,4,5-T, including 2,3,7,8 tetrachloro-dibenzo-p-dioxin (TCDD) and to determine the increased risk for those adverse health effects which have been observed in the sub-acute phase or sub-chronic state in man as well as the effects which have been noted to occur in experimental animals including rodents, rabbits and sub-human primates. The objectives of the study, as reflected in its design, were to determine increased risks for cutaneous, pulmonary, cardiovascular, gastrointestinal, hepatic, renal, neurobehavioral problems, reproductive problems, birth defects, endocrinologic effects, effects on lipid metabolism, susceptibility to infection and the possibility of increased risk for cancer.

A most appropriate population for this study consisted of the employees and former employees of Monsanto Industrial Chemicals, Inc., Nitro, West Virginia who were involved in the manufacture of 2,4,5-T from 1948 to 1969.

STUDY DESIGN

The study design originally proposed the following three cohorts on the basis of company medical records.

- (1) Current employees, former employees and retirees who were exposed to the 2,4,5-T process during the period 1948 to 1969 and who were known to have chloracne and/or other clinical manifestations attributed to the process.

237747

- (2) Current employees, former employees or retirees who were exposed to 2,4,5-T process during the period 1948-1969, but who were not known to develop chloracne or other clinical manifestations attributable to the process.
- (3) Current employees, former employees and retirees who were not exposed to 2,4,5-T process and have no record of chloracne.

In the planning stage, it was anticipated that approximately 150 subjects would be available for the study in each of the above cohorts. It was estimated a total of 400-500 employees and former employees would participate in the study. Both management personnel and members of the Medical Department of the Monsanto/Nitro plant did an excellent job of recruitment of subjects for the study. However, it was recognized during review of questionnaires, including work history interviews as well as physician interviews and physical examination, that the participating subjects did not fulfill some of the criteria for these original cohort requirements. Selection bias was a factor in voluntary participation. No subject was excluded from the examination. The number in the exposed cohort exceeded the number in the non-exposed cohort. Subjects, who had never claimed or been observed to have had chloracne, were found to have history and/or residual chloracne upon examination. There was disagreement with regard to definition of exposure, i.e., exposure and intermittent exposure. On the basis of information gleaned from questionnaires and company work records three cohorts were constituted: 1) those who were clearly exposed to the 2,4,5-T process or its components; 2) those who were clearly not exposed and 3) those who were questionably exposed.

237748

METHODS AND MATERIALS

The design of the study and on-site survey were directed by Dr. Raymond R. Suskind. The interviews and clinical examination of 436 subjects were conducted during the week, June 11-18, 1979, in the Putnam County Health Center in Winfield, West Virginia by members of the Departments of Environmental Health and Dermatology of the University of Cincinnati Medical Center. Personnel from the above departments included physicians, nurses, graduate students in the Department of Environmental Health, technicians and interviewers. An average of 60 persons were examined per day during the study, with fewer persons seen on Sunday. The questionnaire and study program is found in Appendix I.

The complete examination included: an interview, clinical laboratory examination of blood and urine, pulmonary function tests, ECG, chest x-ray, nerve conduction velocity measurements, and a complete physical examination, including skin examination by dermatologists. During the dermatological examination, biopsies, skin scrapings, and photographs were taken as deemed appropriate by the physician and when agreed to by the participating subject. The nerve conduction velocity measurements were obtained for most subjects from two nerves: the peroneal nerve for motor function and the sural nerve for sensory function. In a relatively small number of subjects (22) nerve conduction measurements were made on the ulnar nerve.

Clinical laboratory analyses included: blood calcium, phosphorous, BUN, creatinine, BUN/creatinine ratio, uric acid, glucose (CS), total protein, albumin, globulin, albumin/globulin ratio, total bilirubin, direct bilirubin, Transaminase SGO, Transaminase SGP, alkaline phosphatase, LDH, cholesterol, iron, total lipids, sodium, potassium, chloride, G-glutamyl transpeptidase, triglycerides, CBC and differential, thyroxine R.I.A., thyroxine binding glo-

bulins. Urinalysis included routine examination as well as coproporphyrins and uroporphyrins.* Blood serum lipid fraction examination completed by the Lipid Research Division of the University of Cincinnati Medical Center included: serum cholesterol, serum triglyceride, serum HDL, and estimated serum LDL.

Chest x-rays were read by members of the staff of the Department of Radiology, University of Cincinnati Medical Center, under the supervision of Dr. Jerome Wiot. ECG's were interpreted by Dr. Te-Chuan Chou of the Cardiology Division, Department of Internal Medicine, University of Cincinnati Medical Center. Skin biopsies were prepared and read by Dr. Daniel Richfield, Dermatopathologist. Skin scrapings were cultured at the University of Cincinnati. Dr. A. Blair Smith initiated the examination of the data. Dr. Vicki Hertzberg, of the Biostatistics Division, performed all of the statistical analysis described in this report.

Data from the questionnaires were coded in the conventional manner by assigning numerical values to the responses given. Normal and abnormal findings noted by the examining physicians and salient details of each subject's medical history were coded using the SNOMED⁶ system. Chest x-rays were coded by observations and conclusions drawn by members of the Radiology Department. ECG findings were entered as interpreted by members of the Division of Cardiology, Department of Internal Medicine. ECG findings were reviewed with the subject's history, clinical findings, and chest x-rays in order to determine significant ECG findings. Laboratory data were entered as received. All data were keypunched and verified by the University of Cincinnati Computer Center. The keypunched data were then compared to the original files of the study subjects for accuracy. A computer file containing information from the questionnaires,

* Values for urinary coproporphyrin and uroporphyrin were determined from a single void sample rather than the required 10 ml. aliquot of 24 hour volume; hence levels outside of the normal range cannot be regarded as significant.

physical examinations, laboratory findings was created. All extremely large or small values for each variable were checked against the original values in the study subject's files. Following this second edit for accuracy of entered data, analysis of data began, using statistical programs available through the Statistical Analysis System (SAS) computer package. The statistical procedures used are briefly described in Appendix II. As the analysis progressed, periodic editing continued so as to insure the greatest possible accuracy.

THE SUBJECTS OF THE STUDY

The total number of subjects in the study is 436. There are 419 white males, 5 black males, 1 male of Hispanic descent, 1 male of American Indian descent, and 10 white females. One subject among the 419 white males was a 36-year old who was exposed to runaway reaction residue in 1949 at the age of 6. Since he was not an employee, he is not included in the data analysis. Since the number of women and non-white males is too small to be meaningful, they are not included in the remainder of the analysis. A brief description of these subjects, however, is contained in Appendix III. Information about sex, race, education and age range is found in Table 1.

The cohorts designated by exposure are defined as follows:

Group I - no exposure: 163 subjects

Group II - exposure, without qualification: 204 subjects

These subjects were involved in process and production and include pipefitters, electricians and all other employees working in or around the 2,4,5-T process.

Group III - questionable exposure: 51 subjects

This group includes laboratory and supervisory personnel not involved in production, but who occasionally handled 2,4,5-T or were around

the production area for short periods of time; laboratory personnel who worked in laboratories where 2,4,5-T was analyzed, but did not actually handle the material, carpenters who worked in the buildings of 2,4,5-T production occasionally, supervisory personnel whose main work efforts were in offices, but occasionally toured the buildings where 2,4,5-T was produced, and warehouse employees who described handling all types of finished products, including 2,4,5-T.

For a number of the analyses, the clearly exposed group was compared to the clearly not exposed group. Group III constituted a suspected exposure category. We report comparisons of the latter group with the clearly exposed and not exposed where pertinent.

RESULTS

A. Demographic Information

Demographic data of the 418 white males were examined to determine potentially confounding variables. Data on all subjects are found in Tables 1-4. The three groups were found to be significantly different with respect to employment status ($p < 0.0001$) (Table 2) and the highest education level achieved ($p < 0.0001$) (Table 3). 34.8% of the exposed were retirees and therefore in an older age group, whereas only 13.5% of the not exposed were retirees; 9.8% of the exposed were terminated, among them, employees who left the company in the era of 1949-1955 because of the health problem attributed to 2,4,5-T, whereas only 0.6% of the not exposed group were in the category of terminated. The mean age of the not exposed and questionably exposed groups was ten years younger than the exposed group (Table 4).

B. Alcohol and Smoking Use

History of alcohol consumption was found not to be significantly different in the three group (Table 5). When smoking status (current, former, never) was used as the criteria there was no difference between the exposed and not exposed group (Table 6). However, when the two groups were compared for pack years smoked, the exposed group was significantly higher than the not exposed group (Table 6). When present smokers were compared there was an almost 20 pack year difference between the exposed and not exposed. There was a difference of 9 pack years between the exposed and not exposed group in the former smokers. This probably reflects the 10 year age difference between the exposed and not exposed group and the heavier consumption of cigarettes in the exposed group.

C. Family History of Illness

Family history of illnesses were compared; the results are given in Table 7. All of the comparisons are made using Fisher's exact test for 2 x 2 tables. Family history of hayfever was found to be reported more often in the not exposed group ($0.01 < p < 0.05$). A family history of heart attack or angina after age 60 was reported significantly more often in the exposed group ($p < 0.01$).

D. History of Medical Problems

The comparison of the exposed and not exposed cohorts for illness elicited by medical history is given in Tables 8-9. Chloracne is reported more frequently in the exposed group: 86.27% in the exposed vs. 0.0% in the not exposed and questionable exposure group. In the not exposed group, acne vulgaris occurred more frequently than in the exposed group. A history of upper gastrointestinal ulcer occurred almost 4 times more frequently in the exposed group than in the not exposed group ($p < 0.005$). When the medical history of the exposed and not exposed are compared for two (2) age groups, less than 50 vs. 50 years and older, skin cancer and cerebrovascular accidents are only related to age not exposure; exposure, not age, appears to be a factor in the history of upper gastrointestinal ulcer. Hypertension and coronary artery disease occur more frequently in the older age group irrespective of exposure.

E. History of Medical Problems in Populations With and Without Chloracne

Since chloracne appears to be the prime clinical indicator of exposure, absorption and biological response, the study subjects were further classified into three sub-groups within the exposed populations; i.e., those who never have developed chloracne, those who had a history of chloracne but which was not observed in the 1979 examination and those whose chloracne persisted and

was noted on clinical examination (Tables 10-13). Among the 204 clearly exposed, 176 developed chloracne at some period. Of these, 107 were found to have chloracne on examination. Among the not exposed and questionably exposed, there were none who presented a history of chloracne nor were they found to have evidence of chloracne on examination. In both age groups, history of upper G.I. ulcer is more frequent in those who had chloracne than those who did not have chloracne regardless of exposure (Tables 10 and 11). As in the exposed versus not exposed group, the history of hypertension, cerebrovascular accident (CVA) and coronary artery disease are clearly age-related, not chloracne related.

When the clinical histories of the exposed population only were examined in relation to the history of and/or presence of chloracne, the same observations are made about angina, hypertension and coronary artery disease in that they are age-related not chloracne related. In the exposed group there is no association between the history of upper G.I. ulcer and chloracne (Table 12).

Although there appears to be a statistically significant relationship between exposure and history of upper G.I. ulcer, a closer examination of the temporal sequence of exposure and onset of ulcer reveals six subjects in the exposed group and one subject in the questionable group whose symptoms of ulcer occurred prior to exposure. In addition, there are four subjects among the exposed group whose ulcers were related to cortisone therapy, ASA therapy or alcoholism. If these 11 subjects are omitted from the analysis there are then 32 of 194 (16.49%) of the exposed group reporting ulcer vs. 9 of 163 (5.52%) among the not exposed subjects. This difference is statistically significant upon age adjustment ($p=0.01$). However, if the seven subjects reporting history of ulcer before exposure are considered to be not exposed subjects because of the temporal sequence, there are then 32 of 194 (16.49%) of the exposed group reporting ulcer

vs. 16 of 170 (9.41%). This difference is not statistically significant upon age adjustment.

Other potentially confounding variables were examined with the following results:

- (1) There was no relationship found between exposure category and history of ulcer among never smoking subjects.
- (2) Among formerly smoking subjects, 24.10% (20 of 83) of the exposed group report history of ulcer compared to 6.85% (5 of 73) of the not exposed group ($p < 0.005$).
- (3) There was no relationship found between exposure category and history of ulcer among presently smoking subjects.
- (4) There was no relationship found between exposure category and history of ulcer among the three categories of alcohol drinking (never, former, and present).

The following is a breakdown of data designating exposure vs. ulcer type and treatment:

<u>History of</u>	<u>Not Exposed</u> (n=163)		<u>Exposed</u> (n=204)		<u>Questionable Exposure</u> (n=51)	
	#	%	#	%	#	%
Gastrointestinal Bleeding	0		5		0	
Upper G.I. Ulcer	9	5.52	42	20.59	6	11.76
<u>Site as Reported</u>						
Peptic	3		9		1	
Stomach	4		21		3	
Duodenal	2		12		2	
<u>Treatment as Reported</u>						
Did not Report Treatment			13		3	
No Treatment	2		3			
Treated with Diet Only			4			
Medical Treatment	7		10		2	
Ulcer Symptoms Relieved with Hiatal Hernia Repair			2		1	
Gastrectomy			3			
Partial Gastrectomy			1			
Surgical Treatment of Ulcer, NOS			6			
<u>Problems Now</u>	3		8		1	

These data have the additional problem of being prevalence figures only as opposed to incidence rates.⁷ Also, report of upper gastrointestinal ulcer and designation of ulcer by site is crude at best since neither examination by gastrointestinal x-ray, nor endoscopy diagnosis was available.

Hence, while these data are suggestive, conclusions cannot be drawn due to the equivocal findings and the crude nature of the data.

F. Physical Examination Findings

The physical examination revealed a wide range of findings. These are cited in a comprehensive list in Appendix IV. The significant clinical findings were those associated with the skin and appendages, connective tissues, and sexual complaints. The discernable abnormalities referable to the cardiovascular, pulmonary, hepatic, hematopoietic systems, and nerve function were largely determined by objective tests in this study. These will be discussed under organ function tests, radiography and clinical laboratory measurements.

The significant clinical findings as related to exposure status are found in Table 14 and 15. As was indicated previously 52.45% of those who were clearly exposed still had chloracne. There is a significant difference in the frequency of acne vulgaris among the not exposed as compared to the exposed, 11.66% versus 1.96%. Among the exposed 120 or 58.82% were found to have actinic elastosis in contrast to 49 (30.06%) among the not exposed and 39.22% among the questionably exposed. There is a very significant difference in the occurrence of actinic elastosis between the exposed and not exposed in both age groups even though age is a factor in this clinical finding. There is a rather unique finding of 3 cases of Peyronie's Disease among the 204 exposed. All of them had chloracne at some time and they were all over 50 years old.

Rosacea and rhinophyma occurred in 4 exposed persons over the age of 50 and 2 questionably exposed. The complaints of loss of libido occurred more frequently in the exposed than the not exposed. When age was considered, the largest number of complaints of loss of libido or impotence occurred in the older age group but there were greater percentages of complaints about these problems in the exposed group as compared to the not exposed.

Tables 16 and 17 identify the clinical findings in the exposed population in relation to chloracne status. In these groups, actinic elastosis is found predominantly in the subjects with persistent chloracne (74.8%) but it also occurs significantly in those with a history of chloracne only (46.38%). 11 cases of malar hirsutism were found among the exposed in the persistent chloracne cases (10.28%). 9 of these 11 cases occur in the group over 50.

Table 18 lists the sites and severity of chloracne observed on physical examination. The distribution and severity of actinic elastosis is presented in Table 19.

Since there appears to be some association of actinic elastosis with chloracne further analysis of this relationship with respect to severity of chloracne and severity of actinic elastosis was carried out. These analyses are presented in Table 20 and Table 21. Of the 67 mild cases of residual chloracne, 44 had actinic elastosis. Of the 36 with moderate chloracne 33 had actinic elastosis. 33% of the actinic elastosis cases found with chloracne were severe. It would appear that the percentage of persons with severe actinic elastosis is related to presence of chloracne (Table 21). In other words, actinic elastosis appears to be more severe when found with chloracne.

Blood pressure findings at the time of examination in the exposed, questionably exposed and not exposed groups are presented in Table 22. When the criterion for abnormal systolic and diastolic use different values for the groups <59 (140/90) and ≥60 (160/95), there appears to be no significant differences between the exposed and not exposed group. These criteria are stricter than that proposed by the National Heart, Lung and Blood Institute.⁸

G. Clinical Laboratory and Other Test Findings

1) Lipids

Because of the suspected relationship of serum lipids to exposure to 2,4,5-T and its contaminants, serum lipids are analyzed in several ways. Serum cholesterol, triglyceride, LDL, and HDL were classified by age-specific percentiles as determined by the National Lipid Research Project data⁹ (See Appendix V). Serum cholesterol, triglyceride, and LDL were classified as "abnormal" if they fell above the 90th percentile, and were classified as "normal" otherwise. Serum HDL was classified as "abnormal" if it fell below the 10th percentile, and was classified as "normal" otherwise. The frequency of abnormal lipid findings are compared for exposed, not exposed workers and questionably exposed (Table 23), and no significant differences are noted in cholesterol, triglycerides, HDL and LDL levels. These relationships are further investigated within each level of smoking status (present, former and never) (Table 24). Smoking appears to have no effect on the differences between these groups. Logistic regression was used to detect associations of abnormal serum lipid findings with exposure. After adjusting for pack years smoked, no significant differences between exposed and not exposed could be found.

Multiple linear regression was also used to detect possible "shifts" in the mean serum lipids for the two exposure groups after correcting for the effects of age, tobacco, and alcohol. In all cases (cholesterol, triglycerides, HDL, LDL) there are no significant differences between the two exposure groups after adjusting for the effects of age, tobacco and alcohol.

When the lipid levels of the exposed group only are examined in relation to the occurrence of chloracne, the HDL levels in those with persistent chloracne are found to be somewhat lower than of the group with a history only of

chloracne or those who never had chloracne (Table 25). Those who had a history only of chloracne have somewhat higher LDL levels than those who had chloracne currently or never. Among former smokers in the exposed group there is a greater frequency of abnormal triglyceride and HDL levels among those with residual chloracne than those with no history or only history of chloracne (Table 26). Among those who smoke presently there is a higher frequency of abnormal or high LDL levels for those who have a history only of chloracne.

2) Pulmonary Function Status

Both FEV_1 and FVC were considered abnormal if the observed value was less than 80% of the predicted value of Morris. A FEV_1/FVC ratio of less than 0.70 (70%) was considered to be abnormal. The FEF_{25-75} was considered abnormal if the observed value was less than 70% of the predicted value of Morris.

Consistent differences in abnormal pulmonary function values (FEV_1 , FVC, FEV_1/FVC and FEF_{25-75}) are found between the exposed and not exposed groups (Table 27). Among present smokers there was a significant difference in pulmonary function values between the exposed and not exposed group. There are no differences in pulmonary function values among persons who have formerly smoked or among persons who have never smoked when the exposed were compared to the not exposed (Table 28).

Logistic regression was used to detect associations of abnormal pulmonary function parameters with exposure. The model and coefficients are given in Appendix VI. The significance and odds ratios for abnormal pulmonary function for exposed vs. not exposed after adjusting for pack years smoked are

as follows:

<u>Pulmonary Function Parameter</u>	<u>Significance of Exposure</u>	<u>Odds Ratio</u>
FEV ₁	0.02	2.71
FVC	0.05	2.10
FEV ₁ /FVC	0.01	2.89
FEF ₂₅₋₇₅	0.06	1.82

The association of exposure and abnormal pulmonary function among current smokers was investigated further for the confounding by prior coal mining exposure. None of the not exposed subjects who currently smoke had prior coal mining exposure. Of the exposed subjects who currently smoke, 13 individuals had prior coal mining exposure. Among the current smokers who had no coal mining exposure the exposed were found to have a higher frequency of abnormal FEV₁, FVC and MMEFR than the not exposed as follows:

Non-Miners-Current Smokers						Miners Current Smokers	
Pulmonary Function Parameter	Exposed (n=60)		Not Exposed (n=44)		Probability	Exposed (n=13)	
	#	%Abnormal	#	%Abnormal		#	%Abnormal
FEV ₁	12	20.00	2	4.55	0.039	7	53.85
FVC	14	23.33	1	2.27	0.003	4	30.77
FEV ₁ /FVC	10	16.67	3	6.82	N.S.	8	61.54
FEF ₂₅₋₇₅	18	30.00	5	11.36	0.039	8	61.54

2377E2

3) ECG and X-ray Findings

Tables 29 and 30 list the occurrence of ECG findings in the exposed and not exposed as well as the differences in occurrence when the exposed and not exposed are separated into <50 and ≥50 year groups. Number of persons with PVC's and PAC's appear to be only age-related. Tables 31 and 32 list the x-ray findings in the exposed as compared to the not exposed as well as the comparison between the <50 and ≥50 year old groups. Significant x-ray findings appear to be age-related but not exposure related.

4) Clinical Laboratory Findings

In Table 33 the relative frequency of out of normal range values is compared in the exposed vs. not exposed group. In Table 34 the relative frequency of out of normal range values of clinical laboratory findings for the exposed group in relation to chloracne status is presented.

Analysis of covariance was used to compare the laboratory findings in the exposed group to the not exposed group after adjusting for the effects of age, smoking status and alcohol status. The same procedure was used to compare the laboratory findings for three chloracne groups after adjusting for the effects of age, smoking and alcohol status.

Fisher's exact test was used to determine the existence of differences between the exposed and not exposed with respect to the relative frequency of out-of-reference-range laboratory findings. The χ^2 test for independence in contingency or two way tables was used to determine differences in the three (3) chloracne groups with respect to the relative frequency of out-of-reference-range laboratory findings (Appendix VII).

In several other incidents involving the synthesis of trichlorophenol and 2,4,5-T, porphyria cutanea tarda was observed with uroporphyrinuria. The exposed, not exposed and questionably exposed in this study were compared for percentage of abnormal levels of coproporphyrin and uroporphyrins. No significant differences were found (Table 35).

5) Nerve Conduction Velocity Data

Prior to the beginning of the data analysis, all subjects reporting diabetes or reporting a high weekly alcohol intake were eliminated from the analysis (high weekly alcohol intake was defined as greater than or equal to 35 oz. alcohol per week). After these deletions, there were 319 with complete sural examinations and 336 with complete peroneal examinations remaining. The data from the nerve conduction velocity study were adjusted according to the deJesus method (Appendix VIII). Tables 36-38 lists all nerve conduction parameters considered. The following methods of analysis were then used:

a) Analysis of covariance was used to compare the nerve conduction parameters after adjusting for age differences in the groups. No significant differences were found between the exposed and not exposed. Also within the exposed only, no relation to chloracne status was found after adjusting for age.

b) Using the normal ranges provided by NIOSH (see Appendix IX) the exposed group has a significantly higher proportion with abnormally low peroneal nerve conduction velocities than the not exposed group (74% vs. 49%, $p < 0.0001$). No differences were found with respect to abnormal sural nerve conduction velocity or peroneal distal latency (not enough ulnars were tested to say anything about them). However, Boyd points out that these ranges are not age-adjusted. Moreover, temperature has a great effect on velocity and latency, and

temperatures were not reported with these ranges. (Ranges and appropriate references are attached). Among young men (age <50) no difference between exposed and not exposed with respect to any of the parameters was observed. Among the older men (age ≥50) a significantly higher proportion of the exposed group have abnormally low peroneal nerve conduction velocities as compared to the not exposed group (79% vs. 57%, $0.01 < p < 0.05$).

c) The z-score method (as used by Selikoff) was also used to detect differences in the nerve conduction parameters between exposed and not exposed. No significant differences were found using this method.

H. Reproduction and Birth Defect Data

In presenting this information it should be understood that all of the data depended on personal recall of such information as number of pregnancies, miscarriages, live births, stillbirths, infant mortality, etc. Confounding factors which effect accuracy are obvious - e.g. interviewed male subject only, age of subject, and change in cultural attitudes about reproductive matters. It was also confounded by the fact that the pregnancies, miscarriages, stillbirths were not designated in a time period related to exposure e.g., pre, during, post exposure.

Fisher's exact test was used to compare the reported occurrence of reproductive anomalies in the exposed group to the not exposed group. The data on reproductive and birth defect findings are found in Tables 39 and 40. No significant differences were found in miscarriages, in rate of birth defects or stillbirths.

The TCP Runaway Reaction Group

Among the 204 persons who were known to be exposed to the 2,4,5-T synthesis and preparation, there were 55 who were involved in a trichlorophenol process runaway reaction, which occurred on March 8, 1949, described in the historical introduction. There were a total of 122 persons known to have been involved in this accident and with its products.

This group of 55 was matched as closely as possible in age with an unexposed group and a third group of exposed but not to the accident material. Since the range of the runaway reaction group was 49 years and older, the matched unexposed control group consisted of persons in the same age range, e.g., ≥ 49 years. There were 65 persons in the unexposed group. Because of the percentage of aging retirees in the TCP runaway group there was still a four year age difference between the accident group and controls. There was no difference in age between the TCP accident group and the other exposed. In the other exposed group the age range was ≥ 55 . There were 77 subjects in that group. Data comparisons were made between the accident group and the unexposed group as well as the accident group and the other exposed group.

The following were the significant findings elicited:

1) When smoking status was considered, the average number of pack years was significantly greater in the TCP runaway group than the not exposed group by 10 pack years. The difference between the TCP group and other exposed group was 9.5 pack years.

2) All of the TCP exposed had a history of chloracne; none of the not exposed had chloracne; 83% of the other exposed group had a history of chloracne. In the TCP group examined, 58.2% still had chloracne; in the other exposed 55.8% still had chloracne.

3) There were no significant differences in the current findings of chlor-acne and actinic elastosis between the TCP and the other exposed group.

4) The percentage of persons with actinic elastosis was significantly larger in the TCP group than the not exposed group (75% vs. 49%). The difference in the occurrence of actinic elastosis between the TCP and other exposed group (75% vs. 68%) was not significant.

5) There was a significantly larger number of systolic murmurs found in the TCP as compared to the other exposed group (12.7% vs. 1.3%, $0.01 < p < 0.05$). Although there appears to be a statistical difference between the percentage of abnormal BUN's found in the TCP group (9.43% or 5/55) as compared to the other exposed (1/73 or 1.37%) there was no difference between the TCP group and not exposed group (9.43% vs. 6.35%).

6) The complaints of nervousness were greater in the TCP runaway group than the not exposed controls (21.8% vs. 7.7%). In the other exposed controls the occurrence of nervousness was 16.9%.

7) Logistic regression was used to compare TCP runaway group to the not exposed and to the other exposed group, for abnormal serum lipid findings, while simultaneously adjusting for pack years smoked. No significant differences were found in either comparison.

8) In the pulmonary function tests, the number of persons with abnormal FEV₁/FVC test findings in the TCP group was significantly greater than among the not exposed. This same difference was seen among current smokers in the two groups. There was also a slightly greater percentage of persons with abnormal MMEFR among the TCP group who are currently smoking than the not exposed who are currently smoking.

9) Logistic regression was used to compare TCP runaway exposed to not exposed for abnormal pulmonary function while adjusting for pack years smoked. No relationship was found between TCP runaway exposure and abnormal FEV₁, FVC or MMEFR. However, a significant relationship was found between this exposure classification and abnormal FEV₁/FVC, with a greater frequency seen in the TCP runaway group ($p=0.01$). The odds ratio is 4.02 for abnormal FEV₁/FVC, given pack years smoked, for TCP runaway exposure vs. not exposed.

Logistic regression was used to compare TCP runaway exposed to other exposed for abnormal pulmonary function while adjusting for differences in pack years smoked. No significant differences were found.

Other Work Exposures of the Study Population

Other than 2,4,5-T, its intermediates, and/or contaminants, all of the workers in the study were exposed to multiple chemicals and industrial processes under varying working conditions, at Monsanto/Nitro and/or other industries, in a period roughly between the late 1930's and 1979 (a few subjects were born before 1900).

Chemicals identified by the subjects as other Monsanto/Nitro exposures include: rubber processing chemicals, i.e., diphenylguanidine; a group of benzothiazolesulfenamide accelerators (Santocures[®]); antioxidants, i.e., derivatives of m-cresol; antiozonants (Flectols[®] and Santoflexes[®]), most of the Santoflexes are p phenylenediamine derivatives; vulcanizing agents such as 4,4-dithiodimorpholine; insecticides, i.e., ethyl and methyl parathion. Additional chemicals named were phthalic anhydride, o and p dichlorobenzene, o and p nitrophenol, toluene and mercaptobenzothiazole, derivatives of TMD and trimethylquinoline components. One of the products, Sopanax[®], an antioxidant, was alleged by the study subjects to be associated with the occurrence of kidney stones. The reporting of the H/O kidney stones is not statistically different among the three groups.

One of the chemical hazards to which the study population was exposed was p aminobiphenyl, a known bladder carcinogen. Ninety-five subjects, or 22.72% of the 418, reported exposure to p aminobiphenyl during the course of their employment. To the best of our knowledge these subjects are periodically examined in a monitoring program established by the Medical Department of the Company. Subjects reported the exposure and the monitoring program during the interview and to the examining physician. The data analyses relating to this exposure and

exposure to 2,4,5-T is as follows:

	<u>2,4,5-T Exposure</u>					
	<u>Not Exposed</u> (n=163)		<u>Exposed</u> (n=204)		<u>Questionable Exposure</u> (n=51)	
	#	%	#	%	#	%
p aminobiphenyl Exposure	8	4.91	71	34.80	16	31.37
H/O Bladder Tumor*	1	0.61	7	3.43	0	0.00
H/O Bladder Cancer*	1	0.61	2	0.98	2	3.92

* Figures are mutually exclusive

The degree to which each subject may have been exposed to other chemicals both at Monsanto/Nitro and other places of employment varied markedly. This fact must be considered in attempting to interpret biological significance to statistical differences based on small occurrences.

Discussion and Conclusions

The strengths and weaknesses of this study must be considered critically in any appraisal of the medical significance of the data elicited from it.

Data gleaned from interviews and clinical examinations are useful but have some inherent weaknesses. Medical, work and personal histories depend on memory; findings of physical examinations carried out by different physicians are based on judgments which may differ somewhat with the examiner. Nevertheless these constitute an important data base for making clinical judgments.

Since quantitative TCDD levels for any period during the manufacture of 2,4,5-T were not available, it was only possible to relate effects found, to the history of definite exposure, no exposure, and questionable exposure to any aspect of 2,4,5-T production.

Since chloracne is the hallmark of biological activity of TCDD it was possible in this study to relate all systemic and other cutaneous effects to the presence or absence of chloracne in the exposed group as well to exposure itself.

From this study one can conclude that for those exposed to TCDD the dramatic long term effects are cutaneous and involve the pilosebaceous apparatus and the elastic tissues of the dermis. Chloracne may persist for as long as 30 years after onset and is associated with elastic tissue changes in the dermis and some persistence of malar hirsutism.

There are suggestive but inconclusive data indicating that for the exposed there was an increased risk for upper gastrointestinal ulcer; that among those in whom chloracne persists there is (although numbers are small) an association with low HDL levels and further for those with only a history of chloracne there is an association with higher LDL levels.

In those who currently smoke and have been exposed to the 2,4,5-T process

materials there appears to be an association of abnormal pulmonary function findings when compared to those who smoke but who were never exposed.

There is no evidence from this study that there are identifiable long term effects on the cardiovascular system, on the liver, on the gastrointestinal tract, on peripheral nerve function. There is no indication, on the basis of historical information (recognizing all of its weaknesses) that there was a greater risk for miscarriages, stillbirths, or birth defects among the families in which the male parent was exposed.

References

1. Ashe, William and Suskind, Raymond R.: Report of the Kettering Laboratory, University of Cincinnati, Chloracne Cases of the Monsanto Chemical Company, Nitro, West Virginia, October 1949; April 1950.
2. Suskind R.R.: Report of the Kettering Laboratory, University of Cincinnati, A Clinical and Environmental Survey, Monsanto Chemical Company, Nitro, West Virginia, July 1953.
3. Zack, J.A. and Suskind, R.R.: The Mortality Experience of Workers Exposed to Tetrachlorodibenzodioxin in a Trichlorophenol Process Accident, Journal of Occupational Medicine, 22:11-14, 1980.
4. Kimmig, J. and Schulz, K.H.: Chlorinated Aromatic Cyclic Ether as a Cause of So-Called Chloracne, Naturwissenschaften, 44:337-338, 1957.
5. Kimmig, J. and Schulz, K.H.: Occupational Acne Caused by Chlorinated Aromatic Cyclic Ethers, Dermatologica, 115:540-546, 1957.
6. Systematized Nomenclature of Medicine, College of American Pathologists, Second Edition, 2 Volumes, April 1979.
7. Kurata, J.H., Elashoff, J.D., Grossman, M.I.: Inadequacy of the Literature of the Relationship Between Drugs, Ulcers, and Gastrointestinal Bleeding, Gastroenterology, 82:373-82, 1982.
8. Report of Joint National Committee on Detection, Evaluation and Treatment of High Blood Pressure, National Heart, Lung and Blood Institute, 1977.
9. The Lipid Research Clinics Population Studies Book: Volume I: The Prevalence Study, USDHHS (1980).

TABLES

TABLE 1-
DEMOGRAPHIC DATA ALL STUDY SUBJECTS

	<u>Total</u>	<u>White</u>	<u>Black</u>	<u>Other</u>
Males	426	419	5	2
Females	<u>10</u>	10	0	0
Total	436			

HIGHEST EDUCATION LEVEL ACHIEVED

0 - 8th Grade	25
9 - 12th Grade	266
> 12th Grade	<u>122</u>
Total.	416

237775

TABLE 2
PRESENT EMPLOYMENT STATUS

	<u>Active</u>	<u>Retired</u>	<u>Terminated</u>	<u>Total</u>
Not Exposed				
Number	140	22	1	163
Percent	85.89	13.50	0.61	
Questionable Exposure				
Number	38	11	2	51
Percent	74.51	21.57	3.92	
Exposed				
Number	113	71	20	204
Percent	55.39	34.80	9.80	
Total	291	104	23	418

$p < 0.0001$

TABLE 3
EDUCATION LEVEL

	<u>0 - 8th Grade</u>	<u>9 - 12th Grade</u>	<u>>12th Grade</u>	<u>Total</u>
Not Exposed				
Number	2	92	68	162
Percent	1.23	56.79	41.98	
Questionable Exposure				
Number	4	27	20	51
Percent	7.84	52.94	39.22	
Exposed				
Number	19	147	37	203
Percent	9.36	72.41	18.23	
Total	25	266	125	416

$p < 0.0001$

TABLE 4
AGE OF POPULATIONS

	<u>Mean $\pm$ Standard Deviation</u>
Exposed (204)	56.67 $\pm$ 10.58 years
Questionable Exposure (51)	53.30 $\pm$ 10.63 years
Not Exposed (163)	46.23 $\pm$ 12.86 years

TABLE 5

EXPOSURE
vs.
ALCOHOL STATUS*

	<u>Never</u>	<u>Former</u>	<u>Present</u>	<u>Total</u>
Not Exposed				
Number	27	47	84	158
Percent	17.09	29.75	53.16	
Questionable Exposure				
Number	8	17	26	51
Percent	15.69	33.33	50.98	
Exposed				
Number	18	74	100	192
Percent	9.38	38.54	52.08	
Total	53	138	210	401

p N.S.

* For definition, see Appendix X.

TABLE 6

EXPOSURE
vs.
SMOKING STATUS*

	<u>Never</u>	<u>Former</u>	<u>Present</u>	<u>Total</u>
Not Exposed				
Number	47	72	44	163
Percent	28.83	44.17	26.99	
Questionable Exposure				
Number	18	21	12	51
Percent	35.29	41.18	23.53	
Exposed				
Number	46	84	73	203
Percent	22.66	41.38	35.96	
Total	111	177	129	417

p N.S.

* For definition, see Appendix V.

EXPOSURE vs. PACK YEARS SMOKED*

	<u>Mean ± Standard Deviation</u>
Exposed (198)	27.04 ± 28.82
Not Exposed (162)	15.73 ± 24.01
Questionable Exposure (50)	19.67 ± 23.97

* $p < 0.0001$ for comparing Exposed to Not Exposed

237780

TABLE 7

FAMILY HISTORY OF ILLNESS *

Family History of	Exposed (n=204)		Not Exposed (n=163)		Probability	Questionable Exposure (n=51)	
	#	%	#	%		#	%
Asthma	29	14.22	19	11.66	N.S.	7	13.73
Hayfever	11	5.39	20	12.27	0.03	3	5.88
Acne	21	10.29	20	12.27	N.S.	7	13.53
Eczema	16	7.84	9	5.52	N.S.	3	5.88
Hives	18	8.82	22	13.50	N.S.	3	5.88
Upper G.I. Ulcer	34	16.67	31	19.02	N.S.	12	23.53
Colitis	22	10.78	13	7.98	N.S.	4	7.84
Heart Attack or Angina before Age 60	53	25.98	36	22.09	N.S.	14	27.45
Heart Attack or Angina after Age 60	64	31.37	31	19.02	0.0097	13	25.49
High Blood Pressure	73	35.78	62	38.04	N.S.	19	37.25
Cerebrovascular Accident (CVA)	59	28.92	39	23.93	N.S.	14	27.45
High Cholesterol	26	12.75	21	12.88	N.S.	9	17.65
Diabetes	48	23.53	35	21.47	N.S.	10	19.61
Liver Disease	13	6.37	9	5.52	N.S.	5	9.80
Nervous Disorder	30	14.71	28	17.18	N.S.	9	17.65
Inherited Disorder	10	4.90	7	4.29	N.S.	2	3.92
Cancer†	71	34.81	45	27.78	N.S.	19	37.25

* Includes Parents and Siblings of Subjects

† Not exposed group has n=162 relvino to this question.

TABLE 8
HISTORY OF MEDICAL PROBLEMS

History of	Exposed (n=204)		Not Exposed (n=163)		Questionable Exposure (n=51)	
	#	%	#	%	#	%
Chloracne ¹	176	86.27	0	0.00	0	0.00
Acne Vulgaris ²	20	9.80	48	29.45	10	19.61
Folliculitis	1	0.49	2	1.23	0	0.00
Skin Cancer	8	3.92	4	2.45	1	1.96
Chronic Obstructive Pulmonary Disease (COPD)	3	1.47	2	1.23	1	1.96
Hypertension	60	29.41	36	22.09	10	19.61
Arteriosclerosis	0	0.00	1	0.61	0	0.00
Angina	3	1.47	2	1.23	2	3.92
Coronary Artery Disease	20	9.80	10	6.13	6	11.76
Cerebrovascular Accident (CVA)	6	2.94	2	1.23	1	1.96
Upper GI Ulcer ³	42	20.59	9	5.52	6	11.76
Bladder Cancer	2	0.98	1	0.61	2	3.92
Prostatic Disease	8	3.92	6	3.68	2	3.92
Kidney Stones	24	11.76	16	9.82	5	9.80

¹ p < 0.0001

² p < 0.001

³ p < 0.005

p values for comparing age-adjusted (on basis of age < 50 vs. age ≥ 50) reported occurrence in exposed vs. not exposed

TABLE 9
HISTORY OF MEDICAL PROBLEMS
vs.
EXPOSURE STATUS BY AGE

History of	Age < 50				Age ≥ 50			
	Exposed (n=51)		Not Exposed (n=100)		Exposed (n=153)		Not Exposed (n=63)	
	#	%	#	%	#	%	#	%
Chloracne ¹	39	76.47	0	0.00	137	89.54	0	0.00
Acne Vulgaris ^{2,3}	9	17.65	42	42.00	11	7.19	6	9.52
Folliculitis	0	0.00	2	2.00	1	0.65	0	0.00
Skin Cancer	0	0.00	1	1.00	8	5.23	3	4.76
Chronic Obstructive Pulmonary Disease (COPD)	0	0.00	0	0.00	3	1.96	2	3.17
Hypertension ^{1,4}	9	17.65	14	14.00	51	33.33	22	34.92
Arteriosclerosis	0	0.00	0	0.00	0	0.00	1	1.59
Angina	2	3.92	1	1.00	1	0.65	1	1.59
Coronary Artery Disease ^{1,3}	1	1.96	0	0.00	19	12.42	10	15.87
Cerebrovascular Accident (CVA)	0	0.00	0	0.00	6	3.92	2	3.17
Upper GI Ulcer	7	13.73	5	5.00	35	22.88	4	6.35
Bladder Cancer	0	0.00	0	0.00	2	1.31	1	1.59
Prostatic Disease	3	5.88	3	3.00	5	3.27	3	4.76
Kidney Stones	7	13.73	7	7.00	17	11.11	9	14.29

TABLE 10

¹ 0.01 < p < 0.05

² 0.05 < p < 0.10

In exposed young vs. old

In exposed young vs. old

³ p < 0.0001

⁴ 0.001 < p < 0.01

In not exposed young vs. old

In not exposed young vs. old

TABLE 10
HISTORY OF MEDICAL PROBLEMS
vs.
HISTORY AND/OR PRESENCE OF CHLORACNE

<u>History of</u>	<u>History and/or Presence</u> (n=176)		<u>No History or Presence</u> (n=242)	
	<u>#</u>	<u>%</u>	<u>#</u>	<u>%</u>
Acne Vulgaris ¹	13	7.39	65	26.86
Folliculitis	1	0.57	2	0.83
Skin Cancer	7	3.98	6	2.48
Chronic Obstructive Pulmonary Disease (COPD)	3	1.70	3	1.24
Hypertension ²	55	31.25	51	21.07
Arteriosclerosis	0	0.00	1	0.41
Angina	3	1.70	4	1.65
Coronary Artery Disease	19	10.80	17	7.02
Cerebrovascular Accident (CVA)	6	3.41	3	1.24
Upper GI Ulcer ²	38	21.59	19	7.85
Bladder Cancer	2	1.14	3	1.24
Prostatic Disease	7	3.98	9	3.72
Kidney Stones	19	10.80	26	10.74

¹ p < 0.0001

² 0.001 < p < 0.01

TABLE 1.
HISTORY OF MEDICAL PROBLEMS
vs.
HISTORY AND/OR PRESENCE OF CHLORACNE BY AGE .

History of	Age < 50				Age ≥ 50			
	Chloracne Ever (n=39)		Chloracne Never (n=130)		Chloracne Ever (n=137)		Chloracne Never (n=192)	
	#	%	#	%	#	%	#	%
Acne Vulgaris ¹	5	12.82	48	36.92	8	5.84	17	15.18
Folliculitis	0	0.00	2	1.54	1	0.73	0	0.00
Skin Cancer	0	0.00	1	0.77	7	5.11	5	4.46
Chronic Obstructive Pulmonary Disease (COPD)	0	0.00	0	0.00	3	2.19	3	2.68
Hypertension ^{1,2}	7	17.95	16	12.31	48	35.04	35	31.25
Arteriosclerosis	0	0.00	0	0.00	0	0.00	1	0.89
Angina	2	5.13	1	0.77	1	0.73	3	2.68
Coronary Artery Disease ^{2,3}	1	2.56	0	0.00	18	13.14	17	15.18
Cerebrovascular Accident (CVA)	0	0.00	0	0.00	6	4.38	3	2.68
Upper GI Ulcer	6	15.38	10	7.69	32	23.36	9	8.08
Bladder Cancer	0	0.00	0	0.00	2	1.46	3	2.68
Prostatic Disease	2	5.13	4	3.08	5	3.65	5	4.46
Kidney Stones	5	12.82	12	9.23	14	10.22	14	12.50

¹ 0.0001 < p < 0.001

² 0.05 < p < 0.10

³ p < 0.0001

In chloracne never, young vs. old

In chloracne ever, young vs. old

In chloracne never, young vs. old

TABLE 12
HISTORY OF MEDICAL PROBLEMS
vs.
CHLORACNE STATUS IN EXPOSED ONLY

<u>History of</u>	<u>History Only</u> (n=69)		<u>Current</u> (n=107)		<u>No History</u> (n=28)	
	#	%	#	%	#	%
Acne Vulgaris	6	8.70	7	6.54	7	25.00
Folliculitis	0	0.00	1	0.93	0	0.00
Skin Cancer	4	5.80	3	2.80	1	3.57
Chronic Obstructive Pulmonary Disease (COPD)	2	2.90	1	0.93	0	0.00
Hypertension	21	30.43	34	31.78	5	17.86
Arteriosclerosis	0	0.00	0	0.00	0	0.00
Angina	1	1.45	2	1.87	0	0.00
Coronary Artery Disease	5	7.25	14	13.08	1	3.57
Cerebrovascular Accident (CVA)	2	2.90	4	3.74	0	0.00
Upper GI Ulcer	11	15.94	27	25.23	4	14.29
Bladder Cancer	0	0.00	2	1.87	0	0.00
Prostatic Disease	2	2.90	5	4.67	1	3.57
Kidney Stones	10	14.49	9	8.41	5	17.86

TABLE 13
HISTORY OF MEDICAL PROBLEMS
vs.
CHLORACNE STATUS IN EXPOSED ONLY
BY AGE

History of	Age < 50						Age > 50					
	History Only (n=16)		Current (n=23)		No History (n=12)		History Only (n=53)		Current (n=84)		No History (n=16)	
	#	%	#	%	#	%	#	%	#	%	#	%
Acne Vulgaris	3	18.75	2	8.70	4	33.33	3	5.66	5	5.95	3	18.75
Folliculitis	0	0.00	0	0.00	0	0.00	0	0.00	1	1.19	0	0.00
Skin Cancer	0	0.00	0	0.00	0	0.00	4	7.55	3	3.57	1	6.25
Chronic Obstructive Pulmonary Disease (COPD)	0	0.00	0	0.00	0	0.00	2	3.77	1	1.19	0	0.00
Hypertension ¹	1	6.25	6	26.09	2	16.67	20	37.74	28	33.33	3	18.75
Arteriosclerosis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Angina ²	0	0.00	2	8.70	0	0.00	1	1.89	0	0.00	0	0.00
Coronary Artery Disease ²	1	6.25	0	0.00	0	0.00	4	7.55	14	16.67	1	6.25
Cerebrovascular Accident (CVA)	0	0.00	0	0.00	0	0.00	2	3.77	4	4.76	0	0.00
Upper GI Ulcer	1	6.25	5	21.74	1	8.33	10	18.87	22	26.19	3	18.75
Bladder Cancer	0	0.00	0	0.00	0	0.00	0	0.00	2	2.38	0	0.00
Prostatic Disease	0	0.00	2	8.70	1	8.33	2	3.77	3	3.57	0	0.00
Kidney Stones	2	12.50	3	13.04	2	16.67	8	15.09	6	7.14	3	18.75

¹ 0.01 < p < 0.05

For history only, young vs. old

² 0.05 < p < 0.10

For current, young vs. old

TABLE 14

Significant Clinical Findings
In Relation to Exposure

Finding	Exposed (n=204)		Not Exposed (n=163)		Questionable Exposure (n=51)	
	#	%	#	%	#	%
Chloracne ¹	107	52.45	0	0.00	0	0.00
Acne Vulgaris ²	4	1.96	19	11.66	2	3.92
Actinic Elastosis ³	120	58.82	49	30.06	20	39.22
Actinic Keratoses ¹	21	10.29	9	5.52	5	9.80
Basal Cell Epithelioma	14	6.86	7	4.29	0	0.00
Stasis Dermatitis	2	0.98	5	3.07	0	0.00
Peyronie's Disease ⁴	2	1.47	0	0.00	1	1.96
Folliculitis	9	4.41	14	8.59	3	5.88
Hirsutism	11	5.39	3	1.84	1	1.96
"Nervousness"/Anxiety Depression	33	16.18	19	11.66	6	11.76
Decreased Libido (H/O) ²	39	19.12	11	6.75	9	17.65
Impotence, NOS (H/O)	17	8.33	4	2.45	2	3.92

TABLE 14 CONTINUED

Key to p Values

1	$p < 0.0001$	Age-adjusted comparison of exposed to not exposed
2	$0.01 < p < 0.05$	Age-adjusted comparison of exposed to not exposed
3	$0.0001 < p < 0.001$	Age-adjusted comparison of exposed to not exposed
4	$0.05 < p < 0.10$	Age-adjusted comparison of exposed to not exposed

TABLE 15
Significant Clinical Findings
In Relation to Exposure Status by Age

Finding	Age < 50				Age ≥ 50			
	Exposed (n=51)		Not Exposed (N=100)		Exposed (n=153)		Not Exposed (n=63)	
	#	%	#	%	#	%	#	%
Chloracne	23	45.10	0	0.00	84	54.90	0	0.00
Acne Vulgaris ^{1,2}	4	7.84	18	18.00	0	0.00	1	1.59
Actinic Elastosis ^{3,4}	19	37.25	18	18.00	101	66.01	31	49.21
Actinic Keratoses ⁵	2	3.92	1	1.00	19	12.42	8	12.70
Basal Cell Epithelioma ⁵	1	1.96	0	0.00	13	8.50	7	11.11
Stasis Dermatitis ⁶	1	1.96	0	0.00	1	0.65	5	7.94
Peyronie's Disease	0	0.00	0	0.00	3	1.96	0	0.00
Folliculitis ^{1,6}	7	13.73	13	13.00	2	1.31	1	1.59
Hirsutism	2	3.92	1	1.00	9	5.88	2	3.17
"Nervousness"/Anxiety ⁸	4	7.84	15	15.00	29	18.95	4	6.35
Depression	1	1.96	0	0.00	0	0.00	0	0.00
Decreased Libido (H/O) ^{7,9}	4	7.84	1	1.00	35	22.88	10	15.87
Impotence, NOS (H/O) ^{6,8}	1	1.96	0	0.00	16	10.46	4	6.35

TABLE 15 CONTINUED
Key to p Values

1	$0.001 < p < 0.01$	In exposed, young vs. old
2	$0.001 < p < 0.01$	In not exposed, young vs. old
3	$0.0001 < p < 0.001$	In exposed, young vs. old
4	$p < 0.0001$	In not exposed, young vs. old
5	$0.001 < p < 0.01$	In not exposed, young vs. old
6	$0.01 < p < 0.05$	In not exposed, young vs. old
7	$0.0001 < p < 0.001$	In not exposed, young vs. old
8	$0.05 < p < 0.10$	In exposed, young vs. old
9	$0.01 < p < 0.05$	In exposed, young vs. old

TABLE 16
Significant Clinical Findings
In Relation to Chloracne Status in Exposed Only

Finding	History Only (n=69)		Current (n=107)		No History (n=28)	
	#	%	#	%	#	%
Acne Vulgaris ¹	1	1.45	0	0.00	3	10.71
Actinic Elastosis ^{1,2}	32	46.38	80	74.77	8	28.57
Actinic Keratoses	8	11.59	10	9.35	3	10.71
Basal Cell Epithelioma	4	5.80	9	8.41	1	3.57
Stasis Dermatitis	1	1.45	1	0.93	0	0.00
Peyronie's Disease	2	2.90	1	0.93	0	0.00
Folliculitis	6	8.70	1	0.93	2	7.14
Hirsutism ²	0	0.00	11	10.28	0	0.00
"Nervousness"/Anxiety Depression	9	13.04	20	18.69	4	14.29
Decreased Libido (H/O)	13	18.84	20	18.69	6	21.43
Impotence, NOS (H/O)	6	8.70	10	9.35	1	3.57

¹ 0.01 < p < 0.05

In age < 50

² 0.001 < p < 0.01

In age ≥ 50

TABLE 17
Significant Clinical Findings
In Relation to Chloracne Status in Exposed Only by Age

Finding	Age < 50						Age ≥ 50					
	History only		Current		No History		History only		Current		No History	
	n=16		n=23		n=12		n=53		n=84		n=16	
	#	%	#	%	#	%	#	%	#	%	#	%
Acne Vulgaris	1	6.25	0	0.00	3	25.00	0	0.00	0	0.00	0	0.00
Actinic Elastosis ^{1,2}	5	31.25	13	56.25	1	8.33	27	50.94	67	79.76	7	43.75
Actinic Keratoses	0	0.00	1	4.35	1	8.33	8	15.09	9	10.71	2	12.50
Basal Cell Epithelioma	1	6.25	0	0.00	0	0.00	3	5.66	9	10.71	1	6.25
Stasis Dermatitis	1	6.25	0	0.00	0	0.00	0	0.00	1	1.19	0	0.00
Peyronie's Disease	0	0.00	0	0.00	0	0.00	2	3.77	1	1.19	0	0.00
Folliculitis ³	4	25.00	1	4.35	2	16.67	2	3.77	0	0.00	0	0.00
Hirsutism	0	0.00	2	8.70	0	0.00	0	0.00	9	10.71	0	0.00
"Nervousness"/Anxiety Depression	1	6.25	3	13.04	0	0.00	8	15.09	17	20.24	4	25.00
Decreased Libido (H/O) ⁴	2	12.50	2	8.70	0	0.00	11	20.75	18	21.43	6	37.50
Impotence, NOS (H/O)	0	0.00	1	4.35	0	0.00	6	11.32	9	10.71	1	6.25

¹ 0.01 < p < 0.05

² 0.05 < p < 0.10

In current chloracne, young vs. old

In no history chloracne, young vs. old

³ 0.01 < p < 0.05

⁴ 0.01 < p < 0.05

In history only chloracne, young vs. old

In no history chloracne, young vs. old

TABLE 18
DISTRIBUTION AND SEVERITY OF CHLORACNE

Distribution of Chloracne and Chloracne Scars
in Exposed Group by Site

(n=204)

<u>Site</u>	<u>Residual Chloracne</u>		<u>Chloracne Scars</u>	
	#	%	#	%
Face	98	48.04	13	6.37
Neck	17	8.33	9	4.41
Extremities	4	1.96	0	0.00
Trunk	18	8.82	6	2.94
Genitals	15	7.35	0	0.00
Face (only)	67	32.84	10	4.90
Neck (only)	3	1.47	5	2.45
Face and Neck (only)	8	3.92	1	0.49
Face and Trunk (only)	5	2.45	2	0.98
Face, Trunk and Genitals (only)	2	0.98	0	0.00
Extremities (only)	0	0.00	0	0.00
Trunk (only)	4	1.96	1	0.49
Genitals (only)	1	0.49	0	0.00
Scars (only)	8	3.92	0	0.00

Severity of Chloracne

(n=107)

<u>Mild</u>		<u>Moderate</u>		<u>Severe</u>	
#	%	#	%	#	%
67	62.62	36	33.96	4	3.77

TABLE 19
DISTRIBUTION AND SEVERITY OF ACTINIC ELASTOSIS

Distribution of Actinic Elastosis by Site

<u>SITE</u>	<u>EXPOSED</u> (n=204)		<u>NOT EXPOSED</u> (n=163)		<u>QUESTIONABLE EXPOSURE</u> (n=51)	
	#	%	#	%	#	%
Face	113	55.39	46	28.22	18	35.29
Neck	57	27.94	21	12.88	8	15.69
Arms and Hands	9	4.41	4	2.45	3	5.88
Trunk	1	0.49	0	0.00	0	0.00
Face (only)	62	30.39	27	16.56	11	21.57
Neck (only)	7	3.43	3	1.84	2	3.92
Face and Neck (only)	42	20.59	15	9.20	4	7.84
Face and Trunk (only)	1	0.49	0	0.00	0	0.00
Arms and Hands (only)	0	0.00	0	0.00	0	0.00
Trunk (only)	0	0.00	0	0.00	0	0.00

Severity of Actinic Elastosis
(n=189)

<u>MILD</u>		<u>MODERATE</u>		<u>SEVERE</u>	
#	%	#	%	#	%
67	35.44	81	43.09	41	21.81

237795

TABLE 20

SEVERITY OF CHLORACNE IN PRESENCE
OF ACTINIC ELASTOSIS

	<u>MILD</u>		<u>MODERATE</u>		<u>SEVERE</u>		<u>TOTAL</u>
	#	%	#	%	#	%	
Actinic Elastosis and Chloracne	44	55.00	33	41.25	3	3.75	80
Chloracne Only	<u>23</u>	85.18	<u>3</u>	11.11	<u>1</u>	3.70	<u>27</u>
TOTAL	67		36		4		107

 $0.01 < p < 0.05$

TABLE 21

SEVERITY OF ACTINIC ELASTOSIS IN PRESENCE
OF CHLORACNE

	<u>MILD</u>		<u>MODERATE</u>		<u>SEVERE</u>		<u>TOTAL</u>
	#	%	#	%	#	%	
Actinic Elastosis and Chloracne	18	22.50	35	43.75	27	33.75	80
Actinic Elastosis Only	<u>49</u>	44.95	<u>46</u>	42.20	<u>14</u>	12.84	<u>109</u>
TOTAL	67		81		41		189

 $p < 0.005$

237797

TABLE 22
BLOOD PRESSURE
(Normal <140/90 for Subjects ≤59,
<160/95 for Subjects ≥60)

<u>Exposure Category</u>		<u>Systolic</u>		<u>Diastolic</u>	
		<u>Normal</u>	<u>Abnormal</u>	<u>Normal</u>	<u>Abnormal</u>
EXPOSED (n=202)	#	145	57	153	49
	%	71.78	28.22	75.74	24.26
QUESTIONABLY EXPOSED (n=49)	#	41	8	39	10
	%	83.67	16.33	79.59	20.41
NOT EXPOSED (n=161)	#	122	39	132	29
	%	75.78	24.22	81.99	18.01

Systolic Pressure: p = ns for comparison of exposed to not exposed.

Diastolic Pressure: p = ns for comparison of exposed to not exposed.

TABLE 23
EXPOSURE
vs.
SERUM LIPIDS

<u>Serum Lipid</u>	<u>Exposed</u>		<u>Not Exposed</u>	
	<u>n</u>	<u>#(%Abnormal)</u>	<u>n</u>	<u>#(%Abnormal)</u>
Cholesterol	200	15(7.50)	163	17(10.43)
Triglycerides	200	29(14.50)	163	31(19.02)
LDL, estimated	196	15(7.65)	159	10(6.29)
HDL	200	19(9.50)	163	17(10.43)

237789

Probability

Questionable
Exposure

n

#(%Abnormal)

N.S.

49

13(26.53)

N.S.

49

11(22.45)

N.S.

47

9(19.15)

N.S.

49

4(8.16)

TABLE 24

EXPOSURE

vs.

SERUM LIPIDS BY SMOKING STATUS*

Serum Lipid	Smoking Status	Exposed		Not Exposed		Probability	Questionable Exposure	
		n	#(%)Abnormal	n	#(%)Abnormal		n	#(%)Abnormal
Cholesterol	Never	45	3(6.67)	47	5(10.64)	N.S.	17	3(17.65)
	Former	83	7(8.43)	72	6(8.33)	N.S.	21	7(33.33)
	Present	71	5(7.04)	44	6(13.64)	N.S.	11	3(27.27)
Triglycerides	Never	45	8(17.78)	47	8(17.02)	N.S.	17	3(17.65)
	Former	83	11(13.25)	72	14(19.44)	N.S.	21	7(33.33)
	Present	71	10(14.08)	44	9(20.45)	N.S.	11	1(9.09)
LDL, estimated	Never	43	3(6.98)	46	3(6.52)	N.S.	17	3(17.65)
	Former	83	6(7.23)	70	1(1.43)	N.S.	19	4(21.05)
	Present	69	6(8.70)	43	6(13.95)	N.S.	11	2(18.18)
HDL	Never	45	4(8.89)	47	5(10.64)	N.S.	17	3(17.65)
	Former	83	8(9.64)	72	5(6.94)	N.S.	21	1(4.76)
	Present	71	7(9.86)	44	7(15.91)	N.S.	11	0(0.00)

* When pack years were considered there were no significant differences in all of the lipid parameters.

TABLE 25

CHLORACNE STATUS IN EXPOSED ONLY

vs.

SERUM LIPIDS

Serum Lipid	History Only		Current		No History	
	n	#(%)Abnormal	n	#(%)Abnormal	n	#(%)Abnormal
Cholesterol	67	8(11.94)	105	5(4.76)	28	2(7.14)
Triglycerides	67	5(7.46)	105	20(19.05)	28	4(14.29)
LDL, estimated ¹	66	10(15.15)	103	3(2.91)	27	2(7.41)
HDL ²	67	2(2.99)	105	15(14.29)	28	2(7.14)

1 = $p < 0.015$ 2 = $p < 0.05$

TABLE 26
CHLORACNE STATUS IN EXPOSED ONLY
vs.
SERUM LIPIDS BY SMOKING STATUS

Serum Lipid	Smoking Status	History Only		Current		No History	
		n	#(%) Abnormal	n	#(%) Abnormal	n	#(%) Abnormal
Cholesterol	Never	18	2(11.11)	16	0(0.00)	11	1(9.09)
	Former	31	3(9.68)	42	3(7.14)	10	1(10.00)
	Present	18	3(16.67)	47	2(4.26)	6	0(0.00)
Triglyceride	Never	18	3(16.67)	16	2(12.50)	11	3(27.27)
	Former ¹	31	1(3.23)	42	9(21.43)	10	1(10.00)
	Present	18	1(5.56)	47	9(19.15)	6	0(0.00)
LDL, estimated	Never	18	2(11.11)	15	0(0.00)	10	1(10.00)
	Former	31	3(9.68)	42	2(4.76)	10	1(10.00)
	Present ²	17	5(29.41)	46	1(2.17)	6	0(0.00)
HDL	Never	18	0(0.00)	16	2(12.50)	11	2(18.18)
	Former ¹	31	1(3.23)	42	7(16.67)	10	0(0.00)
	Present	18	1(5.56)	47	6(12.77)	6	0(0.00)

¹ 0.05 < p < 0.10

² 0.001 < p < 0.01

TABLE 27

EXPOSURE
vs.
PULMONARY TEST FINDINGS

Pulmonary Function Parameter	Exposed (n=203) # (%) Abnormal	Not Exposed (n=162) # (%) Abnormal	Probability	Questionable Exposure (n=51) # (%) Abnormal
FEV ₁	32 15.76	4 4.94	0.0001	5 9.80
FVC	35 17.24	11 6.79	0.0038	11 21.57
FEV ₁ /FVC	32 15.76	8 4.94	0.0013	3 5.88
MMEFR	47 23.15	18 11.11	0.0038	13 25.49

1 0.0001 p < 0.001
2 0.0001 p < 0.001

TABLE 28

EXPOSURE

vs.

PULMONARY TEST FINDINGS BY SMOKING STATUS

Pulmonary Function Parameter	Smoking Status	Exposed		Not Exposed		Probability	Questionable Exposure	
		n	#(%)Abnormal	n	#(%)Abnormal		n	#(%)Abnormal
FEV ₁	Never	45	3(6.67)	47	3(6.38)	N.S.	18	0(0.00)
	Former	84	10(11.90)	71	3(4.23)	N.S.	21	3(14.29)
	Present	73	19(26.03)	44	2(4.55)	0.0044	12	2(16.67)
FVC	Never	45	3(6.67)	47	6(12.77)	N.S.	18	2(11.11)
	Former	84	14(16.67)	71	4(5.63)	0.0551	21	6(28.57)
	Present	73	18(24.66)	44	1(2.27)	0.0015	12	3(25.00)
FEV ₁ /FVC	Never	45	3(6.67)	47	1(2.13)	N.S.	18	0(0.00)
	Former	84	11(13.10)	71	4(5.63)	N.S.	21	2(9.52)
	Present	73	18(24.66)	44	3(6.82)	0.0229	12	1(8.33)
MMEFR	Never	45	4(8.89)	47	3(6.38)	N.S.	18	1(5.56)
	Former	84	17(20.24)	71	10(14.08)	N.S.	21	6(28.57)
	Present	73	26(35.62)	44	5(11.36)	0.0059	12	6(50.00)

237504

TABLE 29

EXPOSURE

vs.

ECG FINDINGS

FindingExposed
(n=204)
%

Normal ECG	69	33.82
Negative ECG*	80	39.22
Sinus Bradycardia	11	5.39
Sinus Tachycardia	2	0.98
PVC's	17	8.33
PAC's	5	2.45
Atrial Fibrillation	1	0.49
Intraventricular Conduction Defect	5	2.45
Left Anterior Hemiblock	11	5.39
1st Degree AV Block	4	1.96
Right Bundle Branch Block, complete	6	2.94
Left Bundle Branch Block, complete	2	0.98
Old Anterior Myocardial Infarct	3	1.47
Old Inferior Myocardial Infarct	7	3.43
True Posterior Myocardial Infarct	2	0.98
Digitalis Effect	2	0.98

* Normal or not significant findings

Not Exposed
(n=163)

#	%
71	43.56
43	26.38
5	3.07
1	0.61
4	2.45
4	2.45
1	0.61
1	0.61
4	2.45
2	1.23
2	1.23
1	0.61
2	1.23
2	1.23
1	0.61
1	0.61

Questionable Exposure
(n=51)

#	%
14	27.45
15	29.41
2	3.92
1	1.96
0	0.00
1	1.96
0	0.00
1	1.96
2	3.92
1	1.96
0	0.00
0	0.00
2	3.92
3	5.88
0	0.00
0	0.00

TABLE 29 CONTINUED

EXPOSURE
vs.
ECG FINDINGS

Finding	Exposed (n=204)		Not Exposed (n=163)		Questionable Exposure (n=51)	
	#	%	#	%	#	%
Left Ventricular Hypertrophy	6	2.94	5	3.07	1	1.96
Right Ventricular Hypertrophy	1	0.49	0	0.00	0	0.00
Left Atrial Hypertrophy	2	0.98	0	0.00	0	0.00
Non-specific ST-T Wave Changes	9	4.41	5	3.07	2	3.92
Low Voltage QRS	1	0.49	0	0.00	0	0.00
Abnormal P Wave	9	4.41	4	2.45	1	1.96
Left Axis Deviation	1	0.49	2	1.23	0	0.00

TABLE 30
EXPOSURE
vs.
ECG FINDINGS BY AGE

Finding	Age < 50				Age ≥ 50			
	Exposed (n=51)		Not Exposed (n=100)		Exposed (n=153)		Not Exposed (n=63)	
	#	%	#	%	#	%	#	%
Normal ECG ¹	22	43.14	57	57.00	47	30.72	14	22.22
Negative ECG* ^{2,1}	38	74.51	88	88.00	86	56.21	32	50.79
Sinus Bradycardia	1	1.96	2	2.00	10	6.54	3	4.76
Sinus Tachycardia	1	1.96	0	0.00	1	0.65	1	1.59
PVC's ³	1	1.96	1	1.00	16	10.46	3	4.76
PAC's ⁴	0	0.00	0	0.00	5	3.27	4	6.35
Atrial Fibrillation	0	0.00	0	0.00	1	0.65	1	1.59
Intraventricular Conduction Defect	1	1.96	0	0.00	4	2.61	1	1.59
Left Anterior Hemiblock	3	5.88	2	2.00	8	5.23	2	3.17
1 st Degree AV Block	2	3.92	0	0.00	2	1.31	2	3.17
Right Bundle Branch Block, complete	1	1.96	0	0.00	5	3.27	2	3.17
Left Bundle Branch Block, complete	0	0.00	1	1.00	2	1.31	0	0.00
Old Anterior Myocardial Infarct	0	0.00	0	0.00	3	1.96	2	3.17
Old Inferior Myocardial Infarct	0	0.00	0	0.00	7	4.58	2	3.17
True Posterior Myocardial Infarct	1	1.96	0	0.00	1	0.65	1	1.59
Digitalis Effect	0	0.00	0	0.00	2	1.31	1	1.59

* Normal or not significant findings

TABLE 30 CONTINUED

EXPOSURE
vs.
ECG FINDINGS BY AGE

Finding	Age < 50				Age ≥ 50			
	Exposed (n=51)		Not Exposed (n=100)		Exposed (n=153)		Not Exposed (n=63)	
	#	%	#	%	#	%	#	%
Left Ventricular Hypertrophy	0	0.00	1	1.00	6	3.92	4	6.35
Right Ventricular Hypertrophy	0	0.00	0	0.00	1	0.65	0	0.00
Left Atrial Hypertrophy	1	1.96	0	0.00	1	0.65	0	0.00
Non-Specific ST-T Wave Changes	1	1.96	2	2.00	8	5.23	3	4.76
Low Voltage QRS	0	0.00	0	0.00	1	0.65	0	0.00
Abnormal P Wave ⁴	2	3.92	0	0.00	7	4.58	4	6.35
Left Axis Deviation	0	0.00	1	1.00	1	0.65	1	1.59

¹ $p < 0.0001$

² $0.01 < p < 0.05$

³ $0.05 < p < 0.10$

⁴ $0.01 < p < 0.05$

For not exposed, young vs. old

For exposed, young vs. old

For exposed, young vs. old

For not exposed, young vs. old

Finding

Normal Chest X-Ray

Evidence, Old Granulomatous Disease

Evidence, Arteriosclerosis

Evidence, Degenerative Bone Disease

Cardiomegaly

Mass

Chronic Obstructive Pulmonary Disease (COPD)

Aortic Aneurysm

Pulmonary Hypertension

Blunted Costophrenic Angle

Acute Parenchymal Disease

Elevated Hemi-diaphragms

Pleural Thickening

Parenchymal Scarring

Possible Mass

Aortic Valve Disease

Trauma

TABLE 31

EXPOSURE

VS.

CHEST X-RAY FINDINGS

Exposed (n=204)		Not Exposed (n=163)		Questionable Exposure (n=51)	
#	%	#	%	#	%
94	46.08	110	67.48	36	70.59
60	29.41	23	14.11	9	17.65
23	11.27	12	7.36	1	1.96
15	7.35	4	2.45	2	3.92
8	3.92	2	1.23	0	0.00
5	2.45	3	1.84	1	1.96
9	4.41	3	1.84	1	1.96
1	0.49	0	0.00	1	1.96
0	0.00	1	0.61	0	0.00
20	9.80	9	5.52	2	3.92
0	0.00	1	0.61	0	0.00
5	2.45	1	0.61	2	3.92
15	7.35	5	3.07	1	1.96
13	6.37	9	5.52	0	0.00
6	2.94	7	4.29	2	3.92
0	0.00	1	0.61	0	0.00
2	0.98	3	1.84	0	0.00

TABLE 32

EXPOSURE

vs.

CHEST X-RAY FINDINGS BY AGE

Finding	Age < 50				Age ≥ 50			
	Exposed (n=51)		Not Exposed (n=100)		Exposed (n=153)		Not Exposed (n=63)	
	#	%	#	%	#	%	#	%
Normal Chest X-Ray ^{1,2}	42	82.35	82	82.00	52	33.99	28	44.44
Evidence, Old Granulomatous Disease ^{3,4}	6	11.76	9	9.00	54	35.29	14	22.22
Evidence, Arteriosclerosis ^{2,3}	0	0.00	0	0.00	23	15.03	12	19.05
Evidence, Degenerative Bone Disease ^{4,5}	0	0.00	0	0.00	15	9.80	4	6.35
Cardiomegaly	0	0.00	0	0.00	8	5.23	2	3.17
Mass	1	1.96	2	2.00	4	2.61	1	1.59
Chronic Obstructive Pulmonary Disease (COPD)	2	3.92	0	0.00	7	4.58	3	4.76
Aortic Aneurysm	0	0.00	0	0.00	1	0.65	0	0.00
Pulmonary Hypertension	0	0.00	0	0.00	0	0.00	1	1.59
Blunted Costophrenic Angle	3	5.88	3	3.00	17	11.11	6	9.52
Acute Parenchymal Disease	0	0.00	0	0.00	0	0.00	1	1.59
Elevated Hemi-diaphragms	0	0.00	0	0.00	5	3.27	1	1.59
Pleural Thickening ⁵	0	0.00	2	2.00	15	9.80	3	4.76
Parenchymal Scarring ⁴	1	1.96	2	2.00	12	7.84	7	11.11
Possible Mass	0	0.00	3	3.00	6	3.92	4	6.35
Aortic Valve Disease	0	0.00	1	1.00	0	0.00	0	0.00
Trauma	0	0.00	1	1.00	2	1.31	2	3.17

TABLE 32 CONTINUED

Key to p Values.

< 50 vs. ≥ 50 Years

- | | | |
|---|--------------------|--------------------------------|
| 1 | $p < 0.0001$ | For exposed, young vs. old |
| 2 | $p < 0.0001$ | For not exposed, young vs. old |
| 3 | $0.001 < p < 0.01$ | For exposed, young vs. old |
| 4 | $0.01 < p < 0.05$ | For not exposed, young vs. old |
| 5 | $0.01 < p < 0.05$ | For exposed, young vs. old |

TABLE 33

CLINICAL LABORATORY FINDINGS

vs.

EXPOSURE STATUS

	Exposed		Not Exposed		Questionable Exposure	
	<u>n</u>	<u>#(%Abnormal)</u>	<u>n</u>	<u>#(%Abnormal)</u>	<u>n</u>	<u>#(%Abnormal)</u>
<u>BLOOD</u>						
Calcium	197	0(0.00)	161	0(0.00)	49	2(4.08)
Phosphorus	190	3(1.58)	154	4(2.60)	46	2(4.35)
BUN	197	8(4.06)	161	5(3.11)	49	1(2.04)
Creatinine	196	2(1.02)	160	1(0.63)	49	3(6.12)
Uric Acid	197	12(6.09)	160	7(4.38)	49	2(4.08)
Glucose (CS)	190	14(7.37)	154	5(3.25)	47	3(6.38)
Total Protein	197	1(0.51)	160	1(0.63)	49	0(0.00)
Albumin	197	0(0.00)	160	0(0.00)	49	0(0.00)
Globulin	197	0(0.00)	160	0(0.00)	49	0(0.00)
Albumin/Globulin ratio	197	2(1.02)	161	0(0.00)	49	0(0.00)
Total Bilirubin ¹	197	2(1.02)	161	7(4.35)	48	1(2.08)
Direct Bilirubin ²	197	9(4.57)	161	18(11.18)	49	6(12.24)
Transaminase, SGO	190	8(4.21)	154	3(1.95)	47	1(2.13)
Transaminase, SGP	190	8(4.21)	154	5(3.25)	46	1(2.17)
Alkaline Phosphatase	197	4(2.03)	161	3(1.86)	49	1(2.04)
LDH	190	12(6.32)	154	4(2.60)	47	0(0.00)
Iron	197	2(1.02)	161	2(1.24)	48	0(0.00)

TABLE 33 CONTINUED
CLINICAL LABORATORY FINDINGS
vs.
EXPOSURE STATUS

	<u>n</u>	<u>Exposed</u> <u>#(%Abnormal)</u>	<u>n</u>	<u>Not Exposed</u> <u>#(%Abnormal)</u>	<u>Questionable</u> <u>Exposure</u> <u>#(%Abnormal)</u>	
Sodium	197	2(1.02)	161	2(1.24)	49	0(0.00)
Potassium	190	2(1.05)	154	0(0.00)	47	1(2.13)
Chloride	197	1(0.51)	160	3(1.88)	49	0(0.00)
G-glutamyl transpeptidase	197	8(4.06)	161	6(3.73)	49	6(12.24)
Thyroxine binding globulins	198	51(25.76)	161	53(32.92)	49	16(32.65)
<u>CBC</u>						
WBC	197	7(3.55)	160	7(4.38)	49	1(2.04)
RBC	197	0(0.00)	160	1(0.63)	49	0(0.00)
HGB	197	15(7.61)	160	10(6.25)	49	3(6.12)
HCT	197	25(12.69)	160	17(10.63)	49	11(22.45)
MCHC ³	197	67(34.01)	160	30(18.75)	49	14(28.57)
MCH	197	23(11.68)	160	13(8.13)	49	7(14.29)
MCV ¹	197	79(40.10)	160	49(30.63)	49	20(40.82)
<u>Differential</u>						
Poly	197	4(2.03)	160	3(1.88)	49	1(2.04)
Lymph	197	5(2.54)	160	2(1.25)	49	0(0.00)
Mono	197	1(0.51)	159	2(1.26)	49	0(0.00)
Eos	197	3(1.52)	160	3(1.88)	49	0(0.00)
Baso	197	0(0.00)	160	1(0.63)	49	0(0.00)

TABLE 33 CONTINUED
CLINICAL LABORATORY FINDINGS
vs.
EXPOSURE STATUS

	<u>n</u>	<u>Exposed</u> <u>#(%Positive)</u>	<u>n</u>	<u>Not Exposed</u> <u>#(%Positive)</u>	<u>Questionable</u> <u>Exposure</u> <u>#(%Positive)</u>	
<u>Urinalysis</u>						
Acetone	196	0(0.00)	159	1(0.63)	49	0(0.00)
Albumin	196	2(1.02)	159	0(0.00)	49	0(0.00)
Bacteria	196	11(5.61)	159	13(8.18)	49	0(0.00)
Blood	196	2(1.02)	159	2(1.26)	49	0(0.00)
Epithelial Cells	196	68(34.69)	159	44(27.67)	49	12(24.39)
Glucose	196	2(1.02)	159	2(1.26)	49	0(0.00)
White Blood Cells	196	3(1.53)	159	4(2.52)	49	2(4.08)

1 0.05 < p < 0.10 for exposed vs. not exposed

2 0.01 < p < 0.05 for exposed vs. not exposed

3 0.001 < p < 0.01 for exposed vs. not exposed

TABLE 34

CLINICAL LABORATORY FINDINGS

vs.

CHLORACNE STATUS IN EXPOSED ONLY

	<u>History Only</u>		<u>Current</u>		<u>No History</u>	
	<u>n</u>	<u>#(%Abnormal)</u>	<u>n</u>	<u>#(%Abnormal)</u>	<u>n</u>	<u>#(%Abnormal)</u>
<u>BLOOD</u>						
Calcium	69	0(0.00)	102	0(0.00)	26	0(0.00)
Phosphorus	69	0(0.00)	98	1(1.02)	26	2(7.69)
BUN	69	4(5.80)	102	4(3.92)	26	0(0.00)
Creatinine	69	1(1.45)	101	1(0.99)	26	0(0.00)
Uric Acid ¹	69	1(1.45)	102	7(6.86)	26	4(15.38)
Glucose (CS)	66	6(9.09)	98	7(7.14)	26	1(3.85)
Total Protein	69	1(1.45)	102	0(0.00)	26	0(0.00)
Albumin	69	0(0.00)	102	0(0.00)	26	0(0.00)
Globulin	69	0(0.00)	102	0(0.00)	26	0(0.00)
Albumin/Globulin ratio	69	0(0.00)	102	2(1.96)	26	0(0.00)
Total Bilirubin	69	2(2.90)	102	0(0.00)	26	0(0.00)
Direct Bilirubin	69	4(5.80)	102	5(4.90)	26	0(0.00)
Transaminase, SGO	66	5(7.58)	98	2(2.04)	26	1(3.85)
Transaminase, SGP	66	5(7.58)	98	2(2.04)	26	1(3.85)
Alkaline Phosphatase	69	1(1.45)	102	3(2.94)	26	0(0.00)
LDH	66	3(4.55)	98	8(8.16)	26	1(3.85)
Iron	69	0(0.00)	102	2(1.96)	26	0(0.00)
Sodium	69	0(0.00)	102	2(1.96)	26	0(0.00)

TABLE 34 CONTINUED
CLINICAL LABORATORY FINDINGS

vs.
CHLORACNE STATUS IN EXPOSED ONLY

	<u>History Only</u>		<u>Current</u>		<u>No History</u>	
	<u>n</u>	<u>#(%Abnormal)</u>	<u>n</u>	<u>#(%Abnormal)</u>	<u>n</u>	<u>#(%Abnormal)</u>
Potassium	66	1(1.52)	98	0(0.00)	26	1(3.85)
Chloride	69	0(0.00)	102	1(0.98)	26	0(0.00)
G-glutamyl transpeptidase	69	2(2.90)	102	5(4.90)	26	1(3.85)
Thyroxine binding globulins	69	16(23.19)	102	27(26.47)	27	8(29.63)
<u>CBC</u>						
WBC	69	1(1.45)	101	6(5.94)	27	0(0.00)
RBC	69	0(0.00)	101	0(0.00)	27	0(0.00)
HGB	69	5(7.25)	101	7(6.93)	27	3(11.11)
HCT	69	10(14.49)	101	12(11.80)	27	3(11.11)
MCHC	69	30(43.48)	101	32(31.68)	27	5(18.52)
MCH	69	6(8.70)	101	14(13.86)	27	3(11.11)
MCV	69	27(39.13)	101	45(44.55)	27	7(25.93)
<u>Differential</u>						
Poly	69	2(2.90)	101	2(1.98)	27	0(0.00)
Lymph	69	4(5.80)	101	1(0.99)	27	0(0.00)
Mono	69	0(0.00)	101	1(0.99)	27	0(0.00)
Eos	69	1(1.45)	101	1(0.99)	27	1(3.70)
Baso	69	0(0.00)	101	0(0.00)	27	0(0.00)

TABLE 34 CONTINUED
CLINICAL LABORATORY FINDINGS
vs.
CHLORACNE STATUS IN EXPOSED ONLY

	<u>History Only</u>		<u>Current</u>		<u>No History</u>	
	<u>n</u>	<u>#(%Positive)</u>	<u>n</u>	<u>#(%Positive)</u>	<u>n</u>	<u>#(%Positive)</u>
<u>Urinalysis</u>						
Acetone	68	0(0.00)	101	0(0.00)	27	0(0.00)
Albumin	68	0(0.00)	101	1(0.99)	27	1(3.70)
Bacteria	68	5(7.35)	101	2(1.98)	27	4(14.81)
Blood	68	1(1.47)	101	1(0.99)	27	0(0.00)
Epithelial Cells	68	26(38.24)	101	36(35.64)	27	6(22.22)
Glucose	68	2(2.94)	101	0(0.00)	27	0(0.00)
White Blood Cells	68	1(1.47)	101	2(1.98)	27	0(0.00)

¹ 0.01 < p < 0.05 for history only vs. current vs. no history

TABLE 35

URINE COPROPORPHYRIN*

	<u>Low</u> (<30 mcg/l)		<u>Normal</u> (30-240 mcg/l)		<u>High</u> (>240 mcg/l)	
	#	%	#	%	#	%
EXPOSED (n=197)	6	3.05	185	93.91	6	3.05
QUESTIONABLY EXPOSED (n=49)	0	0.00	48	97.96	1	2.04
NOT EXPOSED (n=161)	1	0.62	154	95.65	6	3.73

p = ns for comparison of exposed to not exposed.

URINE UROPORPHYRINS

	<u>Low</u> (<15 mcg/l)		<u>Normal</u> (15-60 mcg/l)		<u>High</u> (>60 mcg/l)	
	#	%	#	%	#	%
EXPOSED (n=196)	8	4.08	140	71.43	48	24.49
QUESTIONABLY EXPOSED (n=49)	2	4.08	42	85.71	5	10.20
NOT EXPOSED (n=161)	6	3.73	122	75.78	33	20.50

p = ns for comparison of exposed to not exposed.

* The values for coproporphyrin and uroporphyrin were from a single void sample.

TABLE 36

MEAN NERVE CONDUCTION PARAMETER VALUES
FOR THE THREE EXPOSURE CATEGORIES
(Not Adjusted for Age)

NERVE	PARAMETER	EXPOSED	NOT EXPOSED	QUESTIONABLE EXPOSURE
		$\bar{x} \pm s$ (n)	$\bar{x} \pm s$ (n)	$\bar{x} \pm s$ (n)
Ulnar	Nerve Conduction Velocity	56.90 $\pm$ 7.43 (9)	60.07 $\pm$ 8.44 (10)	52.12 $\pm$ 1.53 (2)
	Latency	3.30 $\pm$ 1.08 (9)	3.07 $\pm$ 0.68 (9)	2.55 $\pm$ 0.11 (2)
	Amplitude Ratio	1.04 $\pm$ 0.18 (9)	0.91 $\pm$ 0.19 (10)	1.01 $\pm$ 0.12 (2)
Peroneal	Nerve Conduction Velocity	41.08 $\pm$ 5.63 (160)	43.45 $\pm$ 5.96 (134)	42.55 $\pm$ 5.16 (42)
	Latency	4.07 $\pm$ 1.21 (160)	4.12 $\pm$ 1.04 (134)	4.31 $\pm$ 1.18 (42)
	Amplitude Ratio	0.86 $\pm$ 0.23 (160)	0.92 $\pm$ 0.16 (134)	0.93 $\pm$ 0.16 (42)
Sural	Nerve Conduction Velocity	41.27 $\pm$ 6.50 (150)	42.42 $\pm$ 4.97 (128)	40.90 $\pm$ 4.41 (41)
	Latency	4.84 $\pm$ 0.59 (150)	4.62 $\pm$ 0.68 (128)	4.63 $\pm$ 0.59 (41)
	Amplitude	1.91 $\pm$ 1.07 (150)	2.51 $\pm$ 1.31 (128)	2.07 $\pm$ 1.06 (41)

TABLE 37

MEAN NERVE CONDUCTION PARAMETER VALUES
FOR THE TWO EXPOSURE CATEGORIES
(Adjusted for Age)

<u>NERVE</u>	<u>PARAMETER</u>	<u>EXPOSED</u>	<u>NOT EXPOSED</u>	<u>P</u>
		$\bar{x} \pm s (n)$	$\bar{x} \pm s (n)$	
Ulnar	Nerve Conduction Velocity	$-0.14 \pm 0.92 (9)$	$0.26 \pm 1.13 (10)$	ns
	Latency	$0.20 \pm 1.18 (9)$	$-0.13 \pm 0.94 (9)$	ns
	Amplitude Ratio	$0.35 \pm 0.95 (9)$	$-0.35 \pm 1.05 (10)$	ns
Peroneal	Nerve Conduction Velocity	$-0.06 \pm 0.99 (160)$	$0.04 \pm 1.07 (134)$	ns
	Latency	$-0.09 \pm 1.05 (160)$	$0.06 \pm 0.92 (134)$	ns
	Amplitude Ratio	$-0.10 \pm 1.15 (160)$	$0.05 \pm 0.83 (134)$	ns
Sural	Nerve Conduction Velocity	$0.06 \pm 1.17 (150)$	$-0.04 \pm 0.85 (128)$	ns
	Latency	$0.11 \pm 0.95 (150)$	$-0.06 \pm 1.07 (128)$	ns
	Amplitude	$-0.07 \pm 0.93 (150)$	$0.09 \pm 1.09 (128)$	ns

TABLE 38
EXPOSURE VS. OUT-OF-RANGE NERVE
CONDUCTION PARAMETER VALUES
(Not Adjusted for Age)

NERVE	PARAMETER	EXPOSED			NOT EXPOSED			P	Q.E.	
		(n)	Low (%)	Normal (%)	High (%)	(n)	Low (%)			Normal (%)
Ulnar	NCV	(9)	1 (11.11)	7 (77.78)	1 (11.11)	(10)	1 (10.00)	7 (70.00)	2 (20.00)	ns
	Latency	(9)	0	6 (66.67)	3 (33.33)	(9)	0	7 (77.78)	2 (22.22)	ns
Peroneal	NCV	(160)	119 (74.38)	41 (25.63)	0	(134)	65 (48.51)	68 (50.75)	1 (0.75)	0.0001
	Latency	(160)	98 (61.25)	51 (31.88)	11 (6.88)	(134)	78 (58.21)	49 (36.57)	7 (5.22)	ns
Sural	NCV	(150)	105 (70.00)	35 (23.33)	10 (6.67)	(128)	76 (59.38)	44 (34.38)	8 (6.25)	ns

Exposed group has a higher percentage with low Peroneal Nerve Conduction Velocity than the Not Exposed group. This may, however, be an artifact of age, since NCV slows with age and the Exposed group is older than the Not Exposed group.

237821

TA 39
EXPOSURE
vs.
REPRODUCTIVE FINDINGS

	<u>Exposed</u> (n=189)	<u>Not Exposed</u> (n=155)	<u>Probability</u>	<u>Questionable</u> <u>Exposure</u> (n=49)
# Pregnancies	663	429		139
# Live Births	573	373		128
# Dead in 4 Weeks Rate (/1000 live births)	16 27.92	7 18.767	N.S.	3 23.4375
# Miscarriages Rate (/1000 pregnancies)	72 108.597	51 118.881	N.S.	7 50.360
# Children with Birth Defects* Rate (/1000 live births)	23 40.140	20 53.619	N.S.	6 46.875
# Stillbirths Rate (/1000 Fetuses to term)	14 23.850	5 13.228	N.S.	4 30.303

* These are further detailed in the Summary of Birth Defects which follow

SUMMARY OF BIRTH DEFECTS
AS REPORTED BY SUBJECTS

EXPOSURE CATEGORY: PREGNANCY BEFORE OR AFTER SUBJECTS' EXPOSURE:	<u>EXPOSED</u>			<u>QUESTIONABLY EXPOSED</u>			<u>NOT EXPOSED</u>	<u>TOTAL</u>
	<u>Before</u>	<u>After</u>	<u>Unable to Determine</u>	<u>Before</u>	<u>After</u>	<u>Unable to Determine</u>	<u>--</u>	<u>--</u>
LIKELY BIRTH DEFECTS:	8 ^a	6 ^b	2 ^c	2 ^d	3 ^e	--	11 ^f	32
POSSIBLE BIRTH DEFECTS: ^g (Insufficient data to determine severity or cause)	1	5	1	1	--	--	9	17
UNLIKELY BIRTH DEFECTS: ^h	1	1	--	1	--	--	6	9

Subjects' descriptions of Birth Defects were reviewed with faculty at the Cincinnati Center for Developmental Disorders and categorized as Likely Birth Defects, Possible Birth Defects and Unlikely Birth Defects.

^aIncludes: Congenital cyanotic cardiac anomaly, hydrocoele, hernia, undescended testicle, angioma, congenital short leg, club foot, anomaly of sternum.

^bIncludes: Pectus carinatum, obstructive defects of urinary tract, Down's Syndrome, congenital hydrocoele, spina bifida.

^cIncludes: Unspecified cardiac anomaly, pyloric stenosis.

^dIncludes: Hydrocephalus, congenital anomaly of eye.

^eIncludes: Ventricular-septal defect, atrial-septal defect, club foot.

^fIncludes: Spina bifida, club foot, Down's Syndrome, obstructive defects of urinary tract, hernia, antral web, congenital anomalies of eye, absence of fingers, cystic hygroma, polycystic kidney disease (autosomal dominant with positive family history), congenital dislocation of hips (two of two children in one family; one male, one female).

^gIncludes: Epilepsy, retardation, slow learner, deafness, incomplete ossification of vertebra.

^hIncludes: Muscle problems, one eye larger than other, tongue-tied, speech defect, punctured lungs, inherited arthritis, blood problem, floating kidney.

ACKNOWLEDGEMENT

The study which is reported here received support from:

THE MONSANTO COMPANY

THE NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH
SCIENCES, U.S. PUBLIC HEALTH SERVICE

THE INSTITUTE OF ENVIRONMENTAL HEALTH, UNIVERSITY
OF CINCINNATI

UNIVERSITY OF CINCINNATI
DEPARTMENT OF ENVIRONMENTAL HEALTH
2,4,5-T WORKERS' STUDY

INFORMED CONSENT STATEMENT

Before agreeing to participate in this study, it is important that you understand the purpose of the examination, its benefits and possible discomforts. The objective of this thorough examination is to determine the health status of the employees and former employees of the Monsanto Industrial Chemical Company in Nitro, West Virginia and to identify health problems which may be related to the occupational environment. The examination will focus on possible health effects over a long period of time of chemicals associated with the making of 2,4,5-T such as dioxin.

I, _____, agree to participate in the medical research study conducted by the University of Cincinnati under the direction of Dr. Raymond R. Suskind. I understand that I will be interviewed and asked a series of questions about myself and the health of my family. In addition to a physical examination I shall permit chest X-rays and an EKG to be done; shall permit pulmonary function and nerve conduction tests to be performed; shall have blood drawn and furnish urine for laboratory examination. If indicated by the physician's examination, skin biopsies and skin scrapings for laboratory diagnosis will be done. The discomfort of the biopsy will be the same as with a skin injection.

The University of Cincinnati Medical Center follows a policy of making all decisions concerning compensation and medical treatment for injuries occurring during or caused by participation in biomedical or behavioral research on an individual basis. If I believe I have been injured as a result of research, I will contact Dr. Suskind.

Any questions that I may have concerning this study will be answered by Dr. Raymond R. Suskind, phone (513) 872-5701, or his associates. I am free to withdraw from this study at any time.

Subject _____

Investigator _____

Witness _____

Date _____

237825

HEALTH STATUS RESEARCH PROGRAM

UNIVERSITY OF CINCINNATI

EMPLOYEES OF THE MONSANTO INDUSTRIAL CHEMICAL COMPANY

QUESTIONNAIREName: _____
Last First MiddleAddress: _____
Street Apt. #_____
City State Zip CodeTelephone Number: _____ / _____ - _____
area code

Social Security Number: _____ / _____ / _____

- (5) Present Status: ☐ Active (1)
(check one) ☐ Retired (2)
☐ Terminated (3)

(6-10) Current Department: _____ # / / / / /

(11-14) Job Title: _____ # / / / /

(15-17) Clock Number: / / /

-19) Interviewer Number: / /

20-5) Date of Interview: / /
 mo. day yr.

A. PERSONAL DATA

20-31) 1. Birthdate: / /
 mo. day yr.

2. Sex: / male (1) / female (2)

3. Race: / White, not of Hispanic Origin (1)
 / Black, not of Hispanic Origin (2)
 / Hispanic (3)
 / American Indian or Alaskan Native (4)
 / Asian or Pacific Islander (5)
 / Other _____ (6)

4. Marital Status: / single (1). / married (2) / divorced (3)
 / separated (4) / widowed (5)

5. Number of Marriages: /

6. Education: Highest grade completed / /

Elementary = 01 - 08

Secondary = 09 - 12

College = 13 (1 year)
 14 (2 years)
 15 (3 years)
 16 (4 years)
 17 (5 years)
 18 (6 years)
 19 (7 or more years)

237827

B. OCCUPATIONAL HISTORY

1. Are you now employed at Monsanto, Nitro? ☐ yes (1) ☐ no (2)

If no, date of retirement

or, date of termination / /
mo. day yr.

2. If presently employed at Monsanto

What is your job title: _____ code/ / / /

Name of department: _____ code/ / / / / /

What is your main job or work:(describe)

When did you start this job: / / / / / /
 mo. day yr.

3. Beginning with your first job at Monsanto, give the following information:

<u>Department</u>	<u>Job Title</u>	<u>Dates</u> (from/to) mo/yr/mo/yr	<u>What you did (work description)</u>

11-1111

 / / / - / / /

 / / / / / / / / / / / / . _____

_____ / / / - / / / _____
/ / / / / / / / / /

_____ 11-11 _____
 1111111111

_____ / / /- / / / _____
/ / / / / / / / / / / / / / / /

_____ / / / - / / / _____
/ / / / / / / / / / / / / / / /

If terminated or retired, list same information above.

4. If retired or terminated, what work have you done since leaving Monsanto?

<u>Employee</u>	<u>Job Title</u>	<u>Dates</u> (from/to) mo/yr/mo/yr	<u>Work description</u>	<u>S.I.C.</u>
- 16)	/	/ -	/	/ / / / /
17-28)	/	/ -	/	/ / / / /
-40)	/	/ -	/	/ / / / /
41-52)	/	/ -	/	/ / / / /
1-64)	/	/ -	/	/ / / / /
55-76)	/	/ -	/	/ / / / /
9-60)/0/4/	/	/ -	/	/ / / / /
(5-16)	/	/ -	/	/ / / / /
7-28)	/	/ -	/	/ / / / /
(29-40)	/	/ -	/	/ / / / /
1-52)	/	/ -	/	/ / / / /
3-64)	/	/ -	/	/ / / / /
(65-76)	/	/ -	/	/ / / / /
(79-80)/ / /	/	/ -	/	/ / / / /

5. Previous work history, before Monsanto

<u>Employer</u>	<u>Job Title</u>	<u>Dates</u> (from/to) mo/yr/mo/yr	<u>Work description</u>	<u>S.I.C.</u>
(5-16)	/	/ -	/	/ / / / /
7-28)	/	/ -	/	/ / / / /
(29-40)	/	/ -	/	/ / / / /
1-52)	/	/ -	/	/ / / / /
53-64)	/	/ -	/	/ / / / /
(65-76)	/	/ -	/	/ / / / /
(79-80)/0/5/	/	/ -	/	/ / / / /
5-16)	/	/ -	/	/ / / / /
(7-28)	/	/ -	/	/ / / / /

<u>Employer</u>	<u>Job Title</u>	<u>Dates</u> <u>(from/to)</u> <u>mo/yr/mo/yr</u>	<u>Work description</u>	<u>S.I.C.</u>
9-40)		/ - /	/	/ / / / /
52)		/ - /	/	/ / / / /
3-64)		/ - /	/	/ / / / /
76)		/ - /	/	/ / / / /
9-80) / / /		/ - /	/	/ / / / /
6)		/ - /	/	/ / / / /
7-28)		/ - /	/	/ / / / /

6. While working at Monsanto were you engaged in other employment?

a. mechanical work ☐ yes (1) ☐ no (2)

b. farming ☐ yes (1) ☐ no (2)

c. other ☐ yes(1) ☐ no(2) (describe) _____

7. In previous employment, were you exposed to dust, solvents, pesticides, welding or soldering fumes, fertilizer, weed killers, etc. ☐ yes(1) ☐ no(2)

If yes, specify _____

C. WORK HYGIENE AT MONSANTO

1. Do you or did you smoke at worksite? ☐ yes(1) ☐ no(2)

2. Do you or did you eat at worksite? ☐ yes(1) ☐ no(2)

or drink beverages such as coffee or soft drinks at worksite? ☐ yes(1) ☐ no(2)

3. Do you or did you wear any of the following most of the time at work?

☐ yes(1) ☐ no(2) Short sleeves

☐ yes(1) ☐ no(2) Long sleeves

☐ yes(1) ☐ no(2) Gloves If yes, on what job? _____
What kind (cotton, rubber, leather, plastic, lined, etc)? _____

☐ yes(1) ☐ no(2) Protective sleeves If yes on what job? _____
What kind (cotton, rubber, etc.)? _____

☐ yes(1) ☐ no(2) Apron If yes, on what job? _____
What kind? _____

☐ yes(1) ☐ no(2) Special Shoes or Boots If yes, do you or did you change out of them before going home? ☐ yes ☐ no

☐ yes(1) ☐ no(2) Respirator If yes, on what job? _____

☐ yes(1) ☐ no(2) Eye Protection If yes, on what job? _____

☐ yes(1) ☐ no(2) Mask If yes, on what job? _____

☐ yes(1) ☐ no(2) Protective clothing If yes, on what job? _____
What kind? _____

☐ yes(1) ☐ no(2) Other (specify) _____
If yes, on what job? _____

4. Do you or did you use a barrier or protective creams at work? ☐ yes(1) ☐ no(2)
If yes, ☐ often(1) ☐ occasionally(2) ☐ seldom(3)
If yes, what brand? _____

5. Do you or did you change out of your work clothes regularly before going home?
☐ yes(1) ☐ no(2)

6. Do you or did you change out of your work shoes regularly before going home?
☐ yes(1) ☐ no(2)

237E32

7. Where are or were your work clothes laundered?
☐ home (1) ☐ commercial laundry (2) ☐ company (3)
8. Do you or did you shower before going home? ☐ yes (1) ☐ no (2)
9. Do you or did you use waterless hand cleaner? ☐ yes (1) ☐ no (2)
10. Was soap supplied by the company? ☐ yes (1) ☐ no (2) What type? _____
- Was soap supplied by self? ☐ yes (1) ☐ no (2) What type? _____
11. Did you ever develop an illness which you believed to be related to your work at Monsanto?
- ☐ yes (1) ☐ no (2) If yes, describe briefly _____

What job were you engaged in at the time?

Department _____ Code / / / / / /

Type of work _____ Code / / / /

Date of onset / / / /

no. yr.

5/

D. NUTRITION

1. How many days a week do you eat: (fill in)

- (5) a. a morning meal? _____
(6) b. a lunch or mid-day meal? _____
(7) c. an evening meal? _____
(8) d. during the evening or night? _____

2. How many times per week do you eat the following?

Meat and Meat Substitutes (fill-in)

- (9) a. Bacon _____
(10) b. Tongue _____
(11) c. Sausage _____
(12) d. Luncheon meat _____
(13) e. Hot dogs _____
(14) f. Liver-chicken _____
(15) g. Liver-other _____
(16) h. Poultry _____
(17) i. Salt pork _____
(18) j. Pork or ham _____
(19) k. Bones (neck or other) _____
(20) l. Meat in mixtures (such as stews, casseroles, pies, etc.) _____
(21) m. Beef or veal _____
(22) n. Other meat _____
(23) o. Fish _____
(24) p. Eggs _____
(25) q. Dried beans or pea dishes _____
(26) r. Peanut butter or nuts _____

(27) 3. Do you use any of the following? (circle)

- a. vitamin supplement (1)
b. mineral supplement (2)
c. both vitamins and mineral supplements (3)
d. none of the above (4)

4. How many times per week do you eat the following?

Fruit and Vegetables (fill-in)

- (28) a. Fruit juice (orange, prune, etc.) _____
(29) b. Fruit (apples, oranges, etc.) _____
(30) c. Raw vegetables (carrots, spinach, etc.) _____
(31) d. Potatoes _____
(32) e. Other cooked vegetables _____

5. How many times per week do you eat the following?

- (33) a. Candy _____
(34) b. Soft drinks, popsicles, sherberts _____
(35) c. Instant breakfast _____
(36) d. Artificially sweetened beverage _____
(37) e. Coffee or tea _____
(38) f. Beer _____
(39) g. Wine _____
(40) h. Whiskey, vodka, rum, scotch, gin _____

237834

E. TOBACCO CONSUMPTION

(41) 1. Do you presently smoke cigarettes? ☐ yes(1) ☐ no(2)

(42-43) If yes: at what age did you start? ☐ ☐ ☐

(44-45) total years smoking? ☐ ☐

(46) packs smoked per day? ☐ <1(1) ☐ 1-2(2) ☐ 2-3(3) ☐ >3(4)

2. If you do not now smoke cigarettes, have you smoked them in the past?

(47) ☐ yes(1) ☐ no(2)

(48-49) If yes: at what age did you start? ☐ ☐ ☐

(50-51) total years smoked? ☐ ☐

(52) packs smoked a day? ☐ <1(1) ☐ 1-2(2) ☐ 2-3(3) ☐ >3(4)

3. Have you smoked as many as 5 packs of cigarettes during your life?

(53) ☐ yes(1) ☐ no(2)

237835

F. ALCOHOL CONSUMPTION

- 54) 1. Do you ~~now~~ drink alcoholic beverages? ☐ yes(1) ☐ no(2)
 If no, did you ever drink alcoholic beverages? ☐ yes(1) ☐ no(2)
 56-57) How old were you when you gave up drinking? ☐ ☐ ☐
 58-59) 2. How old were you when you first started drinking? ☐ ☐ ☐
 60) 3. About how often do you drink some kind of alcoholic beverage? (check one)
☐ almost every day (1)
☐ three or four time a week (2)
☐ once or twice a week (3)
☐ once or twice a month (4)
☐ less than once a month (5)
 4. When you drink beer, about how many cans or bottles of beer do you usually drink?
 61) ☐ 0(1) ☐ 1-2(2) ☐ 3-4(3) ☐ 5-6(4) ☐ >6(5)
 5. When you drink wine, about how many glasses of wine do you usually drink?
 62) ☐ 0(1) ☐ 1-2(2) ☐ 3-4(3) ☐ 5-6(4) ☐ >6(5)
 6. When you drink highballs, mixed drinks, or other kinds of liquor, about how many drinks do you usually have?
 63) ☐ 0(1) ☐ 1-2(2) ☐ 3-4(3) ☐ 5-6(4) ☐ >6(5)
 64) 7. Have your drinking habits changed over time? ☐ yes(1) ☐ no(2)
 If YES:
 65-66) 8. If you reduced your alcohol intake, indicate year? 19 ☐ ☐ ☐
 9. When you drank beer, about how many cans or bottles did you usually drink?
☐ 1-2(1) ☐ 3-4(2) ☐ 5-6(3) ☐ >6(4)
 10. When you drank wine, about how many glasses did you usually drink?
 68) ☐ 1-2(1) ☐ 3-4(2) ☐ 5-6(3) ☐ >6(4)
 11. When you drank highballs, mixed drinks, or other kinds of liquor, how many did you usually have?
 69) ☐ 1-2(1) ☐ 3-4(2) ☐ 5-6(3) ☐ >6(4)

67-80)
 67/7/

G. FAMILY HISTORY

Have either your father, your mother, or any of your brothers or sisters (including half-brothers and half-sisters) had any of the following problems?

READ EACH PROBLEM. CHECK A "YES" OR "NO" RESPONSE. IF "YES", CHECK THE APPROPRIATE RELATIONSHIP(S). IF "YES" FOR A BROTHER OR SISTER, ASK:

How many of your brother(s) or sister(s) have (had) this problem?

AND ENTER APPROPRIATE RESPONSE.

	PROBLEM	RESPONSE	RELATIONSHIP	HOW MANY SIBLINGS HAVE (HAD) THIS PROBLEM
(5)	1. Asthma	☐ yes	☐ Father	
(6-9)		☐ no	☐ Mother	
(10-11)			☐ Brother	☐
			☐ Sister	☐
(12)	2. Hayfever	☐ yes	☐ Father	
(13-16)		☐ no	☐ Mother	
(17-18)			☐ Brother	☐
			☐ Sister	☐
(19)	3. Acne	☐ yes	☐ Father	
(20-23)	(pimples)	☐ no	☐ Mother	
(24-25)			☐ Brother	☐
			☐ Sister	☐
(26)	4. Eczema	☐ yes	☐ Father	
(27-30)		☐ no	☐ Mother	
(31-32)			☐ Brother	☐
			☐ Sister	☐
(33)	5. Hives	☐ yes	☐ Father	
(34-37)		☐ no	☐ Mother	
(38-39)			☐ Brother	☐
			☐ Sister	☐

	PROBLEM	RESPONSE	RELATIONSHIP	HOW MANY SIBLINGS HAVE (HAD) THIS PROBLEM
(0)	6. Stomach or	☒ yes	☐ Father	
(1)	peptic ulcers	☒ no	☐ Mother	
(5-46)			☐ Brother	☐
			☐ Sister	☐
(47)	7. Colitis	☐ yes	☐ Father	
(18-51)		☐ no	☐ Mother	
(52-53)			☐ Brother	☐
			☐ Sister	☐
(54)	8. Heart attack	☐ yes	☐ Father	
(55-58)	or angina	☐ no	☐ Mother	
(59-60)	before age 60		☐ Brother	☐
			☐ Sister	☐
(61)	9. Heart attack	☐ yes	☐ Father	
(62-65)	or angina	☐ no	☐ Mother	
(66-67)	after age 60		☐ Brother	☐
			☐ Sister	☐
(68)	10. High blood	☐ yes	☐ Father	
(69-72)	pressure	☐ no	☐ Mother	
(73-74)			☐ Brother	☐
(79-80)			☐ Sister	☐
(0/8/)				
(5)	11. Stroke	☐ yes	☐ Father	
(6-9)		☐ no	☐ Mother	
(10-11)			☐ Brother	☐
			☐ Sister	☐
(12)	12. High	☐ yes	☐ Father	
(13-16)	cholesterol,	☐ no	☐ Mother	
(17-18)	high		☐ Brother	☐
	triglycerides,		☐ Sister	☐
	or high blood fat			

	PROBLEM	RESPONSE	RELATIONSHIP	HOW MANY SIBLINGS HAVE (HAD) THIS PROBLEM
(19)	13. Diabetes	☒ yes	☐ Father	
(20-23)		☐ no	☐ Mother	
1-25)			☐ Brother	☐
			☐ Sister	☐
(26)	14. Liver disease	☒ yes	☐ Father	
(27-30)	(such as	☐ no	☐ Mother	
(31-32)	cirrhosis, hepatitis, etc.)		☐ Brother	☐
			☐ Sister	☐
(33)	15. Nervous	☐ yes	☐ Father	
(34-37)	disorder or	☐ no	☐ Mother	
(38-39)	mental disorder		☐ Brother	☐
			☐ Sister	☐
(40)	16. Inherited	☐ yes	☐ Father	
(41-44)	disorder or	☐ no	☐ Mother	
(45-46)	disorders they were born with		☐ Brother	☐
			☐ Sister	☐
(47)	17. Cancer	☐ yes	☐ Father	TYPE: ☐
(48-51)		☐ no	☐ Mother	☐
(52-53)			☐ Brother	☐
(54-65)			☐ Sister	☐

IF YES TO "CANCER", SPECIFY TYPE AND SITE:

01= lymphoma	06= stomach	11= breast	16= prostate
02= hodgekin's disease	07= rectum	12= cervix	17= bone
03= leukemia	08= bowel	13= uterus	18= other cancer
04= throat	09= kidney	14= lung	(specify)
05= esophagus	10= brain	15= skin	

(66-67) 18. How many brothers or half brothers do you or did you have? ☐

(67-68) 19. How many sisters or half sisters do you or did you have? ☐

(79-80)

/0/9/

237839.

H. PERSONAL MEDICAL HISTORY

Have you ever had any of the following? If yes, in what year? was it confirmed by a doctor?

	YES(1)NO(2)	YEAR	CONFIRMED BY DOCTOR		AREA OF BODY (TYPE)* IF APPROPRIATE
			YES(1)NO(2)		
(5-8) Acne (blackheads & cysts).....1.		19/ / /			
(9-12) Skin abscesses.....2.		19/ / /			
(13-16) Dermatitis.....3.		19/ / /			
(17-20) Liver disorder.....4.		19/ / /			
(21-24) a. hepatitis.....a.		19/ / /			
(25-28) b. cirrhosis.....b.		19/ / /			
(29-32) c. enlarged liver.....c.		19/ / /			
(33-36) d. other.....d.		19/ / /			
(37-40) Muscle pains (area).....5.		19/ / /			
(41-44) Nerve injury.....6.		19/ / /			
(45-48) Nervousness.....7.		19/ / /			
(49-52) Stomach ulcer.....8.		19/ / /			
(53-56) Bowel trouble or colitis.....9.		19/ / /			
(57-60) Kidney trouble (type).....10.		19/ / /			
(61-64) Bladder trouble.....11.		19/ / /			
(65-68) Thyroid disease.....12.		19/ / /			
(69-72) Other hormone problems.....13.		19/ / /			
(73-76) Bone problems (type, where).....14.		19/ / /			
(5-8) Arthritis (type) (79-80) / 1 / 0 / 15.		19/ / /			
(9-12) Hypertension.....16.		19/ / /			
(13-16) Heart attack.....17.		19/ / /			
(17-20) Angina.....18.		19/ / /			
(21-24) Bronchitis.....19.		19/ / /			
(25-28) Recurrent infections (type).....20.		19/ / /			
(29-32) Emphysema.....21.		19/ / /			
(33-36) Bronchial Asthma.....22.		19/ / /			
(37-40) Pulmonary edema.....23.		19/ / /			
(41-44) Pneumonia.....24.		19/ / /			
(45-48) Pleurisy.....25.		19/ / /			
(49-52) Stroke.....26.		19/ / /			

27. Have you ever been told by a doctor that you had (or have) any type of cancer?

(53) / yes (1) / no (2)

(54-55) If yes, what kind of cancer? Specify type: / / / / /

(56-57)

01= lymphoma

06= stomach

11= breast

16= prostate

02= hodgekin's disease

07= rectum

12= cervix

17= bone

03= leukemia

08= bowel

13= uterus

18= other cancer
(specify)

04= throat

09= kidney

14= lung

05= esophagus

10= brain

15= skin

(58-59) In what year were you first told about this (these) condition(s)? 19/ / / 19/ /

(60-61)

237840

2) 28. Have you ever been hospitalized? ☐ yes(1) ☐ no(2)

IF YES, ASK:

Why were you hospitalized?

In what year were you hospitalized?

What was the name of the hospital?

Where is the hospital (in what city and state)?

CONDITION YEAR HOSPITAL - NAME CITY STATE

53-64)	19/ / /			
65-66)	19/ / /			
67-68)	19/ / /			
69-70)	19/ / /			
71-72)	19/ / /			
4)	19/ / /			

COMMENTS:

237841

GASTROINTESTINAL (STOMACH & INTESTINES)

29. Have you ever lost more than 10 pounds without dieting? ☐ yes(1) ☐ no(2)

If yes, amount lost? lbs. over what time period? weeks

If yes, give year(s): 19/ / 19/ / 19/ / 19/ /

30. Have you ever lost your appetite? ☐ yes(1) ☐ no(2)

If yes, when did this happen? / /
mo. yr.

How long did this condition last: / / weeks

31. Have you ever had a peculiar taste in your mouth: ☐ yes(1) ☐ no(2)

If yes, what kind of taste(specify)?

If yes, give year(s): 19/ / 19/ / 19/ / 19/ /

32. Have you experienced nausea frequently? ☐ yes(1) ☐ no(2)

If yes, give year(s): 19/ / 19/ / 19/ / 19/ /

33. Have you ever had abdominal pains: ☐ yes(1) ☐ no(2)

If yes, indicate location (check only one of the following):

☐ diffuse(1) ☐ epigastric(2) ☐ periumbilical(3) ☐ other(4)

If yes, is/was the pain related to meals? ☐ yes(1) ☐ no(2)

If yes, give year(s): 19/ / 19/ / 19/ / 19/ /

34. Have you ever experienced episodes of crampy, abdominal pain associated with constipation, lasting several days? ☐ yes(1) ☐ no(2)

If yes, have there been more than: ☐ 2 such incidents(1) ☐ 5 incidents(2)

If yes, give year(s): 19/ / 19/ / 19/ / 19/ /

NEUROLOGICAL

35. Do you often have headaches: ☐ yes(1) ☐ no(2)

If yes, how often? ☐ daily(1) ☐ weekly(2) ☐ less frequently than weekly(3)

36. Have you ever had any of the following conditions?

WHEN?

Sleeplessness current ☐ yes(1) ☐ no(2) past ☐ yes(1) ☐ no(2) 19/ /

Nightmares current ☐ yes(1) ☐ no(2) past ☐ yes(1) ☐ no(2) 19/ /

Muscle pain current ☐ yes(1) ☐ no(2) past ☐ yes(1) ☐ no(2) 19/ /

Joint pain current ☐ yes(1) ☐ no(2) past ☐ yes(1) ☐ no(2) 19/ /

Muscle weakness
 (21-24) in limbs current ☐ yes(1) ☐ no(2) past ☐ yes(1) ☐ no(2) 19/ ☐ / ☐ /
 (25-28) Paresthesia current ☐ yes(1) ☐ no(2) past ☐ yes(1) ☐ no(2) 19/ ☐ / ☐ /
 (29-32) Dizziness current ☐ yes(1) ☐ no(2) past ☐ yes(1) ☐ no(2) 19/ ☐ / ☐ /
 (33-36) Depression current ☐ yes(1) ☐ no(2) past ☐ yes(1) ☐ no(2) 19/ ☐ / ☐ /
 Memory poor,
 or change in
 (37-40) memory current ☐ yes(1) ☐ no(2) past ☐ yes(1) ☐ no(2) 19/ ☐ / ☐ /
 Always tired,
 general
 (41-44) fatigue current ☐ yes(1) ☐ no(2) past ☐ yes(1) ☐ no(2) 19/ ☐ / ☐ /
 (45-48) Nervousness current ☐ yes(1) ☐ no(2) past ☐ yes(1) ☐ no(2) 19/ ☐ / ☐ /
 (49-52) Sleepiness current ☐ yes(1) ☐ no(2) past ☐ yes(1) ☐ no(2) 19/ ☐ / ☐ /

SEXUAL HISTORY

(53) 37. Have you noticed any change in your sexual life? ☐ yes(1) ☐ no(2)
 (54-59) If yes, give year(s): 19/ ☐ / ☐ / 19/ ☐ / ☐ / 19/ ☐ / ☐ /
 If yes, what was the change?
 (60-62) Decreased sexual desire? ☐ yes(1) ☐ no(2) If yes, when? 19/ ☐ / ☐ /
 (63-65) Increased sexual desire? ☐ yes(1) ☐ no(2) If yes, when? 19/ ☐ / ☐ /
 (66-68) Decreased ability to achieve & maintain erection? ☐ yes(1) ☐ no(2)
 If yes, when? 19/ ☐ / ☐ /
 (69-71) Increased ability to achieve & maintain erection? ☐ yes(1) ☐ no(2)
 If yes, when? 19/ ☐ / ☐ /

(79-80)
 /1/3/

237843

1. REPRODUCTIVE HISTORY

How many times have you been married? / / Time(s)-14) Date(s) of marriage(s): 19/ / / 19/ / / 19/ / / 19/ / /

ASK FOR ALL WIVES (HUSBANDS): (Record answers in table below)

1. Do you have (have you had) trouble having a family with your wife (husband) despite a desire to have one?
2. How many children, born alive, do you have or have you had with your (present, previous, last previous, etc.) wife (husband)?
3. How many children, born alive, died within 4 weeks of birth?
4. How many miscarriages or spontaneous abortions did your wife (did you) have?
5. How many stillbirths did your wife (did you) have?
6. How many children, born alive, were born with a birth defect?

QUESTION		PRESENT SPOUSE		PREVIOUS SPOUSE		LAST PREVIOUS SPOUSE	
(15-17)	1. Problems having a family	<u> </u> / yes (1)	<u> </u> / no (2)	<u> </u> / yes (1)	<u> </u> / no (2)	<u> </u> / yes (1)	<u> </u> / no (2)
(18-23)	2. Children born alive	<u> </u> / <u> </u> / <u> </u> / #children		<u> </u> / <u> </u> / <u> </u> / #children		<u> </u> / <u> </u> / <u> </u> / #children	
	Birthdates (mo./day/yr.)						
(24-29)	3. Children dead within 4 weeks	<u> </u> / <u> </u> / <u> </u> / #children		<u> </u> / <u> </u> / <u> </u> / #children		<u> </u> / <u> </u> / <u> </u> / #children	
(30-35)	4. Number of miscarriages	<u> </u> / <u> </u> / <u> </u>		<u> </u> / <u> </u> / <u> </u>		<u> </u> / <u> </u> / <u> </u>	
(36-41)	5. Number of stillbirths	<u> </u> / <u> </u> / <u> </u>		<u> </u> / <u> </u> / <u> </u>		<u> </u> / <u> </u> / <u> </u>	
(42-47)	6. Children with birth defects	<u> </u> / <u> </u> / <u> </u> / #children		<u> </u> / <u> </u> / <u> </u> / #children		<u> </u> / <u> </u> / <u> </u> / #children	
	State type of birth defects						

237844

J. MEDICATION HISTORY

1. Do you regularly use health aids such as those for constipation, indigestion, arthritis, or headache (for example aspirin, laxatives, diet pills,

(48)

☐ yes(1) ☐ no(2)

If yes, what kind or brand: _____

2. Do you regularly use salves or liniments such as those for itchy skin, burns, abrasions, etc.?

(49)

☐ yes(1) ☐ no(2)

If yes, what kind or brand: _____

3. Do you have or have you ever had acne? ☐ yes(1) ☐ no(2)
If yes, how was it treated? _____

4. Are you now taking medication(s) prescribed by a doctor?

(51)

☐ yes(1) ☐ no(2)

If yes specify the name(s) of the medications and the illness(es) being treated: _____

(52)

5. Do you have any known allergic reactions to drugs? ☐ yes(1) ☐ no(2)
If yes, to what drugs (be specific)? _____

237845

Vital Signs

(61-66) BP / / mmHg. (67-69) Pulse / / /min. (70-71) Resp. / /min.

(6) Unusual appearance / yes(1) / no(2)

If yes, describe

(7-8) Physician _____ Physician ID# / / /

Review of Systems

Physical Examination

(Indicate Problems and/or Abnormal Findings)

Skin - active or residue of acne,
other skin abnormalities, nails, hair

(9-10) / / yes(1) / / no(2)

/ / yes(1) / / no(2)

Nose, mouth, throat, mucous membranes

(11-12) / / yes(1) / / no(2)

/ / yes(1) / / no(2)

Dental status

(13-14) / / yes(1) / / no(2)

/ / yes(1) / / no(2)

237846

Additional History
Review of Systems

Physical Examination

Eyes

16) ☐ yes(1) ☐ no(2)

☐ yes(1) ☐ no(2)

Lymph nodes

18) ☐ yes(1) ☐ no(2)

☐ yes (1) ☐ no(2)

Thorax, Pulmonary, Cardiac

20) ☐ yes(1) ☐ no(2)

☐ yes(1) ☐ no(2)

Gastrointestinal

22) ☐ yes(1) ☐ no(2)

☐ yes(1) ☐ no(2)

Liver

24) ☐ yes(1) ☐ no(2)

☐ yes(1) ☐ no(2)

Additional History
Review of Systems

Physical Examination

Sexual - Libido

(25-26) ☐ yes(1) ☐ no(2)

☐ yes(1) ☐ no(2)

Skeletal

(27-28) ☐ yes(1) ☐ no(2)

☐ yes(1) ☐ no(2)

Kidney

(29-30) ☐ yes(1) ☐ no(2)

☐ yes(1) ☐ no(2)

Bladder

(31-32) ☐ yes(1) ☐ no(2)

☐ yes(1) ☐ no(2)

Genitalia, including additional
reproductive review

(33-34) ☐ yes(1) ☐ no(2)

☐ yes(1) ☐ no(2)

Additional History
Review of Systems

Physical Examination

Vascular

(35-36) / yes(1) / no(2)

 / yes(1) / no(2)

Neuropsychiatric

(37-38) / yes(1) / no(2)

 / yes(1) / no(2)

Infections

(39-40) / yes(1) / no(2)

 / yes(1) / no(2)

Abnormal Findings

From History ☐ yes(1) ☐ no(2)
Detail:

2) From Physical Examination ☐ yes(1) ☐ no(2)
Detail:

Diagnosis - Impression

1.

2.

3.

4.

Comments

PULMONARY FUNCTION RECORD

1. Since your last examination or visit to the doctor, have you experienced any of the following:

		Yes	No
(43)	a. Cough	_____	_____
(44)	b. Fever	_____	_____
(45)	c. Chills	_____	_____
(46)	d. Muscle aches	_____	_____
(47)	e. Shortness of breath	_____	_____
(48)	f. Chest pains, aching, tightness or burning	_____	_____
(49)	g. Wheezing	_____	_____
(50)	h. Expectoration (phlegm)	_____	_____
(51)	i. Stuffy nose	_____	_____
(52)	j. Eyes burning or watering	_____	_____
(53)	k. Throat sore or burning	_____	_____
(54)	l. Loss of appetite	_____	_____
(55)	m. Weight loss	_____	_____

(56) 2. Do you smoke cigarettes, cigars or pipe? ☐ / yes(1) ☐ / no(2)

3. Have you had any of the following recently?

- (57) Respiratory infection within two(2) weeks? ☐ / yes(1) ☐ / no(2)
- (58) Bronchodilator drug within six (6) hours? ☐ / yes(1) ☐ / no(2)
- (59) Cigarette within one (1) hour? ☐ / yes(1) ☐ / no(2)
- (60) Meal within two (2) hours? ☐ / yes(1) ☐ / no(2)

(61) 4. Are you now wearing any tight garments? ☐ / yes(1) ☐ / no(2)

(62) 5. Have you had this test before? ☐ / yes(1) ☐ / no(2)

If yes, when? _____ where? _____

(63) under same name? ☐ / yes(1) ☐ / no(2)

APPENDIX I

PULMONARY FUNCTION TEST RECORD

5) Room Temperature _____ °C

56) TEST MOTIVATION-EFFORT: Poor _____ Fair _____ Good _____ Excellent _____
(1) (2) (3) (4)57) RECORD: Acceptable _____ Not Acceptable _____
(1) (2)

REMARKS: _____

58-69) TECHNICIAN _____ ID# / / /
(79-80) /1/5/

(5-7) Total FVC Time _____

VOLUME IN L. ATPS	VOLUME IN L. BTPS	% FEV/FVC	PREDICTED NORMAL	% PREDICTED
FEV ₁ (8-11)	(12-15)	(16-17)	(18-21)	(22-23)
FVC (24-27)	(28-31)	(32-33)	(34-37)	(38-39)
FMF (25-75%) L/Sec.	L/Sec. (40-43)	-----	(44-47)	-----

237852

NERVE CONDUCTION

8-49) Technician ID#

1. Ulnar

(50-53) Latency ms

(54-56) Distance mm

(57-60) N.C.V. m/s

(61-63) Stm. Curr. mA

(79-80) 1/6/

(5-14)

(15-23)

(24-30)

2. Peroneal

(31-34) Latency ms

(35-37) Distance mm

(38-41) N.C.V. m/s

(42-44) Stm. Curr. mA

(45-54)

(55-63)

(64-70)

(79-80) 1/7/

3. Sural

(5-8) Latency ms

(9-11) Distance mm

(12-15) N.C.V. m/s

(16-18) Stm. Curr. mA

(19-28)

(29-37)

(38-44)

LABORATORY TESTS

Please check if done:

(45-47)	<u> </u> / <u> </u> / yes(1)	<u> </u> / <u> </u> / no(2)	Urine Sample	ID# / <u> </u> / <u> </u> /
(48-50)	<u> </u> / <u> </u> / yes(1)	<u> </u> / <u> </u> / no(2)	Blood Sample	ID# / <u> </u> / <u> </u> /
(51-53)	<u> </u> / <u> </u> / yes(1)	<u> </u> / <u> </u> / no(2)	Skin Biopsy	ID# / <u> </u> / <u> </u> /
(54-56)	<u> </u> / <u> </u> / yes(1)	<u> </u> / <u> </u> / no(2)	Skin Scrapings	ID# / <u> </u> / <u> </u> /
(57-59)	<u> </u> / <u> </u> / yes(1)	<u> </u> / <u> </u> / no(2)	Culture	ID# / <u> </u> / <u> </u> /
(60-62)	<u> </u> / <u> </u> / yes(1)	<u> </u> / <u> </u> / no(2)	Photograph	ID# / <u> </u> / <u> </u> /
(63-65)	<u> </u> / <u> </u> / yes(1)	<u> </u> / <u> </u> / no(2)	X-Ray	ID# / <u> </u> / <u> </u> /
(66-68)	<u> </u> / <u> </u> / yes(1)	<u> </u> / <u> </u> / no(2)	EKG	ID# / <u> </u> / <u> </u> /

(79-80)

(1/8/

OTHER TESTS:

COMMENTS:

APPENDIX II

Statistical Procedure

For a discussion of the methods (χ^2 test for independence, age-adjustment) used for contingency table analysis please see Statistical Methods for Rates and Proportions (J.L. Fleiss, Wiley Interscience (1973) New York). Fisher's exact test is presented in Testing Statistical Hypotheses (E.L. Lehmann, John Wiley & Sons (1959) New York).

A fine discussion of multiple linear regression analysis and analysis of covariance is contained in Applied Regression Analysis and Other Multivariable Methods (D.G. Kleinbaum and L.L. Kupper, Duxbury Press (1978) North Scituate, Massachusetts).

APPENDIX III
Clinical Findings

OTHERS

	Not Exposed (n=13)	Exposed (n=5)
Limited Motion	1	
H/O "Nervousness"	1	1
H/O Depression	1	1
Arcus Senilis	1	
Cataracts	1	1
Retinal Nicking	1	
H/O Thrombosed Deep Vessels	1	
H/O Angina		1
H/O Hypertension	2	1
Rhonchi	1	
Asthma	1	
Poor Dental Hygiene	1	
H/O Duodenal Ulcer	1	
H/O Stomach Ulcer		1
H/O Cholecystectomy	1	
H/O Prostatitis	1	
H/O Renal Surgery		1
H/O Thyroid Disease		1
H/O Tumors(Breast, Uterus, Bone)	1	
Arthritis(Heberden's Nodes)		1
H/O Chloracne		4
Chloracne		3
Actinic Elastosis	2	4
H/O Acne Vulgaris	4	
Acne Vulgaris	3	
Hirsutism		1
Seborrheic Dermatitis	1	

237856



Clinical Findings

OTHERS

	<u>Not Exposed (n=13)</u>	<u>Exposed (n=5)</u>
"Dyshydrotic Dermatitis"		1
Lichen Planus	1	
Hypopigmentation, post inflammatory		1
Seborrheic Keratoses	1	1
Actinic Keratoses	1	
Dermatophytosis	2	3
Onychomycosis	1	1
Baker's Cyst		1
Decreased Growth of Hair	1	
Nevi	2	
Dermatofibroma	1	

APPENDIX IV
CLINICAL FINDINGS

	<u>NOT EXPOSED (n=163)</u>		<u>EXPOSED (n=204)</u>		<u>QUESTIONABLE EXPOSURE (n=51)</u>	
	#	%	#	%	#	%
<u>NEUROLOGIC</u>						
Clonus	-		1	0.49	-	
Hyporeflexia and Hyperreflexia	5	3.07	5	2.45	-	
Positive Babinski/Romberg	-		2	0.98	-	
Loss of Vibratory Sensation, Light Touch, and Proprioception	9	5.52	14	6.86	-	
Paresthesia; Numbness	1	0.61	6	2.94	-	
Resting Tremor Head, Hand	3	1.84	4	1.96	1	1.96
Speech Dysfunction	1	0.61	-		-	
H/O Multiple Sclerosis	1	0.61	-		-	
H/O Cerebrovascular Accident	2	1.23	6	2.94	1	1.96
H/O Epilepsy	1	0.61	-		-	
<u>PSYCHOSOCIAL</u>						
H/O "Nervousness"	16	9.82	27	13.24	5	9.80
H/O Depression	3	1.84	6	2.94	1	1.96
H/O Anxiety	-		1	0.49	-	
H/O Decreased Libido	12	7.36	38	18.63	9	17.65
H/O Increased Libido	2	1.23	-		-	
H/O Impotence, NOS	4	2.45	17	8.33	2	3.92
<u>EYE</u>						
Pterygium	-		2	0.98	-	
Macular Degeneration	-		1	0.49	-	
Arcus Senilis	2	1.23	6	2.94	1	1.96
Cataract	4	2.45	3	1.47	1	1.96
Diabetic Retinopathy	-		-		1	1.96
Exotropia, NOS	2	1.23	1	0.49	-	
H/O Cataract Surgery	1	0.61	2	0.98	-	
H/O Glaucoma	1	0.61	3	1.47	2	3.92

	NOT EXPOSED (n=163)		EXPOSED (n=204)		QUESTIONABLE EXPOSURE (n=51)	
	#	%	#	%	#	%
EARS, NOSE AND THROAT						
Otitis	2	1.23	-	-	1	1.96
Hearing Loss	3	1.84	2	0.98	2	3.92
H/O Parotid Tumor	-	-	1	0.49	-	-
CARDIOVASCULAR						
Retinal Nicking	6	3.68	6	2.94	2	3.92
Varicosities	10	6.13	30	14.71	2	3.92
Localized Edema	1	0.61	2	0.98	-	-
Pitting Edema	1	0.61	5	2.45	1	1.96
Venous Stasis	-	-	-	-	1	1.96
Diminished Pulses in Lower Extremities	5	3.07	10	4.90	1	1.96
Cardiac Murmur, NOS	1	0.61	-	-	-	-
Diastolic Murmur	1	0.61	-	-	-	-
Systolic Murmur	5	3.07	9	4.41	1	1.96
Bruit	-	-	1	0.49	1	1.96
Hypertension (see B.P. findings)	-	-	-	-	-	-
H/O Aortic Aneurysm	-	-	1	0.49	1	1.96
H/O Arteriosclerosis	1	0.61	-	-	-	-
H/O Anemia	-	-	1	0.49	-	-
H/O Coronary Artery Disease	10	6.13	20	9.80	6	11.76
H/O Raynaud's Phenomenon	1	0.61	-	-	-	-
H/O Angina	2	1.23	3	1.47	2	3.92
H/O Hypertension	36	22.09	60	29.41	10	19.61
PULMONARY						
Increased AP Diameter, Chest	1	0.61	1	0.49	1	1.96
Nasal Polyp	1	0.61	-	-	-	-
Chronic Obstructive Pulmonary Disease (COPD)	1	0.61	3	1.47	-	-
Rales	3	1.84	10	4.90	1	1.96
Breath Sounds, Vesicular	-	-	-	-	1	1.96
Dullness to Percussion	-	-	1	0.49	-	-
Crepitation	1	0.61	-	-	-	-
Decreased Breath Sounds	3	1.84	9	4.41	-	-

	NOT EXPOSED (n=163)		EXPOSED (n=204)		QUESTIONABLE EXPOSURE (n=51)	
	#	%	#	%	#	%
Tronchi	4	2.45	10	4.90	1	1.96
Clubbed Fingers and Toes	-	-	1	0.49	-	-
H/O Lung Tumor	-	-	1	0.49	-	-
H/O Bronchial Asthma	-	-	1	0.49	-	-
H/O Black Lung Benefits	-	-	-	-	1	1.96
H/O Chronic Obstructive Pulmonary Disease (COPD)	2	1.23	3	1.47	1	1.96
<u>ORAL</u>						
Leukoplakia	1	0.61	-	-	-	-
Poor Dental Hygiene and Caries	14	8.59	22	10.78	4	7.84
Periodontal Disease	4	2.45	5	2.45	2	3.92
<u>GASTROINTESTINAL</u>						
H/O Colitis	2	1.23	1	0.49	3	5.88
H/O Diverticulitis	-	-	2	0.98	-	-
H/O Colon Tumor	-	-	1	0.49	-	-
H/O Cecal Tumor	-	-	1	0.49	-	-
H/O Esophageal Tumor	-	-	1	0.49	-	-
H/O Colon Cancer	-	-	2	0.98	-	-
H/O Colostomy	-	-	1	0.49	-	-
H/O GI Bleeding	-	-	5	2.45	-	-
H/O Upper GI Ulcer	9	5.52	42	20.59	6	11.76
<u>Site As Reported:</u>						
Peptic	3	1.84	9	4.41	1	1.96
Stomach	4	2.45	21	10.29	3	5.88
Duodenal	2	1.23	12	5.88	2	3.92
<u>Surgical Treatment as Reported:</u>						
H/O Gastrectomy	-	-	3	-	-	-
H/O Partial Gastrectomy	-	-	1	-	-	-
H/O Surgical Treatment of Ulcer, NOS	-	-	6	-	-	-
<u>LIVER AND GALLBLADDER</u>						
Enlarged Liver	4	2.45	8	3.92	1	1.96
Tender Liver	2	1.23	2	0.98	-	-
H/O Hepatitis	-	-	1	0.49	2	3.92
H/O Cholecystectomy	1	0.61	5	2.45	1	1.96
H/O Cirrhosis	1	0.61	-	-	-	-
H/O Factor IX Deficiency	2	1.23	-	-	-	-
<u>UROGENITAL</u>						
Enlarged Prostate	3	1.84	5	2.45	1	1.96
Enlarged Testis	-	-	1	0.49	1	1.96
Testicular Atrophy	-	-	2	0.98	1	1.96
Inguinal Hernia	-	-	2	0.98	-	-

237860

	NOT EXPOSED (n=163)		EXPOSED (n=204)		QUESTIONABLE EXPOSURE (n=51)	
	#	%	#	%	#	%
Hypospadias	1	0.61	-	-	-	-
Hydrocoele	-	-	4	1.96	1	1.96
Spermatocoele, Bilateral	-	-	1	0.49	-	-
Phimosis	-	-	1	0.49	-	-
Balanitis	1	0.61	1	0.49	1	1.96
H/O Kidney Stones	16	9.82	24	11.76	5	9.80
H/O Hydronephrosis	-	-	1	0.49	-	-
H/O Hematuria	2	1.23	5	2.45	1	1.96
H/O Nephritis	3	1.84	3	1.47	1	1.96
H/O Pyelonephritis	-	-	1	0.49	-	-
H/O Prostatitis	4	2.45	6	2.94	-	-
H/O Prostatectomy	2	1.23	2	0.98	2	3.92
H/O Renal Abscess	-	-	1	0.49	-	-
H/O Bladder Tumor	1	0.61	7	3.43	-	-
H/O Prostate Cancer	-	-	1	0.49	-	-
H/O Venereal Disease (Gonorrhea, Syphilis)	-	-	2	0.98	-	-
H/O Infertility	-	-	1	0.49	-	-
H/O Bladder Carcinoma	1	0.61	2	0.98	2	3.92
H/O Renal Surgery	-	-	6	2.94	-	-
<u>LYMPHATIC</u>						
Enlarged Lymph Nodes	2	1.23	2	0.98	2	3.92
Enlarged Tonsils	1	0.61	1	0.49	-	-
<u>ENDOCRINE</u>						
Enlarged Thyroid Gland	1	0.61	-	-	-	-
Exophthalmos	-	-	1	0.49	-	-
H/O Gynecomastia	1	0.61	-	-	-	-
H/O Diabetes	3	1.84	9	4.41	2	3.92
H/O Thyroid Disease	-	-	3	1.47	1	1.96
<u>SKIN</u>						
Cutis Marmorata	-	-	1	0.49	-	-
Polymorphous Light Eruption	-	-	1	0.49	-	-
Nodular Elastosis of Favre-Racouchot	1	0.61	-	-	-	-
Radiation Dermatitis	-	-	1	0.49	1	1.96
Comedones, NOS	14	8.59	4	1.96	8	15.69
Miliaria	1	0.61	-	-	-	-

237861

	NOT EXPOSED (n=163)		EXPOSED (n=204)		QUESTIONABLE EXPOSURE (n=51)	
	#	%	#	%	#	%
Cysts (including Sebaceous and Keratin)	8	4.91	3	1.47	1	1.96
Acne Vulgaris	19	11.66	4	1.96	2	3.92
Chloracne	-	-	107	52.45	-	-
Rosacea	-	-	3	1.47	1	1.96
Folliculitis	14	8.59	9	4.41	3	5.88
Irritant Dermatitis	2	1.23	-	-	-	-
Stasis Dermatitis	5	3.07	2	0.98	-	-
Nummular Dermatitis	2	1.23	1	0.49	-	-
"Dyshidrotic Dermatitis"	1	0.61	-	-	-	-
ID Reaction	1	0.61	-	-	-	-
Xerosis	-	-	1	0.49	-	-
Lichen Simplex Chronicus	-	-	4	1.96	2	3.92
Prurigo Nodularis	-	-	1	0.49	-	-
Intertrigo	1	0.61	1	0.49	-	-
Drug Eruption	-	-	1	0.49	-	-
Seborrheic Dermatitis	15	9.20	11	5.39	2	3.92
Psoriasis	2	1.23	2	0.98	3	5.88
Actinic Elastosis	49	30.06	120	58.82	20	39.22
Xanthoma	-	-	1	0.49	-	-
Dystrophic Toenails	2	1.23	5	2.45	-	-
Hirsutism	3	1.84	11	5.39	1	1.96
Universal Hirsutism	1	0.61	-	-	-	-
Pigmentation, NOS	-	-	1	0.49	-	-
Hypopigmentation, Chemically Induced	1	0.61	1	0.49	-	-
Hypopigmentation, Post Inflammatory	1	0.61	3	1.47	-	-
Leukoderma and Vitiligo	2	1.23	3	1.47	-	-
Hyperpigmentation, NOS	-	-	4	1.96	-	-
Hyperpigmentation, Post Inflammatory	-	-	1	0.49	1	1.96
Lentigo, Cafe au Lait Spots, Poikiloderma of Civatte	4	2.45	3	1.47	-	-
Hemosiderosis	-	-	3	1.47	-	-
Idiopathic Guttate Hypomelanosis	-	-	1	0.49	-	-

	NOT EXPOSED (n=163)		EXPOSED (n=204)		QUESTIONABLE EXPOSURE (n=51)	
	#	%	#	%	#	%
Lichen Sclerosus et Atrophicus	-		2	0.98	-	
Hyperplasia Sebaceous Gland	1	0.61	2	0.98	1	1.96
Alopecia, Circumscribed	-		-		1	1.96
Keratosis, NOS	2	1.23	1	0.49	1	1.96
Seborrheic Keratosis	10	6.13	18	8.82	6	11.76
Actinic Keratosis	9	5.52	21	10.29	5	9.80
Acanthoma	1	0.61	2	0.98	-	
Keratosis Pilaris	-		-		1	1.96
Junction, Dermal, and Compound Nevus	15	9.20	13	6.37	3	5.88
Blue Nevus	1	0.61	-		-	
Peyronie's Disease	-		3	1.47	1	1.96
Dupuytren's Contracture	-		1	0.49	1	1.96
Telangiectasis	6	3.63	7	3.43	-	
Spider Angiomata	2	1.23	1	0.49	-	
Verruca, Verruca Vulgaris, Molluscum Contagiosum	5	3.07	4	1.96	1	1.96
Fibroepithelial Polyps	5	3.07	2	0.98	2	3.92
Squamous Cell Carcinoma	-		1	0.49	-	
Bowen's Disease	-		1	0.49	-	
Basal Cell Epithelioma	7	4.29	14	6.86	-	
Trichoepithelioma	1	0.61	-		-	
Melanoma/Impression	1	0.61	-		-	
Dermatofibroma	2	1.23	2	0.98	-	
Lipoma	2	1.23	5	2.45	1	1.96
Angiomas	4	2.45	3	1.47	1	1.96
Neurofibroma/Multiple Neurofibroma	1	0.61	1	0.49	-	
Herpes I	1	0.61	-		-	

237863

	NOT EXPOSED (n=163)		EXPOSED (n=204)		QUESTIONABLE EXPOSURE (n=51)	
	#	%	#	%	#	%
Dermatophytosis	45	27.61	62	30.39	14	27.45
Onychomycosis	16	9.82	22	10.78	6	11.76
Trichomycosis Axillaris	-	-	1	0.49	-	-
Tinea Versicolor	1	0.61	1	0.49	1	1.96
Dermagraphic Urticaria	1	0.61	-	-	-	-
Ichthyosis Vulgaris	-	-	3	1.47	-	-
H/O Dermatitis, NOS	16	9.82	11	5.39	10	19.61
H/O Pilonidal Cyst	1	0.61	1	0.49	-	-
H/O Acne Vulgaris	48	29.45	20	9.80	10	19.61
H/O Chloracne	-	-	176	86.27	-	-
H/O Folliculitis	2	1.23	1	0.49	-	-
H/O Dishidrotic Dermatitis	1	0.61	-	-	-	-
H/O Xerosis	1	0.61	-	-	-	-
H/O Skin Cancer, NOS	4	2.45	8	3.92	1	1.96
H/O Skin Tumor, NOS	1	0.61	-	-	-	-
H/O Melanoma, Surgical Excision	1	0.61	-	-	-	-
H/Q Basal Cell Epithelioma	-	-	2	0.98	-	-
INFECTIONS						
H/O Malaria	1	0.61	1	0.49	-	-
H/Q Dengue Fever	-	-	1	0.49	-	-
H/Q Rheumatic Fever	1	0.61	-	-	-	-

Table 20. Plasma Total Cholesterol (mg/dl) *

White Males - Visit 2, Random Sample.

The Lipid Research Clinics Prevalence Study (North America).

Age (Years)	N	OVERALL Mean $\pm$ S.E.	CLINIC RANGE Mean $\pm$ S.E.	PERCENTILES						
				5	10	25	50	75	90	95
0-4	20	—	—	—	—	—	—	—	—	—
5-9	146	155.2 $\pm$ 1.8	151.0 $\pm$ 3.4 157.1 $\pm$ 2.3	125	131	141	153	168	183	189
10-14	294	160.6 $\pm$ 1.5	152.0 $\pm$ 3.3 168.1 $\pm$ 4.3	124	131	144	160	173	188	202
15-19	298	153.0 $\pm$ 1.4	150.6 $\pm$ 2.6 155.5 $\pm$ 2.5	118	123	136	152	168	183	191
20-24	118	162.2 $\pm$ 2.5	163.0 $\pm$ 5.6 163.5 $\pm$ 3.2	118	126	142	159	179	197	212
25-29	253	178.7 $\pm$ 2.1	171.3 $\pm$ 4.1 187.8 $\pm$ 4.7	130	137	154	176	199	223	234
30-34	403	193.1 $\pm$ 1.8	185.6 $\pm$ 4.6 204.1 $\pm$ 5.9	142	152	171	190	213	237	258
35-39	371	200.6 $\pm$ 1.9	186.6 $\pm$ 4.5 214.8 $\pm$ 6.6	147	157	176	195	222	248	267
40-44	383	205.2 $\pm$ 1.9	197.8 $\pm$ 4.7 210.3 $\pm$ 5.8	150	160	179	204	229	251	260
45-49	326	213.4 $\pm$ 1.9	201.0 $\pm$ 3.9 237.4 $\pm$ 7.1	163	171	188	210	235	258	275
50-54	340	213.2 $\pm$ 1.9	201.4 $\pm$ 7.4 225.4 $\pm$ 4.4	156	168	189	211	237	263	274
55-59	261	215.0 $\pm$ 2.2	206.8 $\pm$ 4.7 227.1 $\pm$ 7.2	161	172	188	214	236	260	280
60-64	131	216.6 $\pm$ 3.3	216.4 $\pm$ 7.4 234.9 $\pm$ 7.2	163	170	191	215	237	262	287
65-69	105	221.0 $\pm$ 3.8	211.8 $\pm$ 6.6 225.7 $\pm$ 5.1	166	174	192	213	250	275	288
70+	119	210.3 $\pm$ 3.4	210.4 $\pm$ 4.1 210.4 $\pm$ 4.1	144	160	185	214	236	253	265

Note: Mean not given if N < 25.

5th and 95th percentiles not given if N < 100;

10th and 90th percentiles not given if N < 75;

25th and 75th percentiles not given if N < 50;

50th percentile not given if N < 40.

Clinic range indicates the range among Lipid Research Clinics (the lowest LRC mean value and the highest LRC mean value) and its respective SE.

* The Lipid Research Clinics Population Studies Book: Volume I: The Prevalence Study, USDHHS, Public Health Service, National Institutes of Health, (1980).

237865

Table 24. Plasma Triglyceride (mg/dl) *

White Males - Visit 2, Random Sample.

The LRC Prevalence Study (North America).

AGE (Years)	N	OVERALL Mean $\pm$ S.E.	CLINIC RANGE Mean $\pm$ S.E.	PERCENTILES						
				5	10	25	50	75	90	95
0-4	20	-	-	-	-	-	-	-	-	-
5-9	148	51.9 $\pm$ 1.7	50.2 $\pm$ 3.5 53.2 $\pm$ 2.1	28	34	39	48	58	70	85
10-14	299	63.4 $\pm$ 1.6	53.9 $\pm$ 5.2 67.2 $\pm$ 4.5	33	37	46	58	74	94	111
15-19	299	78.2 $\pm$ 2.4	74.1 $\pm$ 4.3 80.1 $\pm$ 4.1	38	43	53	68	88	125	143
20-24	118	89.3 $\pm$ 3.7	87.9 $\pm$ 5.2 98.5 $\pm$ 9.4	44	50	61	78	107	146	165
25-29	253	104.2 $\pm$ 4.2	80.2 $\pm$ 5.4 125.3 $\pm$ 14.1	45	51	67	88	120	171	204
30-34	403	122.1 $\pm$ 3.7	95.4 $\pm$ 4.6 148.0 $\pm$ 22.3	48	57	76	102	142	214	253
35-39	372	140.8 $\pm$ 5.5	115.8 $\pm$ 12.5 160.8 $\pm$ 19.4	52	59	80	109	167	250	316
40-44	385	152.4 $\pm$ 6.9	117.5 $\pm$ 9.6 197.3 $\pm$ 41.6	56	69	89	123	174	252	318
45-49	327	143.4 $\pm$ 5.9	124.4 $\pm$ 8.7 184.7 $\pm$ 34.1	56	65	88	119	165	218	279
50-54	340	153.4 $\pm$ 5.5	122.8 $\pm$ 9.0 161.4 $\pm$ 12.0	63	75	94	128	178	244	313
55-59	261	134.3 $\pm$ 4.2	129.8 $\pm$ 10.4 146.9 $\pm$ 12.1	60	70	85	117	167	210	261
60-64	131	130.6 $\pm$ 8.7	125.8 $\pm$ 10.1 148.4 $\pm$ 30.9	56	65	84	111	150	193	240
65-69	105	138.6 $\pm$ 11.1	135.9 $\pm$ 16.8 144.8 $\pm$ 20.5	54	61	78	108	164	227	256
70+	119	132.8 $\pm$ 7.2	130.9 $\pm$ 8.9 130.9 $\pm$ 8.9	63	71	87	115	152	202	239

Note: Mean not given if N < 25;

5th and 95th percentiles not given if N < 100;

10th and 90th percentiles not given if N < 75;

25th and 75th percentiles not given if N < 50;

50th percentile not given if N < 40.

Clinic range indicates the range among Lipid Research Clinics (the lowest LRC mean value and the highest LRC mean value) and its respective SE.

* The Lipid Research Clinics Population Studies Book: Volume I: The Prevalence Study, USDOHHS, Public Health Service, National Institutes of Health, (1980).

Table 32. Plasma LDL-Cholesterol (mg/dl) *

White Males - Visit 2, Random Sample.

The Lipid Research Clinics Study (North America).

AGE (Years)	N	OVERALL Mean $\pm$ S.E.	CLINIC RANGE Mean $\pm$ S.E.	PERCENTILES							
				5	10	25	50	75	90	95	
0-4	9	—	—	—	—	—	—	—	—	—	—
5-9	131	92.5 $\pm$ 1.8	90.9 $\pm$ 3.9 92.8 $\pm$ 2.1	63	69	80	90	103	117	129	
10-14	284	96.5 $\pm$ 1.4	84.8 $\pm$ 3.0 101.5 $\pm$ 3.8	64	72	81	94	109	122	132	
15-19	298	94.4 $\pm$ 1.3	92.5 $\pm$ 3.4 95.5 $\pm$ 2.3	62	68	80	93	109	123	130	
20-24	118	103.3 $\pm$ 2.4	101.6 $\pm$ 3.0 108.4 $\pm$ 5.2	66	73	85	101	118	138	147	
25-29	253	116.7 $\pm$ 1.9	109.6 $\pm$ 3.5 120.6 $\pm$ 4.7	70	75	96	116	138	157	165	
30-34	403	126.4 $\pm$ 1.6	119.8 $\pm$ 4.4 128.7 $\pm$ 5.7	78	88	107	124	144	166	185	
35-39	371	133.2 $\pm$ 1.7	118.4 $\pm$ 3.9 146.3 $\pm$ 5.8	81	92	110	131	154	176	189	
40-44	385	135.6 $\pm$ 1.6	129.5 $\pm$ 4.3 146.1 $\pm$ 4.5	87	98	115	135	157	173	186	
45-49	325	143.9 $\pm$ 1.8	132.9 $\pm$ 3.6 155.8 $\pm$ 6.6	98	106	120	141	163	186	202	
50-54	340	142.3 $\pm$ 1.7	137.0 $\pm$ 4.2 154.1 $\pm$ 4.2	89	102	118	143	162	185	197	
55-59	261	145.8 $\pm$ 2.1	137.0 $\pm$ 5.6 160.5 $\pm$ 5.9	88	103	123	145	168	191	203	
60-64	131	146.3 $\pm$ 3.1	148.2 $\pm$ 5.1 157.3 $\pm$ 7.2	83	106	121	143	165	188	210	
65-69	105	150.4 $\pm$ 3.5	146.3 $\pm$ 5.5 153.4 $\pm$ 5.0	98	104	125	146	170	199	210	
70+	119	142.9 $\pm$ 2.9	141.5 $\pm$ 3.5 141.5 $\pm$ 3.5	88	100	119	142	164	182	186	

Note: Mean not given if N < 25;

5th and 95th percentiles not given if N < 100;

10th and 90th percentiles not given if N < 75;

25th and 75th percentiles not given if N < 50;

50th percentile not given if N < 40.

Clinic range indicates the range among Lipid Research Clinics (the lowest LRC mean value and the highest LRC mean value) and its respective SE.

* The Lipid Research Clinics Population Studies Book: Volume I: The Prevalence Study, USDHHS, Public Health Service, National Institutes of Health, (1980).

237867

Table 36. Plasma HDL-Cholesterol (mg/dl)*

White Males - Visit 2, Random Sample.

The LRC Prevalence Study (North America).

AGE (years)	N	OVERALL Mean $\pm$ S.E.	CLINIC RANGE Mean $\pm$ S.E.	PERCENTILES						
				5	10	25	50	75	90	95
0-4	17	—	—	—	—	—	—	—	—	—
5-9	142	55.5 $\pm$ 1.0	54.8 $\pm$ 1.8 55.6 $\pm$ 1.1	38	42	49	54	63	70	74
10-14	296	54.9 $\pm$ 0.7	53.9 $\pm$ 1.0 58.5 $\pm$ 2.3	37	40	46	55	61	71	74
15-19	299	46.1 $\pm$ 0.6	42.2 $\pm$ 1.2 48.6 $\pm$ 1.6	30	34	39	46	52	59	63
20-24	118	45.4 $\pm$ 1.0	40.0 $\pm$ 1.6 48.2 $\pm$ 1.8	30	32	38	45	51	57	63
25-29	253	44.7 $\pm$ 0.7	39.6 $\pm$ 1.8 45.7 $\pm$ 1.2	31	32	37	44	50	58	63
30-34	403	45.5 $\pm$ 0.6	39.8 $\pm$ 1.6 50.2 $\pm$ 2.2	28	32	38	45	52	59	63
35-39	371	43.4 $\pm$ 0.6	34.6 $\pm$ 1.2 48.0 $\pm$ 1.8	29	31	36	43	49	58	62
40-44	383	44.3 $\pm$ 0.6	35.5 $\pm$ 1.7 49.9 $\pm$ 2.1	27	31	36	43	51	60	67
45-49	325	45.4 $\pm$ 0.6	40.2 $\pm$ 2.0 49.3 $\pm$ 2.2	30	33	38	45	52	60	64
50-54	340	44.1 $\pm$ 0.6	36.5 $\pm$ 1.3 50.1 $\pm$ 2.1	28	31	36	44	51	58	63
55-59	261	47.6 $\pm$ 0.9	41.2 $\pm$ 1.6 51.1 $\pm$ 3.0	28	31	38	46	55	64	71
60-64	131	51.5 $\pm$ 1.3	44.8 $\pm$ 2.2 54.6 $\pm$ 2.3	30	34	41	49	61	69	74
65-69	105	51.1 $\pm$ 1.5	41.2 $\pm$ 2.1 56.7 $\pm$ 2.1	30	33	39	49	62	74	78
70+	119	50.5 $\pm$ 1.7	53.2 $\pm$ 2.1 53.2 $\pm$ 2.1	31	33	40	48	58	70	75

Note: Mean not given if N < 25;

5th and 95th percentiles not given if N < 100;

10th and 90th percentiles not given if N < 75;

25th and 75th percentiles not given if N < 50;

50th percentile not given if N < 40.

Clinic range indicates the range among Lipid Research Clinics (the lowest LRC mean value and the highest LRC mean value) and its respective SE.

* The Lipid Research Clinics Population Studies Book: Volume I: The Prevalence Study, USDHHS, Public Health Service, National Institutes of Health, (1980).

APPENDIX VI

Logistic Regression

For a binary variable (e.g., FEV₁, normal or abnormal) each subject's probability of a positive response is modeled as a function of one or more predictor variables (in this example, exposure group and pack years smoked), as follows:

$$\text{Prob (FEV}_1 \text{ abnormal)} = \frac{1}{1 + \exp(-(\beta_0 + \beta_1 \times \text{Pack Years} + \beta_2 \times Z))}$$

where Z = 1 if exposed
0 if not exposed

The Newton-Raphson method is then applied to the entire sample to produce maximum likelihood estimates of the coefficients of pack years smoked and Z, the exposure variable. More details are given in The Analysis of Binary Data (D.R. Cox, Chapman and Hall (1970) London).

The maximum likelihood estimates for the exposed vs. not exposed comparison found are as follows:

Coefficient	Pulmonary Function Parameter			
	FEV ₁	FVC	FEV ₁ /FVC	MMEFR
Intercept	-3.54	-3.10	-3.43	-2.64
Pack Years	0.02	0.02	0.02	0.03
Exposure	1.00	0.74	1.06	0.60

APPENDIX VII

Clinical Laboratory Values Reference Range

Calcium	8.8 - 10.8	MG/DL
Phosphorus	2.0 - 4.7	MG/DL
BUN	6 - 25	MG/DL
Creatinine	0.5 - 1.7	MG/DL
Glucose	65 - 130	MG/DL
Uric Acid	2.5 - 8.5	MG/DL
Total Protein	6.2 - 8.3	GM/DL
Albumin	3.6 - 5.2	GM/DL
Alb:Glob Ratio	1.0 - 2.3	
Globulin	1.9 - 3.7	GM/DL
SGOT	1 - 70	IU/L
SGPT	1 - 70	IU/L
LDH	90 - 250	UNITS
Total Bilirubin	0.1 - 1.7	MG/DL
Direct Bilirubin	0 - 0.3	MG/DL
Alk. Phosphatase	10 - 50	UNITS/L
GGTP	1 - 40	UNITS/L
Sodium	134 - 145	MMOLA
Potassium	3.5 - 5.5	MMOLA
Chloride	96 - 110	MMOLA
Total Lipids	0.3 - 1.0	GM/DL
Triglycerides	50 - 200	MG/DL
Cholesterol	125 - 300	MG/DL
Iron	45 - 200	MCG/DL

THYROXINE-BINDING GLOBULIN (TBO)

Reference Range: 12 - 30 MCG/ML
 Pregnant women or
 women taking the pill: G.T. 15 MCG/ML

URINALYSIS

Appearance Clear
 pH 4.8 - 7.5
 Specific Gravity 1.001 - 1.035
 Acetone Negative
 Albumin Negative
 Glucose Negative
 Blood Negative
 WBC 0-5/HPF
 RBC 0-2/HPF
 Cast Negative
 Bacteria Negative
 Epithelial Cells Negative

CBC WITH DIFFERENTIAL

WBC		4.0 - 11.0 Thousand/ CU.MM
RBC	Male:	4.6 - 6.2 Million/ CU.MM
	Female:	4.2 - 5.4 Million/ CU.MM
HEMOGLOBIN	Male:	14.0 - 18.0 GM/DL
	Female:	12.0 - 16.0 GM/DL
HEMATOCRIT	Male:	42 - 54 PERCENT
	Female:	37 - 49 PERCENT
MCV		80 - 100 U3
MCH		26 - 33 UUG
MCHC		31 - 36 PERCENT
POLYS		42 - 81 PERCENT
BANDS		0 - 5 PERCENT
LYMPHOCYTES		10 - 47 PERCENT
MONOCYTES		0 - 10 PERCENT
EOSINOPHILS		0 - 8 PERCENT
BASOPHILS		0 - 2 PERCENT

Differential Absolute Values

NEUTROPHILS	1650 - 8330	Cells/CU.MM
LYMPHOCYTES	1049 - 3581	Cells/CU.MM
MONOCYTES	61 - 929	Cells/CU.MM
EOSINOPHILS	40 - 423	Cells/CU.MM
BASOPHILS	10 - 148	Cells/CU.MM

PORPHYRINS, URINE, QUANTITATIVE

Coproporphyrin 30 - 240 MCG/24 hrs.
 Uroporphyrin 15 - 60 MCG/24 hrs.

237870

APPENDIX VIII

Adjustment of Nerve Conduction Velocity Data

For purposes of analysis of the nerve conduction findings, all cases reporting consuming more than 35 oz. of alcohol per week were eliminated. Also dropped from the analysis were all subjects giving a history of diabetes.

To correct for temperature effects a mode temperature was calculated for each limb across all participants in the study. The following data adjustments were then made:

Ulnar or Peroneal

- a) NCV's were corrected to the mode of the midpoint nerve temperatures using DeJesus et al.'s (1973) temperature correction equation,

$$V_s = V_e e^{0.0419\Delta T} \text{ where}$$

V_s = standardized NCV to standard (mode) temperature

V_e = measured velocity at the experimental temperature

ΔT = difference in $^{\circ}\text{C}$ between standard and experimental temperatures

- b) Distal latencies were corrected to the mode of the distal temperatures using DeJesus' temperature correction equation:

$$DL_s = DL_e e^{-0.0507\Delta T}$$

DL_s = corrected distal latencies to standard temperature

DL_e = measured distal latency at the experimental temperature

ΔT = as above

- c) Residual latencies were calculated by subtracting from the latency (derived in b above) the terminal distance divided by the standardized NCV (derived in a above).

d) Distal latencies derived in b above were correct to the mode of the nerve terminal distances using the equation below:

$$L_s' = L_s + \frac{\Delta s}{V_s} \text{ where}$$

L_s' = latency standardized to standard (mode) distance

L_s = latency derived in b above

V_s = velocity derived in a above

Δs = difference between standard (mode) and experimental terminal distances

e) Ratio of amplitudes (proximal divided by distal) was calculated

Sural

The only standardizations performed on the sural nerve consisted of correcting the velocities to the mode of the midpoint nerve temperatures as in a above.

APPENDIX IX.

Normal Nerve Conduction Velocity and Distal Latency

<u>Segment</u>	<u>Conduction Velocity</u> <u>Average & Range</u> <u>Meters/sec</u>	<u>Distal Latency</u> <u>msec</u>	<u>Reference</u>
Ulnar Motor Elbow-Wrist	56.4 S.D.4.8. 57.5(49.5-63.6)	2.6(2.0-3.4)	1 2
Peroneal Motor Fibula Head-Ankle	50 S.D.3.5	5.1.S.D.0.5	2
Sural Sensory Lateral Malleolus-Calf (Ortho)	46.2 ± 5		3

1. Trojaborg, W., Electroenceph. Clin. Neurophysiol., 17:314-321, 1964.
2. McQuillen, M.P. and Gorin, F.J., J. Neurol. Neurosurg. Psychiat., 32:144-148, 1969.
3. DiBenedetto

Temperature effects on nerve conduction velocity: (2 to 2.4) meter per second /°C. Meaningful conduction velocity of peripheral nerves can be made only if segment, size, age, and temperature are known.

Typical peak-to-peak amplitudes using recording electrodes at sites referred to in this manual.

Ulnar Motor: 10 - 20mV
Peroneal Motor: 10 - 20mV
Sural Sensory: 20 - 28uV

APPENDIX X.

DEFINITION OF ALCOHOL STATUS

IF "Do you ~~now~~ drink alcoholic beverages?" = NO

AND "If no, did you ever?" = NO

THEN ALCOHOL STATUS = NEVER

IF "Do you now drink?" = NO

AND "If no, did you ever?" = YES

THEN ALCOHOL STATUS = FORMER

IF "Do you now drink?" = YES

THEN ALCOHOL STATUS = PRESENT

APPENDIX X

DEFINITION OF SMOKING

IF "Do you presently smoke cigarettes?" = NO

AND "If not now, did you ever smoke?" = NO

THEN SMOKING STATUS = NEVER

IF "Do you smoke now?" = NO

AND "If you do not now smoke cigarettes,
have you smoked them in the past?" = YES

THEN SMOKING STATUS = FORMER

IF "Do you smoke now?" = YES

THEN SMOKING STATUS = PRESENT

DEMOGRAPHIC DATA*

Runaway Reaction Subjects vs. Not Exposed

AGE

Mean $\pm$ Standard Deviation

Exposed (55)	62.73 $\pm$ 7.92
Not Exposed (65)	59.40 $\pm$ 8.88

0.01 < p < 0.05

HIGHEST EDUCATION LEVEL

	TCP Runaway Exposed	Percent	Not Exposed	Percent
0 - 8th Grade	7	12.73	2	3.13
9 - 12th Grade	41	74.55	45	70.31
> 12th Grade	<u>7</u>	12.73	<u>17</u>	26.56
Total	55		64**	

0.01 < p < 0.05

EMPLOYMENT STATUS

	TCP Runaway Exposed	Percent	Not Exposed	Percent
Active	13	23.64	42	64.62
Retired	32	58.18	22	33.85
Terminated	<u>10</u>	18.18	<u>1</u>	1.54
Total	55		65	

p < 0.0001

* All subjects white males

** Information not available for one (1) subject

237876

EXPOSURE vs. SMOKING STATUS*

	<u>TCP Runaway Exposed</u>	<u>Percent</u>	<u>Not Exposed</u>	<u>Percent</u>
Never	13	23.64	15	23.08
Former	24	43.64	35	53.85
Present	18	32.73	15	23.08
Total	55		65	

p N.S.

TCP EXPOSURE vs. PACK YEARS SMOKED*

Mean ± Standard Deviation

TCP Runaway Exposed (55)	36.66 ± 36.13
Not Exposed (65)	26.01 ± 32.42

* 0.05 < p < 0.10 for comparing TCP Exposed to Not Exposed

EXPOSURE vs. ALCOHOL STATUS*

	<u>TCP Runaway Exposed</u>	<u>Percent</u>	<u>Not Exposed</u>	<u>Percent</u>
Never	6	11.54	9	14.06
Former	21	40.38	24	37.50
Present	25	48.08	31	48.44
Total	52		64	

p N.S.

* For definition, see Appendix V

237877

FAMILY HISTORY OF ILLNESS *

<u>Family History of</u>	TCP Runaway Exposed (n=55)		Not Exposed (n=65)		<u>Probability</u>
	#	%	#	%	
Asthma	6	10.91	8	12.31	N.S.
Hayfever	4	7.27	5	7.69	N.S.
Acne	4	7.27	2	3.08	N.S.
Eczema	4	7.27	3	4.62	N.S.
Hives	4	7.27	5	7.69	N.S.
Ulcers	8	14.55	9	13.85	N.S.
Colitis	4	7.27	4	6.15	N.S.
Heart Attack or Angina before Age 60	17	30.91	17	26.15	N.S.
Heart Attack or Angina after Age 60	21	38.18	17	26.15	N.S.
High Blood Pressure	20	36.36	23	35.38	N.S.
Cerebrovascular Accident (CVA)	18	32.73	28	43.08	N.S.
High Cholesterol	4	7.27	6	9.23	N.S.
Diabetes	10	18.18	15	23.08	N.S.
Liver Disease	2	3.64	5	7.69	N.S.
Nervous Disorder	8	14.55	9	13.85	N.S.
Inherited Disorder	2	3.64	2	3.08	N.S.
Cancer	24	43.64	21	32.31	N.S.

* Includes Parents and Siblings of Subjects

HISTORY OF MEDICAL PROBLEMS

vs.

EXPOSURE STATUS

<u>History of</u>	<u>TCP Runaway Exposed (n= 55)</u>		<u>Not Exposed (n=65)</u>	
	<u>#</u>	<u>%</u>	<u>#</u>	<u>%</u>
Chloracne ¹	55	100.00	0	0.00
Acne Vulgaris	3	5.45	6	9.23
Folliculitis	0	0.00	0	0.00
Skin Cancer	3	5.45	3	4.62
Chronic Obstructive Pulmonary Disease (COPD)	1	1.82	2	3.08
Hypertension	20	36.36	23	35.38
Arteriosclerosis	0	0.00	1	1.54
Angina	1	1.82	1	1.54
Coronary Artery Disease	8	14.55	10	15.38
Cerebrovascular Accident (CVA)	2	3.64	2	3.08
Bladder Cancer	1	1.82	1	1.54
Prostatic Disease	2	3.64	3	4.62
Kidney Stones	3	5.45	9	13.85

¹ p < 0.0001

CLINICAL FINDINGS*

vs.

EXPOSURE

Finding

TCP
 Runaway
 Exposed
 (n=55)

#	%
32	58.18
0	0.00
41	74.55
6	10.91
0	0.00
1	1.82
5	9.09
1	1.82
0	0.00
1	1.82
1	1.82
0	0.00
14	25.45
7	12.73
0	0.00
2	3.64
0	0.00
4	7.27
1	1.82

Chloracne¹
 Acne Vulgaris
 Actinic Elastosis²
 Actinic Keratosis
 Alopecia, circumscribed
 Acanthoma
 Basal Cell Epithelioma
 Depigmentation
Dermatitis
 Irritant
 Nummular
 Seborrheic³
 Stasis³
 Dermatochytosis
 Onychomycosis
 Dupuytren's Contracture
 Peyronie's Disease
 Folliculitis
 Hirsutism
 Ichthyosis Vulgaris

* Not inclusive

Not Exposed
(n=65)

<u>#</u>	<u>%</u>
0	0.00
1	1.54
32	49.23
8	12.31
0	0.00
0	0.00
7	10.77
1	1.54
1	1.54
1	1.54
8	12.31
5	7.69
26	40.00
13	20.00
0	0.00
0	0.00
1	1.54
2	3.08
0	0.00

Key to p Values

- 1 $p < 0.0001$ for comparing TCP vs. Not Exposed
- 2 $0.001 < p < 0.01$ for comparing TCP vs. Not Exposed
- 3 $0.05 < p < 0.10$ for comparing TCP vs. Not Exposed

EXPOSURE
vs.
SERUM LIPID FINDINGS

<u>Serum Lipid</u>	<u>n</u>	TCP Runaway Exposed <u>#(%Abnormal)</u>	<u>n</u>	Not Exposed <u>#(%Abnormal)</u>
Cholesterol	54	5(9.26)	65	8(12.31)
Triglycerides	54	8(14.81)	65	16(24.62)
LDL, estimated	54	5(9.26)	63	4(6.35)
HDL	54	9(16.67)	65	6(9.23)

Probability

N.S.

N.S.

N.S.

N.S.

EXPOSURE
vs.
PULMONARY TEST FINDINGS

<u>Pulmonary Function Parameter</u>	<u>TCP Runaway Exposed (n= 55)</u>		<u>Not Exposed (n= 64)</u>		<u>Probability</u>
	<u>#</u>	<u>(%)Abnormal</u>	<u>#</u>	<u>(%)Abnormal</u>	
FEV ₁	11	20.00	6	9.38	N.S.
FVC	12	21.82	7	10.94	N.S.
FEV ₁ /FVC	15	27.27	5	7.81	0.0092
MMEFR	17	30.91	11	17.19	N.S.

EXPOSURE

vs.

SERUM LIPID FINDINGS BY SMOKING STATUS

<u>Serum Lipid</u>	<u>Smoking Status</u>	TCP Runaway Exposed		Not Exposed		<u>Probability</u>
		n	#(%)Abnormal	n	#(%)Abnormal	
Cholesterol						
	Never	12	1(8.33)	15	2(13.33)	N.S.
	Former	24	2(8.33)	35	3(8.57)	N.S.
	Present	18	2(11.11)	15	3(20.00)	N.S.
Triglycerides						
	Never	12	1(8.33)	15	5(33.33)	N.S.
	Former	24	4(16.67)	35	6(17.14)	N.S.
	Present	18	3(16.67)	15	5(33.33)	N.S.
LDL, estimated						
	Never	12	1(8.33)	15	1(6.67)	N.S.
	Former	24	2(8.33)	33	1(3.03)	N.S.
	Present	18	2(11.11)	15	2(13.33)	N.S.
HDL						
	Never	12	1(8.33)	15	2(13.33)	N.S.
	Former	24	4(16.67)	35	3(8.57)	N.S.
	Present	18	4(22.22)	15	1(6.67)	N.S.

EXPOSURE
vs.
PULMONARY TEST FINDINGS

<u>Pulmonary Function Parameter</u>	<u>TCP Runaway Exposed (n=55)</u>		<u>Not Exposed (n=64)</u>		<u>Probability</u>
	<u>#</u>	<u>(%)Abnormal</u>	<u>#</u>	<u>(%)Abnormal</u>	
FEV ₁	11	20.00	6	9.38	N.S.
FVC	12	21.82	7	10.94	N.S.
FEV ₁ /FVC	15	27.27	5	7.81	0.0092
MMEFR	17	30.91	11	17.19	N.S.

EXPOSURE
vs.
PULMONARY TEST FINDINGS BY SMOKING STATUS

Pulmonary Function Parameter	Smoking Status	TCP Runaway Exposed		Not Exposed		Probability
		n	#(%)Abnormal	n	#(%)Abnormal	
FEV ₁	Never	13	1(7.69)	15	2(13.33)	N.S.
	Former	24	4(16.67)	34	3(8.82)	N.S.
	Present	18	6(33.33)	15	1(6.67)	N.S.
FVC	Never	13	1(7.69)	15	3(20.00)	N.S.
	Former	24	6(25.00)	34	3(8.82)	N.S.
	Present	18	5(27.78)	15	1(6.67)	N.S.
FEV ₁ /FVC	Never	13	2(15.38)	15	1(6.67)	N.S.
	Former	24	5(20.83)	34	4(11.76)	N.S.
	Present	18	8(44.44)	15	0(0.00)	0.0063
MMEFR	Never	13	2(15.38)	15	1(6.67)	N.S.
	Former	24	6(25.00)	34	8(23.53)	N.S.
	Present	18	9(50.00)	15	2(13.33)	0.0599

EXPOSURE
vs.
ECG FINDINGS

Finding

TCP
Runaway
Exposed
(n= 55)
**%**

Normal ECG	9	16.36
Negative ECG*	25	45.45
Sinus Bradycardia	7	12.73
Sinus Tachycardia	0	0.00
PVC's ¹	10	18.18
PAC's	1	1.82
Atrial Fibrillation	1	1.82
Intraventricular Conduction Defect	2	3.64
Left Anterior Hemiblock	5	9.09
1st Degree AV Block	0	0.00
Right Bundle Branch Block, complete	1	1.82
Left Bundle Branch Block, complete	1	1.82
Old Anterior Myocardial Infarct	1	1.82
Old Inferior Myocardial Infarct	3	5.45
True Posterior Myocardial Infarct	0	0.00
Digitalis Effect	2	3.64

¹ 0.01 < p < 0.05 for comparing TCP vs. Not Exposed
* Normal or not significant findings

Not Exposed
(n= 65)

<u>#</u>	<u>%</u>
15	23.08
33	50.77
3	4.62
1	1.54
3	4.62
4	6.15
1	1.54
1	1.54
2	3.08
2	3.08
2	3.08
0	0.00
2	3.08
2	3.08
1	1.54
1	1.54

EXPOSURE
vs.
ECG FINDINGS

Finding

	TCP Runaway Exposed (n=55)	
	#	%
Left Ventricular Hypertrophy	3	5.45
Right Ventricular Hypertrophy	0	0.00
Left Atrial Hypertrophy	0	0.00
Non-specific ST-T Wave Changes	2	3.64
Low Voltage QRS	1	1.82
Abnormal P Wave	2	3.64
Left Axis Deviation	0	0.00



237889

Not Exposed
(n= 65)

<u>#</u>	<u>%</u>
5	7.69
0	0.00
0	0.00
3	4.62
0	0.00
4	6.15
1	1.54

EXPOSURE

vs.

PULMONARY TEST FINDINGS BY SMOKING STATUS

Pulmonary Function Parameter	Smoking Status	n	TCP Runaway Exposed	n	Not Exposed	Probability
			#(%)Abnormal		#(%)Abnormal	
FEV ₁	Never	13	1(7.69)	15	2(13.33)	N.S.
	Former	24	4(16.67)	34	3(8.82)	N.S.
	Present	18	6(33.33)	15	1(6.67)	N.S.
FVC	Never	13	1(7.69)	15	3(20.00)	N.S.
	Former	24	6(25.00)	34	3(8.82)	N.S.
	Present	18	5(27.78)	15	1(6.67)	N.S.
FEV ₁ /FVC	Never	13	2(15.38)	15	1(6.67)	N.S.
	Former	24	5(20.83)	34	4(11.76)	N.S.
	Present	18	8(44.44)	15	0(0.00)	0.0063
MMEFR	Never	13	2(15.38)	15	1(6.67)	N.S.
	Former	24	6(25.00)	34	8(23.53)	N.S.
	Present	18	9(50.00)	15	2(13.33)	0.0599

237820

EXPOSURE
vs.
CHEST X-RAY FINDINGS

<u>Finding</u>	TCP Runaway Exposed (n=55)	
	#	%
Normal Chest X-Ray ¹	14	25.45
Evidence, Old Granulomatous Disease ¹	23	41.82
Evidence, Arteriosclerosis	11	20.00
Evidence, Degenerative Bone Disease	8	14.55
Cardiomegaly	5	9.09
Mass	2	3.64
Chronic Obstructive Pulmonary Disease (COPD)	2	3.64
Aortic Aneurysm	0	0.00
Pulmonary Hypertension	0	0.00
Blunted Costophrenic Angle	6	10.91
Acute Parenchymal Disease	0	0.00
Elevated Hemi-diaphragms	4	7.27
Pleural Thickening	6	10.91
Parenchymal Scarring	6	10.91
Possible Mass	1	1.82
Aortic Valve Disease	0	0.00
Trauma	2	3.64

¹ 0.01 < p < 0.05 for comparing TCP vs. Not Exposed

Not Exposed
(n= 65)

%

29	44.62
14	21.54
12	18.46
4	6.15
2	3.08
1	1.54
3	4.62
0	0.00
1	1.54
6	9.23
1	1.54
1	1.54
3	4.62
8	12.31
4	6.15
0	0.00
2	3.08

CLINICAL LABORATORY FINDINGS

vs.

EXPOSURE STATUS

	n	TCP Runaway Exposed #(%Abnormal)	n	Not Exposed #(%Abnormal)
<u>BLOOD</u>				
Calcium	53	0(0.00)	63	0(0.00)
Phosphorus	52	0(0.00)	62	3(4.84)
BUN	53	5(9.43)	63	4(6.35)
Creatinine	52	1(1.92)	63	0(0.00)
Uric Acid	53	3(5.66)	62	2(3.23)
Glucose (CS)	52	3(5.77)	62	5(8.06)
Total Protein	53	1(1.89)	62	1(1.61)
Albumin	53	0(0.00)	62	0(0.00)
Globulin	53	0(0.00)	62	0(0.00)
Albumin/Globulin ratio	53	1(1.89)	62	0(0.00)
Total Bilirubin	53	0(0.00)	63	0(0.00)
Direct Bilirubin	53	3(5.66)	63	4(6.35)
Transaminase, SGO	52	2(3.85)	62	1(1.61)
Transaminase, SGP	52	2(3.85)	62	1(1.61)
Alkaline Phosphatase	53	2(3.77)	63	2(3.17)
LDH	52	3(5.77)	62	2(3.23)
Iron	53	1(1.89)	63	0(0.00)

2682
237892

CLINICAL LABORATORY FINDINGS

vs.

EXPOSURE STATUS

	n	TCP Runaway Exposed #(%Abnormal)	n	Not Exposed #(%Abnormal)
Sodium	53	2(3.77)	63	0(0.00)
Potassium	52	0(0.00)	62	0(0.00)
Chloride	53	1(1.89)	62	2(3.23)
G-glutamyl transpeptidase	53	4(7.55)	63	1(1.59)
Thyroxine binding globulins	53	12(22.64)	63	16(25.40)
<u>CBC</u>				
WBC	53	3(5.66)	63	3(4.76)
RBC	53	0(0.00)	63	1(1.59)
HGB	53	6(11.32)	63	6(9.52)
HCT	53	7(13.21)	63	8(12.70)
MCHC ¹	53	20(37.74)	63	13(20.63)
MCH	53	6(11.32)	63	8(12.70)
MCV	53	28(52.83)	63	27(42.86)
<u>Differential</u>				
Poly	53	1(1.89)	63	1(1.59)
Lymph	53	2(3.77)	63	1(1.59)
Mono	53	1(1.89)	62	0(0.00)
Eos	53	0(0.00)	63	1(1.59)
Baso	53	0(0.00)	63	1(1.59)

237893

CLINICAL LABORATORY FINDINGS

vs.

EXPOSURE STATUS

	<u>n</u>	TCP Runaway Exposed <u>#(%Positive)</u>	<u>n</u>	Not Exposed <u>#(%Positive)</u>
<u>Urinalysis</u>				
Acetone	52	0(0.00)	63	0(0.00)
Albumin	52	1(1.92)	63	0(0.00)
Bacteria	52	2(3.85)	63	7(11.11)
Blood	52	0(0.00)	63	1(1.59)
Glucose	52	0(0.00)	63	1(1.59)
White Blood Cells	52	1(1.92)	63	3(4.76)

¹ 0.05 < p < 0.10 for comparing TCP Exposed to Not Exposed

237894

DEMOGRAPHIC DATA*

TCP Runaway Reaction vs: Other Exposed

AGE

Mean $\pm$ Standard Deviation

Exposed (55)	62.73 $\pm$ 7.92
Other Exposed (77)	63.06 $\pm$ 5.59

p N.S.

HIGHEST EDUCATION LEVEL

	TCP Runaway Exposed	Percent	Other Exposed	Percent
0 - 8th Grade	7	12.73	12	15.79
9 - 12th Grade	41	74.55	54	71.05
> 12th Grade	<u>7</u>	12.73	<u>10</u>	13.16
Total	55		76**	

p N.S.

EMPLOYMENT STATUS

	TCP Runaway Exposed	Percent	Other Exposed	Percent
Active	13	23.64	35	45.45
Retired	32	58.18	37	48.05
Terminated	<u>10</u>	18.18	<u>5</u>	6.49
Total	55		77	

0.01 < p < 0.05

* All subjects white males

** Information not available for one (1) subject

237895

EXPOSURE vs. SMOKING STATUS*

	<u>TCP Runaway Exposed</u>	<u>Percent</u>	<u>Other Exposed</u>	<u>Percent</u>
Never	13	23.64	15	19.74
Former	24	43.64	36	47.37
Present	18	32.73	25	32.89
Total	55		76	

p N.S.

TCP EXPOSURE vs. PACK YEARS SMOKED*

Mean $\pm$ Standard Deviation

TCP Runaway Exposed (55) 36.66 $\pm$ 36.13

Other Exposed (73) 27.13 $\pm$ 26.01

* $0.05 < p < 0.10$ for comparing TCP Exposed to Other Exposed

EXPOSURE vs. ALCOHOL STATUS*

	<u>TCP Runaway Exposed</u>	<u>Percent</u>	<u>Other Exposed</u>	<u>Percent</u>
Never	6	11.54	7	10.00
Former	21	40.38	33	47.14
Present	25	48.08	30	42.86
Total	52		70	

p N.S.

* For definition, see Appendix V

237896

FAMILY HISTORY OF ILLNESS *

<u>Family History of</u>	<u>TCP Runaway Exposed (n= 55)</u>		<u>Other Exposed (n= 77)</u>		<u>Probability</u>
	<u>#</u>	<u>%</u>	<u>#</u>	<u>%</u>	
Asthma	6	10.91	12	15.58	NS
Hayfever	4	7.27	3	3.90	NS
Acne	4	7.27	9	11.69	
Eczema	4	7.27	6	7.79	NS
Hives	4	7.27	8	10.39	NS
Ulcers	8	14.55	12	15.58	NS
Colitis	4	7.27	7	9.09	NS
Heart Attack or Angina before Age 60	17	30.91	19	24.68	NS
Heart Attack or Angina after Age 60	21	38.18	26	33.77	NS
High Blood Pressure	20	36.36	23	29.87	NS
Cerebrovascular Accident (CVA)	18	32.73	25	32.47	NS
High Cholesterol	4	7.27	6	7.79	NS
Diabetes	10	18.18	18	23.38	NS
Liver Disease	2	3.64	7	9.09	NS
Nervous Disorder	8	14.55	12	15.58	NS
Inherited Disorder	2	3.64	5	6.49	NS
Cancer	24	43.64	31	40.26	NS

* Includes Parents and Siblings of Subjects

237897

HISTORY OF MEDICAL PROBLEMS

vs.

EXPOSURE STATUS

<u>History of</u>	TCP Runaway Exposed (n= 55)		Other Exposed (n= 77)	
	#	%	#	%
Chloracne*	55	100.00	64	83.12
Acne Vulgaris	3	5.45	5	6.49
Folliculitis	0	0.00	0	0.00
Skin Cancer	3	5.45	5	6.49
Chronic Obstructive Pulmonary Disease (COPD)	1	1.82	2	2.60
Hypertension	20	36.36	25	32.47
Arteriosclerosis	0	0.00	0	0.00
Angina	1	1.82	0	0.00
Coronary Artery Disease	8	14.55	10	12.99
Cerebrovascular Accident (CVA)	2	3.64	4	5.19
Bladder Cancer	1	1.82	1	1.30
Prostatic Disease	2	3.64	3	3.90
Kidney Stones	3	5.45	7	9.09

*0.001 < p < 0.01 for comparing TCP to Other Exposed

CLINICAL FINDINGS*

vs.

EXPOSURE

<u>Finding</u>	TCP Runaway Exposed (n= 55)	
	#	%
Chloracne	32	58.18
Acne Vulgaris	0	0.00
Actinic Elastosis	41	74.55
Actinic Keratosis	6	10.91
Alopecia, circumscribed	0	0.00
Acanthoma	1	1.82
Basal Cell Epithelioma	5	9.09
Depigmentation	1	1.82
<u>Dermatitis</u>		
Irritant	0	0.00
Nummular	1	1.82
Seborrheic	1	1.82
Stasis	0	0.00
Dermatophytosis	14	25.45
Onychomycosis	7	12.73
Dupuytren's Contracture	0	0.00
Peyronie's Disease	2	3.64
Folliculitis	0	0.00
Hirsutism	4	7.27
Ichthyosis Vulgaris	1	1.82

* Not inclusive

Other Exposed
(n = 77)

<u>#</u>	<u>%</u>	
43	55.84	
0	0.00	0.00
52	67.53	1
12	15.58	...
0	0.00	0.00
1	1.30	0.00
6	7.79	0.00
0	0.00	0.00
0	0.00	0.00
0	0.00	0.00
5	6.49	0.00
1	1.30	0.00
24	31.17	1
13	16.88	0.00
0	0.00	0.00
0	0.00	0.00
1	1.30	0.00
5	6.49	
1	1.30	

237900

CLINICAL FINDINGS*

vs.

EXPOSURE

Finding

	TCP Runaway Exposed (n= 55)	
	#	%
Lichen Simplex Chronicus	1	1.82
Lipoma	2	3.64
Melanoma, impression	0	0.00
Millaria	0	0.00
Neurofibroma, multiple	1	1.82
Poikiloderma	0	0.00
Psoriasis	1	1.82
Rhinophyma/Rosacea	0	0.00
Squamous Cell Carcinoma, impression	0	0.00
Xerosis	0	0.00
Nervousness/Anxiety/ Depression	12	21.82
Systolic murmur **	7	12.73
Diastolic murmur	0	0.00
Decreased libido (H/O)	13	23.64
H/O Impotence, NOS	9	16.36

* Not inclusive

** $0.01 < p < 0.05$ for comparing TCP to Other Exposed

Other Exposed
(n= 77)

#	%
3	3.90
1	1.30
0	0.00
0	0.00
0	0.00
0	0.00
0	0.00
4	5.19
1	1.30
1	1.30
13	16.88
1	1.30
0	0.00
19	24.68
7	9.09
	1.30
1	1.30



EXPOSURE
vs.
SERUM LIPID FINDINGS

<u>Serum Lipid</u>	<u>n</u>	TCP Runaway Exposed	<u>n</u>	Other Exposed
		<u># (%Abnormal)</u>		<u># (%Abnormal)</u>
Cholesterol	54	5 (9.26)	75	3 (4.00)
Triglycerides	54	8 (14.81)	75	10 (13.33)
LDL, estimated	54	5 (9.26)	75	4 (5.33)
HDL	54	9 (16.67)	75	6 (8.00)

237901

Probability

NS

NS

NS

NS



EXPOSURE
vs.
SERUM LIPID FINDINGS BY SMOKING STATUS

<u>Serum Lipid</u>	<u>Smoking Status</u>	<u>TCP Runaway Exposed</u>		<u>Other Exposed</u>		<u>Probability</u>
		<u>n</u>	<u>#(%)Abnormal</u>	<u>n</u>	<u>#(%)Abnormal</u>	
Cholesterol						
	Never	12	1(8.33)	15	0(0.00)	N.S.
	Former	24	2(8.33)	35	3(8.57)	N.S.
	Present	18	2(11.11)	24	0(0.00)	N.S.
Triglycerides						
	Never	12	1(8.33)	15	2(13.33)	N.S.
	Former	24	4(16.67)	35	6(17.14)	N.S.
	Present	18	3(16.67)	24	2(8.33)	N.S.
LDL, estimated						
	Never	12	1(8.33)	15	0(0.00)	N.S.
	Former	24	2(8.33)	35	3(8.57)	N.S.
	Present	18	2(11.11)	24	1(4.17)	N.S.
HDL						
	Never	12	1(8.33)	15	2(13.33)	N.S.
	Former	24	4(16.67)	35	2(5.71)	N.S.
	Present	18	4(22.22)	24	2(8.33)	N.S.

237902

EXPOSURE
vs.
PULMONARY TEST FINDINGS

<u>Pulmonary Function Parameter</u>	<u>TCP Runaway Exposed (n= 55)</u>		<u>Other Exposed (n= 76)</u>		<u>Probability</u>
	<u>#</u>	<u>(%)Abnormal</u>	<u>#</u>	<u>(%)Abnormal</u>	
FEV ₁	11	20.00	18	23.68	N.S.
FVC	12	21.82	20	26.32	N.S.
FEV ₁ /FVC	15	27.27	14	18.42	N.S.
MMEFR	17	30.91	22	28.95	N.S.

237903

EXPOSURE

vs.

PULMONARY TEST FINDINGS BY SMOKING STATUS

Pulmonary Function Parameter	Smoking Status	TCP Runaway Exposed		Other Exposed		Probability
		n	#(%)Abnormal	n	#(%)Abnormal	
FEV ₁	Never	13	1(7.69)	14	2(14.29)	N.S.
	Former	24	4(16.67)	36	6(16.67)	N.S.
	Present	18	6(33.33)	25	10(40.00)	N.S.
FVC	Never	13	1(7.69)	14	2(14.29)	N.S.
	Former	24	6(25.00)	36	7(19.44)	N.S.
	Present	18	5(27.78)	25	11(44.00)	N.S.
FEV ₁ /FVC	Never	13	2(15.38)	14	1(7.14)	N.S.
	Former	24	5(20.83)	36	6(16.67)	N.S.
	Present	18	8(44.44)	25	7(28.00)	N.S.
MMEFR	Never	13	2(15.38)	14	2(14.29)	N.S.
	Former	24	6(25.00)	36	9(25.00)	N.S.
	Present	18	9(50.00)	25	11(44.00)	N.S.

237904

237905

EXPOSURE
vs.
ECG FINDINGS

Finding

	TCP Runaway Exposed (n=55)		Other Exposed (n=77)	
	#	%	#	%
Normal ECG ¹	9	16.36	30	38.96
Negative ECG*	25	45.45	46	59.74
Sinus Bradycardia	7	12.73	3	3.90
Sinus Tachycardia	0	0.00	1	1.30
PVC's ²	10	18.18	5	6.49
PAC's	1	1.82	4	5.19
Atrial Fibrillation	1	1.82	0	0.00
Intraventricular Conduction Defect	2	3.64	1	1.30
Left Anterior Hemiblock	5	9.09	3	3.90
1st Degree AV Block	0	0.00	1	1.30
Right Bundle Branch Block, complete	1	1.82	4	5.19
Left Bundle Branch Block, complete	1	1.82	1	1.30
Old Anterior Myocardial Infarct	1	1.82	1	1.30
Old Inferior Myocardial Infarct	3	5.45	3	3.90
True Posterior Myocardial Infarct	0	0.00	1	1.30
Digitalis Effect	2	3.64	0	0.00

* Normal or not significant findings

¹ 0.001 < p < 0.01 for comparing TCP to Other Exposed

² 0.05 < p < 0.1 for par TCP to Ot Exposed

EXPOSURE

vs.

ECG FINDINGS

FindingTCP
Runaway
Exposed
(n=55)

%

Left Ventricular Hypertrophy	3	5.45
Right Ventricular Hypertrophy	0	0.00
Left Atrial Hypertrophy	0	0.00
Non-specific ST-T Wave Changes	2	3.64
Low Voltage QRS	1	1.82
Abnormal P Wave	2	3.64
Left Axis Deviation	0	0.00

237906



Other Exposed
(n=77)

<u>#</u>	<u>%</u>
3	3.90
0	0.00
1	1.30
4	5.19
0	0.00
5	6.49
1	1.30

EXPOSURE
vs.
CHEST X-RAY FINDINGS

Finding	TCP Runaway Exposed (n= 55)		Other Exposed (n= 77)	
	#	%	#	%
Normal Chest X-Ray	14	25.45	28	36.36
Evidence, Old Granulomatous Disease	23	41.82	26	33.77
Evidence, Arteriosclerosis	11	20.00	12	15.58
Evidence, Degenerative Bone Disease	8	14.55	6	7.79
Cardiomegaly	5	9.09	3	3.90
Mass	2	3.64	1	1.30
Chronic Obstructive Pulmonary Disease (COPD)	2	3.64	5	6.49
Aortic Aneurysm	0	0.00	1	1.30
Pulmonary Hypertension	0	0.00	0	0.00
Blunted Costophrenic Angle	6	10.91	9	11.69
Acute Parenchymal Disease	0	0.00	0	0.00
Elevated Hemi-diaphragms	4	7.27	1	1.30
Pleural Thickening	6	10.91	7	9.09
Parenchymal Scarring	6	10.91	4	5.19
Possible Mass	1	1.82	4	5.19
Aortic Valve Disease	0	0.00	0	0.00
Trauma	2	3.64	0	0.00

237907

CLINICAL LABORATORY FINDINGS

vs.

EXPOSURE STATUS

	n	TCP Runaway Exposed #(%Abnormal)	n	Other Exposed #(%Abnormal)
<u>BLOOD</u>				
Calcium	53	0(0.00)	73	0(0.00)
Phosphorus	52	0(0.00)	70	1(1.43)
BUN*	53	5(9.43)	73	1(1.37)
Creatinine	52	1(1.92)	73	1(1.37)
Uric Acid	53	3(5.66)	73	3(4.11)
Glucose (CS)	52	3(5.77)	70	8(11.43)
Total Protein	53	1(1.89)	73	0(0.00)
Albumin	53	0(0.00)	73	0(0.00)
Globulin	53	0(0.00)	73	0(0.00)
Albumin/Globulin ratio	53	1(1.89)	73	1(1.37)
Total Bilirubin	53	0(0.00)	73	0(0.00)
Direct Bilirubin	53	3(5.66)	73	2(2.74)
Transaminase, SGO	52	2(3.85)	70	1(1.43)
Transaminase, SGP	52	2(3.85)	70	0(0.00)
Alkaline Phosphatase	53	2(3.77)	73	0(0.00)
LDH	52	3(5.77)	70	5(7.14)
Iron	53	1(1.89)	73	0(0.00)

0.05 < p < 0.10 for comparing TCP to Other Exposed

8067237908

CLINICAL LABORATORY FINDINGS

vs.

EXPOSURE STATUS

	n	TCP Runaway Exposed #(%Abnormal)	n	Other Exposed #(%Abnormal)
Sodium	53	2(3.77)	73	0(0.00)
Potassium	52	0(0.00)	70	2(2.86)
Chloride	53	1(1.89)	73	0(0.00)
G-glutamyl transpeptidase	53	4(7.55)	73	1(1.37)
Thyroxine binding globulins	53	12(22.64)	74	16(21.62)
<u>CBC</u>				
WBC	53	3(5.66)	73	2(2.74)
RBC	53	0(0.00)	73	0(0.00)
HGB	53	6(11.32)	73	7(9.59)
HCT	53	7(13.21)	73	9(12.33)
MCHC	53	20(37.74)	73	28(38.36)
MCH	53	6(11.32)	73	13(17.81)
MCV	53	28(52.83)	73	30(41.10)
<u>Differential</u>				
Poly	53	1(1.89)	73	3(4.11)
Lymph	53	2(3.77)	73	3(4.11)
Mono	53	1(1.89)	73	0(0.00)
Eos	53	0(0.00)	73	2(2.74)
Baso	53	0(0.00)	73	0(0.00)

237909