



CHEMICAL MANUFACTURERS ASSOCIATION

November 26, 1984

TO: OSHA Legal Contacts
General Counsels' Group

FROM: Claire BoccellaCB

RE: AFL-CIO Legal Foundation

Enclosed is a prospectus, prepared by the Industrial Union Department of the AFL-CIO, regarding an Occupational Health Legal Rights Foundation. The prospectus states that the impetus for the creation of the Foundation is the "fundamental failure of state workers' compensation programs to provide fair and adequate relief to workers who have suffered illness as a result of exposure to workplace health hazards."

The purpose of the Foundation is to assist workers in bringing test cases to recover workers' compensation benefits and tort remedies for diseases resulting from workplace health hazards.

The Foundation will target the following types of cases:

- . cases involving hazards from toxic substances where there previously was no established association between workplace exposure and occupational disease, and where there is now reason to believe that many workers face a significant risk of harm;
- . cases on behalf of workers exposed to toxic substances that the medical community has long associated with worker health impairment who have been unable to obtain adequate legal representation;
- . cases where an important legal precedent could be established that could benefit many workers (see page 4-5 of the prospectus).

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The various state right-to-know laws could facilitate the bringing of these types of cases. The activities of the Foundation could also have an impact on state workers' compensation legislation.

We will keep you informed of further developments relating to the Foundation.

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PROSPECTUS

OCCUPATIONAL HEALTH LEGAL RIGHTS FOUNDATION

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September 25, 1984

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SERVICES OF THE FOUNDATION

- *Identify workers exposed to known hazards
- *Screen cases for scientific and legal merit
- *Notify exposed workers of their legal rights
- *Provide lists of cooperating lawyers
- *Recommend expert witnesses
- *Provide scientific and legal review of testimony
- *Provide a central data base for use by witnesses and attorneys.
- *Share information developed in Foundation cases
- *Provide educational opportunities for attorneys on occupational disease.

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PURPOSES

On June 7, at the International Conference on Disability Compensation for Occupational Disease in New York City, Industrial Union Department President Howard D. Samuel proposed a program to bring lawsuits on behalf of workers (and their families) who have suffered illness as a result of occupational health hazards. After discussions with the Executive Council of the Department, meetings were held with officers, attorneys and staff of the affiliates. On the basis of a unanimous, positive response, the Industrial Union Department has established a non-profit corporation: The Occupational Health Legal Rights Foundation.

The purposes of the Foundation are to ensure that workers obtain adequate compensation when they have suffered illness from workplace hazards, to educate workers about the existence of such hazards and steps they may take to safeguard their health and legal rights, and to exert pressure upon employers to eliminate or ameliorate such hazards in the first place.

BACKGROUND

The primary impetus for creation of the Occupational Health Legal Rights Foundation is the fundamental failure of state workers' compensation programs to provide fair and adequate relief to workers who have suffered illness as a result of exposure to workplace health hazards. The basic concept of the workers' compensation system was sound when the system was initiated three-quarters of a century ago, and remains sound today. That concept is that workers ought to be

provided with a means to obtain fair and adequate compensation for illnesses and injuries arising from employment, regardless of who was at fault, without the cost and delay that accompany negligence suits brought in court. The reality has been, however, that state workers' compensation programs have utterly failed to honor this concept in the context of occupational disease.

Most occupational disease is effectively excluded from the coverage of the workers' compensation laws of some states. Other states impose unrealistic requirements concerning time or place of exposure, fail to define precisely compensable occupational diseases, or include restrictive definitions of causation that are out of step with current legal and scientific thinking. In those states where compensation is obtainable, the benefits provided are woefully inadequate.

Although these problems have received increasing attention, they are difficult to correct because workers' compensation programs are operated on a state-by-state basis. The IUD, BCTD and AFL-CIO have proposed a comprehensive and uniform federal workplace disability compensation system. As a result of vigorous opposition by the manufacturing and insurance industries to these proposals, afflicted workers cannot expect to achieve a satisfactory legislative solution in the near future.

Lacking meaningful legislative protection, many workers who have contracted occupational diseases, and the families of such workers, have resorted to negligence suits in court. This effort has produced

mixed results. On the one hand, many of these lawsuits have achieved large verdicts in the workers' favor, sometimes including punitive damages. On the other hand, lawyers who traditionally handle such cases typically require a contingency fee of 35 to 50 percent of the recovery, and lawyers who are not conscientiously dedicated to their clients' cause have in some cases counseled workers to enter into substandard settlements at amounts far below an objective valuation of the case. Frequently, workers with valid claims go unrepresented at all because they lack information about their legal rights or access to competent counsel, or because negligence lawyers lack the resources or expertise to recognize the association between a workers' problems and conditions in the workplace. Moreover, discovery costs, including charges for expert depositions, and other expenses have often been inflated or duplicated.

Against this background, the IUD has undertaken to establish the Foundation, while at the same time remaining committed to obtaining federal legislation that assures adequate compensation for victims of occupational disease. Until the Congress acts and an equitable system is in place and functioning effectively, we are determined to assist workers, within the framework of current law, to obtain the compensation they are due. The Foundation intends to tap for the benefit of workers both the existing compensation system and the desirable aspects of the private tort system. This will be done by helping to ensure that workers

with valid claims relating to workplace exposures have qualified legal representation at equitable costs.

FUNCTIONS

The Foundation's principal function will be the coordination and support of lawsuits brought on behalf of workers who have suffered illness from workplace health hazards. The Foundation will engage, as well, in educational activities to inform employees (and unions) of the nature and dangers of workplace health hazards, where to seek assistance, and how to enforce their rights. In the near future, the Foundation will focus its efforts and resources mainly on litigation activity.

The Foundation's litigation activity will seek to ensure that workers or their families are fairly compensated for job-related illnesses, and that companies abate workplace health hazards as quickly as possible. To these ends, and given the limited number of cases that the Foundation will be able to finance in its formative years, the Foundation will concentrate its efforts on the following types of cases:

1. Cases involving hazards from toxic substances where there previously was no established association between workplace exposure and occupational disease, and where there is now reason to believe that many workers face a significant risk of harm. In such a situation, information uncovered during pretrial discovery or trial involving certain victims could be made available to lawyers of other victims of similar

workplace exposures. This would broaden the impact of an individual suit.

2. Cases on behalf of workers exposed to toxic substances that the medical community has long associated with worker health impairment who have been unable to obtain adequate legal representation. Various populations of exposed workers have failed to benefit from the legal system either because they have been uninformed of their legal rights or because they have gone unnoticed by negligence lawyers. The Foundation will assist in providing representation to such workers and in drawing attention to their problems.

3. Cases where an important legal precedent could be established that could benefit many workers: (i) Suits against the workers' immediate employers in those states, such as Ohio and Vermont, where the "exclusivity" principle of the workers' compensation laws does not prohibit intentional tort suits against employers. (ii) Suits to establish that intentional torts are not barred by state workers' compensation laws in states where that principle has not yet been established. (iii) Suits designed to produce large punitive damage verdicts. (iv) Suits against laboratories for misrepresenting data in their epidemiological studies, thereby understating the severity of health risks to workers exposed to a particular substance. (v) Suits against company doctors or industrial hygienists for practices that are unacceptable from an occupational health standpoint.

STRUCTURE

The Foundation has been set up as a non-profit, tax exempt corporation consistent with Section 501(c)(5) of the Internal Revenue Code which is applicable to labor unions and related organizations.

The Foundation is directed by a Board of Directors, whose members will be appointed by the IUD Executive Council. The officers of the Foundation include a President and Secretary-Treasurer, who will also be selected by IUD Executive Council.

Assisting and advising the Board and Officers is an Advisory Council consisting of officers of those unions most likely to provide cases from among their membership.

The Foundation has two committees that will play a critical role in determinations concerning which lawsuits to bring.

The first is the Scientific Advisory Committee, which will comprise persons drawn from the medical and scientific community. This Committee will evaluate instances of suspected employment-related disease to determine the degree, if any, of actual health impairment and the actual association, if any, with workplace events or exposure. While the Committee's own expertise will enter into the judgments about these matters, it is not contemplated that it will conduct actual medical or scientific examinations, but it will assist in approving and securing the services of qualified experts to do so. The chairperson of the Scientific Advisory Committee serves ex officio as a member of the Board of Directors of the Foundation.

The second committee is the Legal Advisory Committee, which will comprise attorneys knowledgeable about occupational safety and health litigation, including counsel to unions. This Committee will perform the following functions:

1. Analyze and evaluate whether to pursue potential lawsuits consistent with the purposes of the Foundation.
2. Recommend attorneys or law firms to represent workers or their families in litigation coordinated or supported by the Foundation.
3. Periodically review the quality of the representation provided by lawyers who receive referrals through the Foundation.
4. Conduct practical seminars for interested lawyers in various locations throughout the country.
5. Review the case selection process and recommend to the Board categories of cases to be pursued or categories of cases to be dropped.

The chairperson of this Committee will serve ex officio as a Director of the Foundation.

A third committee -- the Executive Committee -- will be responsible for the general governance of the Foundation between meetings of the Board of Directors. The Executive Committee will have five members, which will include ex officio the President, the Secretary-Treasurer, and the chairpersons of the Legal Advisory Committee and the Scientific Advisory Committee, and one other Director.

The Foundation will have an Administrator appointed by the Officers who shall supervise a small staff to handle administrative matters and investigate litigation prospects. To this end, the Administrator and staff will act as liaison with the AFL-CIO and its departments, international unions, local unions, exposed workers, and other persons and organizations that may seek the assistance of the Foundation on behalf of potential plaintiffs.

The staff will conduct -- if necessary and appropriate -- on-site interviews or investigations. It will provide, with the advice of the Scientific and Legal Advisory Committees, lists of approved expert witnesses and, wherever possible and cost-effective, centralized data bases available to all participating attorneys.

The litigation that the Foundation decides to coordinate and support will be handled, as noted, by attorneys recommended by the Legal Advisory Committee. The Foundation will establish a contingent fee schedule, for such representation, that reflects rates below the 35 to 50 percent customarily charged by plaintiffs' lawyers. The schedule would specify a percentage for recovery by settlement in the early stages of the litigation, and a higher percentage for recovery at or after trial. Whatever the percentages determined to be appropriate, any law firm that obtains any case as a result of a referral through the Foundation will have to agree that its charges for that case will be in accord with this restricted contingent fee.

As an incentive to encourage law firms to participate in handling such cases under the Foundation's standards, it is contemplated that the Foundation will establish a procedure to assist plaintiffs for a specified maximum amount of money for all or some out-of-pocket expenses incurred for particular purposes -- for example, deposition transcripts, travel, photocopying, and expert witness fees. In this connection, the Legal Advisory Committee will draft model agreements for use by the Foundation, plaintiffs, and plaintiffs' counsel. Under such an agreement, at the successful culmination of the lawsuit, the plaintiffs will reimburse counsel for those expenses, and counsel, in turn, will return to the Foundation those monies advanced for expenses.

Although the Legal Advisory Committee will endeavor to select only highly qualified counsel to handle cases referred to or supported by the Foundation, the Foundation nonetheless will exercise a coordinating role with the local counsel. Such coordination is necessary to ensure that cases are not settled precipitously or unfavorably, that the Foundation's standards are met, and that legal research, discovery, and other litigation resources are efficiently shared among all counsel handling cases in which the Foundation is involved. To this end, the Foundation will assign counsel to serve as co-counsel in each such case, on behalf

f the Foundation. The designated co-counsel will participate actively in important litigation judgments made in each case and will ensure that information and other resources generated in cases supported by the Foundation are efficiently shared. The designated co-counsel shall be recompensed by the Foundation for such services on an hourly, non-contingency fee basis.

FINANCES

As indicated by the foregoing discussion, the Foundation will incur administrative and operating expenses in implementing its objectives, and will require substantial funds in order to advance litigation expenses. Although the Foundation should increasingly recover a portion of the expenses advanced, the recovery would not be complete barring the extremely unlikely event of a 100 percent success rate in litigation. The Foundation will be supporting cases that are on the frontiers of science and law. In any event, recovery would be deferred pending the outcome of litigation.

In order to meet the Foundation's need to finance its expected deficit, the Foundation will solicit contributions and loans from labor unions whose members will ultimately benefit from the activities of the Foundation. This is consistent with the labor movement's commitment to remedy the failings of other measures to ensure adequate workers' compensation and safe and healthful working conditions.

Further, it is contemplated that the Foundation will charge fees to cover the costs of certain services it will provide in connection

tion for expenses advanced. The combined percentage of attorneys' fees and contingent payment to the Foundation would be set beneath the rates customarily charged by plaintiffs' lawyers for handling such cases. Funding from these sources will not be available unless litigation is successfully completed.

A first-year budget will be developed when the case load for that year has been determined.

APPENDIX

Editorial: Quantitative Estimates of Cancer in the Workplace

Carcinogens/Carcinogenic Processes and Exposed Work Populations At Risk

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for Human Exposure, 1940-79

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EDITORIAL

Quantitative Estimates of Cancer in the Workplace

Key words: occupational cancer

The role of occupation in the etiology of human cancer has received increasing attention, particularly in the past decade. This issue contains a report of yet another group of workers at excess risk for cancer (woodworkers other than cabinet makers). In recent years, a variety of high volume solvents and other widely used chemicals have also been implicated as potential human carcinogens by animal bioassay data. Nevertheless, the identification of specific human carcinogens progresses slowly, and the general acceptance of the human carcinogenic potential of agents for which there are animal data and suggestive human epidemiological data has preceded even more slowly. This slowness has often been for valid scientific reasons. Confounding factors and methodological uncertainties may have affected epidemiological studies. Animal data are often limited by the small number of deaths and by the effects of agent toxicity. Corroborative studies may not always be available.

Our scientific conservatism in accepting evidence of carcinogenicity for humans may be unduly severe and, as a result, our estimates of the importance of occupational cancer correspondingly diminished. In a recent analysis by Doll and Peto of the quantitative estimates of avoidable risks of cancer in America [Doll and Peto, 1981], 18 occupational agents or processes were considered "established" as carcinogens on the basis of human evidence. Thirteen medical and 12 social causes were similarly categorized. The International Agency for Research on Cancer (IARC) has published a virtually identical list of 18 agents causally associated with cancer in humans (Group 1 compounds or processes) [IARC, 1982]. While the relative risks (observed/expected deaths) were uncertain for a number of the compounds because of relatively few deaths, a review of the IARC list shows that nine of the agents or processes had relative risks of from about 50 to 500 for cancer of a specific site among some group of individuals. Eight had risks between about 5 and 50 and only one, the rubber industry, had a risk of the order of 2 for cancer at some sites. Any plausible frequency distribution of the relative risks of site-specific human occupational cancers would certainly have a large number of points with relative risks less than 5, were they to be known. In terms of accepted human carcinogens, we have clearly identified only the "tip of the iceberg."

While most occupational carcinogens have yet to be fully accepted or even identified, deaths from the "established" causes of occupational cancer account for at least 3% of all cancer deaths among both males and females in the United States. In terms of impact on mortality, excepting cigarette smoking, occupation is the most important specific factor quantitatively identified as causative of human cancer in the United States. In terms of agents, again excepting cigarette smoking, occupational exposure to asbestos is the most important carcinogenic exposure, being associated

with more than 8,500 deaths annually [Nicholson et al, 1982]. If one considers only male deaths, the contribution of the identified causes of occupational cancer accounts for 6% of all cancer, but for more than 12% of all cancer among blue collar workers, the only group actually at significant identified risk from occupation.

It is generally accepted, based on comparisons of cancer incidence in different geographic areas, that "environmental factors" can contribute to at least 80% of United States cancer mortality. Here "environmental factors" are taken to mean the totality of the effects of that which we eat, breathe or are otherwise exposed to. Dietary factors (high cholesterol or fat intake, nutritional deficiencies, etc.) generally have been accorded an important role as a cause of human cancer. The recent review by Doll and Peto attributed 35% all of U.S. cancer to diet and suggested the contribution could even be twice as high. While diet must be of importance in human cancer etiology, there are yet no quantitative data that allow a specific estimate to be made of the contribution of any dietary factor. Considering the existing evidence, only about 50% of the cancers in males can be associated at present with some specific agent (this includes some double counting because of synergistic effects). Thus, specific "accepted" occupational carcinogens account for at least 25% of the identified causes of cancer among United States blue collar workers. As more occupational carcinogens are identified, this percentage will certainly rise. And in terms of preventable cancer, occupational neoplasms perhaps take pride of place. Certainly workers need no behavioral modification, as with cigarette smoking, to accept the advantage of cessation of exposure to workplace carcinogens.

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REFERENCES

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- IARC (1982): IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals in Humans. Supplement 4, October, 1982.
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CARCINOGENS/CARCINOGENIC PROCESSES AND EXPOSED WORK POPULATIONS AT RISK

Unregulated as Agents/Processes	Population at risk	Regulated as Agents/Processes	Population at risk
Asphalt fumes	500,000	2-Acetylaminofluorene	E
Auramine***	3,000	Acrylonitrile	125,000
Benzene***	2,976,000	4-Aminodiphenyl***	E
Benzidine, dianisidine, and toluidine-based dyes	N	Asbestos***	2,479,900
Beryllium	30,000	Benzidine***	2,200
Boot and Shoe***	N	bis-Chloromethyl ether***	E
1,3-Butadiene	50,000	Carbon oven emissions	10,000
Cadmium	100,000	1,2-dibromo-3-chloro- propane (DBCP)	N
Carbon tetrachloride	56,500	3,3'-Dichlorobenzidine	E
Chloroform	40,000	4-Dimethylaminoazo-benzene	28,600
Chloroprene	2,500	Ethylene oxide	100,000
Chromate pigments	550,000	Ethyleneimine	4,500
Coal gasification	4,000**	Inorganic arsenic*** (and compounds)	1,491,700
Coal tar products	N	Kepone	E
Cutting oils (nitrosamines)	780,000	Methyl chloromethyl ether	E
4,4'-diaminodiphenyl-methane (DDM)	2,500	4,4-Methylene bis (1-chloroaniline) (MOCA)	67,200
Dianisidine	N	alpha-Naphthylamine	46,400
Dimethylcarbamylchloride (DMCC)	E	beta-Naphthylamine***	1,000
Epichlorohydrin	85,000	4-Nitrobiphenyl	E
Ethylene dibromide	660,000	n-Nitrosodimethylamine	E
Ethylene dichloride	34,000	beta-Propiolactone	E
Ethylene thiourea	3,500	Vinyl chloride***	3,546,700
Formaldehyde	100,000*		
Furniture***	348,000		
Hematite mining***	N		
Hexamethylphosphoric- triamine (HMPA)	5,000		
Hexavalent chromium***	175,000		
Hydrazine and salts	100,000		
Isopropyl refining***	141,000		
Methylene chloride	70,000		
Nickel (oxides)	1,400,000		
2-Nitropropane	100,000		
n-Phenyl-beta-naphthylamine	15,000		
Polychlorinated biphenyls (PCB)	12,000		
Rubber products***	N		
Shale oil extraction	E		
Toluidine	N		
Trichloroethylene (TCE)	280,000		
Uranium mining & milling	N		
Vinyl bromide	26,000		
Vinyl fluoride	32,000		
Vinylidene chloride	58,000		
Welding fumes	N		
Woodworking	534,000		

Notes:

N, no satisfactory estimates at this time

E, estimates of less than 1000 workers exposed

***Deemed carcinogens/carcinogenic processes for humans by IARC (WHO)

**Estimate for 1985

*Direct production

Source: Health, safety & Environment,
Industrial Union Dept., AFL-CIO

Source: Office of Technology Assessment, Assessment of Technologies for Determining Cancer Risks from the Environment, June 1981.

OCCUPATIONAL CANCER HAZARDS

Agent	Cancer site or type	Type of workers exposed
Acrylonitrile	Lung, colon	Manufacturers of apparel, carpeting, blankets, draperies, synthetic furs, and wigs Chemical workers
Aminobiphenyl	Bladder	
Arsenic and certain arsenic compounds	Lung, skin, scrotum, lymphatic system, hemangiosarcoma of the liver	Workers in the metallurgical industries, sheep-dip workers, pesticide production workers, copper smelter workers, vineyard workers, insecticide makers and sprayers, tanners, miners (gold miners)
Asbestos	Lung, larynx, GI tract, pleural and peritoneal mesothelioma	Asbestos factory workers, textile workers, rubber-tire manufacturing industry workers, miners, insulation workers, shipyard workers
Auramine and the manufacture of auramine	Bladder	Dye-stuffs manufacturers, rubber workers, textile dyers, paint manufacturers
Benzene	Leukemia	Rubber-tire manufacturing industry workers, painters, shoe manufacturing workers, rubber cement workers, glue and varnish workers, distillers, shoemakers, plastics workers, chemical workers
Benzidine	Bladder, pancreas	Dye-workers, chemical workers
Beryllium and certain beryllium compounds	Lung	Beryllium workers, electronics workers, missile parts producers
Bis(chloromethyl)ether (BCME)	Lung	Workers in plants producing anion-exchange resins (chemical workers)
Cadmium and certain cadmium compounds	Lung, prostate	Cadmium production workers, metallurgical workers, electroplating industry workers, chemical workers, jewelry workers, nuclear workers, pigment workers, battery workers
Carbon tetrachloride	Liver	Plastic workers, dry cleaners
Chloromethyl methyl ether (CMME)	Lung	Chemical workers, workers in plants producing ion exchange resin
Chromium and certain chromium compounds	Lung, nasal sinuses	Chromate-producing industry workers, acetylene and aniline workers, bleachers, glass, pottery, pigment, and linoleum workers
Coal tar pitch volatiles	Lung, scrotum	Steel industry workers, aluminum potroom workers, laundry workers
Coke oven emissions	Lung, kidney, prostate	Steel industry workers, coke plant workers
Dimethyl sulphate	Lung	Chemical workers, drug makers, dyemakers
Epichlorohydrin	Lung, leukemia	Chemical workers
Ethylene oxide	Leukemia, stomach	Hospital workers, research lab workers, beekeepers, fumigators
Hematite and underground hematite mining	Lung	Miners
Isopropyl oils and the manufacture of isopropyl oils	Paranasal sinuses	Isopropyl oil workers
Mustard gas	Respiratory tract	Production workers
2-naphthylamine	Bladder, pancreas	Dye-workers, rubber-tire manufacturing industry workers, chemical workers, manufacturers of coal gas, nickel refiners, copper smelter-electrolysis workers
Nickel (certain compounds) and nickel refining	Nasal cavity, lung, larynx	Nickel refiners
Polychlorinated biphenyls (PCBs)	Melanoma	PCBs workers
Radiation, ionizing	Skin, pancreas, brain, stomach, breast, salivary glands, thyroid, GI tract, bronchus, lymphoid tissue, leukemia, multiple myeloma	Uranium miners, radiologists, radiographers, luminous dial painters
Radiation, ultraviolet	Skin	Farmers, sailors, arc welders
Soots, tars, mineral oils	Skin, lung, bladder, GI tract	Construction workers, roofers, chimney sweeps, machinists
Thonium dioxide	Liver, kidney, larynx, leukemia	Chemical workers, steelworkers, ceramic makers, incandescent lamp makers, nuclear reactor workers, gas mantle makers, metal refiners, vacuum tube makers
Vinyl chloride	Liver, brain, lung, hematolymphopoietic system, breast	Plastics factory workers, vinyl chloride polymerization plant workers
Agents not identified	Pancreas Stomach Brain, stomach Hematolymphopoietic system Bladder Eye, kidney, lung Leukemia, brain Colon, brain Esophagus, stomach, lung	Chemists Coal miners Petrochemical industry Rubber industry workers Printing pressmen Chemical workers Farmers Pattern and model makers Oil refinery workers

CMA 046964

Risk Factors Associated With Workplace Exposures To Five High-Volume Human Carcinogens

Chemical	Sites of primary cancers	Occupations at risk	Latency period for cancer (years)	1981 NIOSH estimated numbers of workers potentially exposed	
				Full + part time ^a	Full time
Arsenic	Skin, lung, liver, lymphatic system	Miners, smelters, insecticide makers and sprayers, chemical workers, oil refiners, wineries	10+	255,407 431,914 (arsenic oxides)	12,270 8,269
Asbestos	Lung, pleural and peritoneal mesothelioma, gastrointestinal tract	Miners, millers, textile, insulation and shipyard workers	4-40	1,281,023	79,843
Benzene	Bone marrow (leukemia)	Explosives, benzene and rubber cement workers, distillers, dye users, printers, shoe-makers	6-14	1,495,194	40,844
Chromium	Nasal cavity and sinuses, lung	Producers and processors of Cr: acetylene and aniline workers; bleachers; glass, pottery, and linoleum workers; battery makers	5-15	1,451,480 (oxides)	237,686
Nickel	Nasal cavity and sinuses, lung	Nickel smelters, mixers, and roasters, electrolysis workers	3-30	1,369,169 (oxides)	232,684

Risk Factors Associated With Workplace Exposures To Six High-Volume Human Carcinogens

Chemical	Sites of primary cancers	Occupations at risk	Latency period for cancer (years)	1981 NIOSH estimated numbers of workers potentially exposed	
				Full + part time	Full time
Acrylonitrile	Colon, lung	Chemical workers and plastics workers	20+	374,312	25,245
Carbon tetrachloride	Liver	Drycleaning, machinists		1,378,982	21,457
Ethylene oxide	Leukemia, gastric cancer (suggested)	Hospital workers, laboratory workers, fumigators		144,329	2,767
Beryllium	Lung	Beryllium workers, defense and aerospace industry, nuclear industry	15+	855,073 (oxides)	106,633
Cadmium	Prostate, respiratory tract, renal	Electrical workers, painters, battery plant and alloy workers		1,376,756 (oxides)	230,607
Vinyl chloride	Angiosarcoma, lung, brain, hematolymphopoietic	Plastics industry	20+	239,347	8,186

Source: Davis et al (1981).

- From "Cancer Prevention: Assessing Causes, Exposure, and Recent Trends in Mortality for U.S. Males 1968-1978", Davis, D.L., Bridbord, K., and Schneiderman, M.; Teratogenesis, Carcinogenesis, and Mutagenesis 2:105-135 (1982)

Amounts of Confirmed or Suspect Human Carcinogens Potentially Available for Human Exposure, 1940-79

Substance, measure, unit	1940-49	1950-59	1960-69	1970-79
Metals				
Asbestos (U.S. apparent consumption, thousands of short tons)	4,637	7,419	7,561	6,875
Beryllium (U.S. apparent consumption, millions of pounds)	-	65 ^a	117 ^b	33 ^c
Cadmium (U.S. production, millions of pounds)	-	76 ^d	105	53 ^e
Chromium (U.S. apparent consumption, thousands of short tons)	7,992	13,377	13,136	11,579
Nickel (U.S. consumption, thousands of short tons)	-	1,040	1,492	1,692
White Arsenic (As ₂ O ₃) (U.S. apparent consumption, thousands of short tons, estimated)	343	221	247	Confidential industry data
Synthetic Organic Chemicals				
Acrylonitrile (U.S. production, millions of pounds)	-	964 ^f	6,224	14,047
Benzene (U.S. production, millions of pounds)	1,225	6,663	49,363	93,203
Carbon Tetrachloride (U.S. production, millions of pounds)	1,705	2,763	5,896	9,251
Chloroform (U.S. production, millions of pounds)	-	387	1,396	2,820
Ethylene Oxide (U.S. production, millions of pounds)	-	6,127 ^g	21,259	43,484
Vinyl Chloride (U.S. production, millions of pounds)	388 ^h	5,161	20,071	53,626

^a1950-55 figures not available.

^b1960 figures not available.

^c1975-79 figures not available.

^d1950-51 figures not available.

^e1978-79 figures not available. Figure shown includes 1977 estimate.

^f1950-53 figures not available.

^g1950-52, 1954 figures not available.

^h1946-49 figures not available.

Source: U.S. Internal Trade Commission; U.S. Department of Interior, Bureau of Mines.

- From "Cancer Prevention: Assessing Causes, Exposures, and Recent Trends in Mortality for U.S. Males 1968-1978", D. Davis, K. Briddbord, and M. Schneiderman, *Teratogenesis, Carcinogenesis, and Mutagenesis*, 2:105-135 (1982)

WORKPLACE CHEMICALS AND PROCESSES ASSOCIATED WITH REPRODUCTIVE EFFECTS

EVIDENCE IN HUMANS

Anesthetic gases (In Hospitals)

Anesthetic gases (nitrous oxide)

Carbon Disulfide

Chloroprene

1,2-dibromo-3 chloropropane (DBCP)

Diethylstilbestrol (DES)

Ethylene dibromide (EDB)

Hexachlorobenzene (HCB)

Kepone

Laboratory reagents

Lead and other smelter emissions

Methyl mercury

Occupational exposure to pesticides

Polychlorinated biphenyls (PCBs)

Vinyl chloride

Source: Health, Safety & Environment, Industrial Union Dept. AFL-CIO

Source: Health, Safety & Environment, Industrial Union Department, AFL-CIO

NON-NEOPLASTIC DISEASE CLINICALLY CONFIRMED

Aluminosis
Asbestiosis
Silicosis
Shaver's Disease
Berylliosis
Byssinosis
Pneumoconiosis of diatomite
Pneumoconiosis of kaolin
Heavy metal poisoning
Carbon disulfide poisoning
Carbontetrachloride poisoning
Fluorocarbon arrhythmia
Hydrogensulfide poisoning

"The Work Relatedness of Renal Disease", Landrigan, P.J., Goyer, R.A.,
 Clarkson, T.W., Sandler, D.P., Smith, J.H., Thun, M.J., Wedeen, R.P.,
Archives of Environmental Health, vol. 39, no 3, May/June 1984, pp. 225-230.

Table 2.—Estimated Numbers of Workers in the United States
 With Potential Occupational Exposures* to Known or Suspect
 Nephrotoxins, 1971-1972

Lead†	614,887‡
Cadmium†	51,572
Inorganic Mercury†	37,593
Uranium†	1,163
Solvents‡	3,373,339
Silica‡	174,614
Arsenic†	5,929
Pesticides‡	16,358
Beryllium‡	10,510

* The phrase "potential occupational exposure" derives from NIOSH's National Occupational Hazard Survey (NOHS), in which occupational groups are related to chemical exposures.¹ Environmental samples were not collected in the NOHS. A recordable potential exposure agent was defined as a chemical used in a worker's work area for at least 30 min/wk for at least 90% of the weeks in a year and which presented the potential, in the surveyor's judgment, for contact with the worker in one or more of its physical phases.

† Known Nephrotoxin

‡ Suspect Nephrotoxin

§ Total exceeds 3.9 million because some workers have multiple potential exposures.

Table 1.—Factors Associated with Work-Related Cardiovascular Disease*

Substance	High-Risk Workers	Cardiovascular Abnormalities or Diseases		
		Acute		Chronic
Arsenite	Brazing workers Drug makers	Powerworkers Typesetters	EKG changes	
Arsenic	Alloy makers Insecticide makers	Smelters	EKG changes	Increased mortality from CHD†
Cadmium	Alloy makers	Jewelry makers		Increased mortality from CHD† Hypertension†
Carbon disulfide	Ammonium salt makers Bromine processors Carbon tetrachloride makers Depressors Dry cleaners Eucroplasters Fat processors Fission agent makers Iodine processors Oil processors Paint workers Preservative makers	Pulley makers Rayon makers Resin makers Rocket fuel makers Rubber cement workers Rubber workers Sulfur processors Tallow makers Textile makers Vacuum tube makers Varnish makers Wax processors		Increased mortality from CHD Increased atherosclerosis
Carbon monoxide	Acetylene workers Blaze furnace workers Boiler room workers Brewery workers Carbon black makers Coke oven workers Diesel engine operators Garage mechanics Steel workers	Metal oxide reducers Miners Mordant process workers Organic chemical synthesizers Petroleum refinery workers Pulp and paper workers Water gas workers	Acute myocardial infarction (MI), angina, arrhythmias, sudden death	Increased atherosclerosis†
Cobalt	Alloy makers			Congestive cardio-myopathy
Cold	Refrigeration workers Out-of-door workers	Packing house workers	Acute MI, angina, sudden death	Increased atherosclerosis†
Fibrogenic dusts	See Chap. 18			Right-sided heart failure Increased mortality from CHD†
Fluorocarbons	Aerosol bomb makers Ceramic mold makers Dry cleaners Drug makers Fire extinguisher workers Heat transfer workers	Metal conditioners Plastic makers Pressurized food makers Refrigeration makers Rocket fuel makers Solvent workers	Arrhythmias	
Heat	Bakers Boilers Furnace workers	Foundry workers Kiln workers Smelter workers	Acute MI, angina, sudden death	Increased atherosclerosis†
Hydrocarbons	See Appendix A)		• Arrhythmias	
Lead	Smelters Battery makers	Brass foundry workers		Hypertension†
Methylene chloride	Aerosol packagers Anesthetic makers Bitumen makers Depressors Fat extractors Flavoring makers	Leather finish workers Oil processors Paint remover makers Resin makers Solvent workers Skin removers	(metabolized to carbon monoxide in body—see "Carbon Monoxide" above)	
Nitrites	Explosives makers	Drug makers	Angina, acute MI, sudden death	Increased atherosclerosis†
Noise	Textile mill workers Lumber workers Wood workers	Petroleum workers Coal workers Metal workers	Acute MI† Anginal	Increased atherosclerosis†
Radiation (ionizing)	Atomic energy plant workers Uranium workers	Denoise and assisting X-ray technicians See Table 13-1		Increased atherosclerosis†

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ICD-9	Condition	A	B	C	Industry/occupation ^a	Agent
011	Pulmonary Tuberculosis (OI)	P	P,T	P,T	Physicians, ¹¹ medical personnel, ¹¹ med lab workers ¹¹	<i>Mycobacterium tuberculosis</i> ^{11,12,13,14}
011.502	Silicuberculosis	P	P,T	P,T	Quartermen, sandblasters, silica processors, mining, metal foundries, ceramic industry. ¹¹	SiO ₂ + <i>Mycobacterium tuberculosis</i> ^{11,12,13,14}
020	Plague (OI)	P	-	P,T	Shepherds, farmers, ranchers, hunters, field geologists ¹¹	<i>Yersinia pestis</i> ¹¹
021	Tularemia (OI)	P	-	P,T	Nurses, fur handlers, sheep industry workers, ¹¹ cooks, vets, ranchers, vet pathologists. ¹¹	<i>Francisella tularensis</i> ^{11,12}
022	Anthrax (OI)	P	-	P,T	Shepherds, farmers, butchers, handlers of imported hides or furs, ¹¹ veterinarians, veterinarian pathologists, weavers. ¹¹	<i>Bacillus anthracis</i> ^{11,12,13,14}
023	Brucellosis (OI)	P	P	P,T	Farmers, shepherds, veterinarians, lab workers, ¹¹ slaughterhouse workers. ^{11,12}	<i>Brucella abortus suis</i> ^{11,12,13,14}
037	Tetanus (OI)	P	-	P,T	Farmers, ranchers. ¹¹	<i>Clostridium tetani</i> ¹¹
054	Rubella (OI)	P	P	P	Medical personnel, ^{11,12,13,14} intensive care personnel, ¹¹	Rubella virus. ^{11,12,13,14}
055	Hepatitis A (OI)	P	P	P	Day care center staff, ^{11,12} orphanage staff, ^{11,12} institutionalization staff, ^{11,12} medical personnel. ¹¹	Hepatitis A virus. ^{11,12,13,14}
070.2.3	Hepatitis B (OI)	P	P	P	Nurses and aides, ^{11,12} anesthesiologists, ¹¹ orphanage and mental institution staff, ¹¹ med lab personnel, ^{11,12} general dentists ¹¹ and oral surgeons, ¹¹ physicians. ^{11,12}	Hepatitis B virus. ^{11,12,13,14}
070.4	Non-A, Non-B Hepatitis (OI)	P	P	P	As above for hepatitis A and B	Unknown
071	Rabies (OI)	P	-	P	Veterinarians, animal and game wardens, lab researchers, farmers, ranchers, trappers. ¹¹	Rabies virus. ¹¹
073	Ornithosis (OI)	P	-	P	Poultry bird breeders, pet shop staff, poultry producers, veterinarians, zoo employees. ¹¹	<i>Chlamydia psittaci</i> ¹¹
155.44	Hemangiosarcoma of the Liver	P	P	P	Vinyl chloride polymerization industry. ¹¹ Vintners. ¹¹	Vinyl chloride monomer. ^{11,12,13,14} Arenic pesticides. ¹¹
160.0	Malignant Neoplasm of Nasal Cavities (OI)	P	P,T	P,T	Woodworkers, cabinet, furniture makers, ^{11,12,13,14} Boot and shoe industry. ^{11,12} Radium chemists and processors, ¹¹ dial painters, ¹¹ Chromium producers, processors, users, ¹¹ Nickel smelting and refining. ^{11,12}	Hardwood dusts. ^{11,12,13,14} Unknown. ^{11,12} Radium. ^{11,12} Chromates. ^{11,12} Nickel. ^{11,12,13,14}
161	Malignant Neoplasm of Larynx (OI)	P	P,T	P,T	Asbestos industries and utilizers. ¹¹	Asbestos. ^{11,12}
162	Malignant Neoplasm of Trachea, Bronchus, and Lung (OI)	P	P	P	Asbestos industry and utilizers, ^{11,12} Topsoil coke oven workers, ^{11,12,13} Uranium and fluor spar miners, ¹¹ Chromium producers and processors, ¹¹ users. ^{11,12} Nickel smelters, processors, users. ¹¹ Smelters. ¹¹ Mustard gas formulations. ¹¹ Ion exchange resin makers, chemists. ^{11,12}	Asbestos. ^{11,12,13,14} Coke oven emissions. ^{11,12,13} Radon daughters. ¹¹ Chromates. ^{11,12,13,14} Nickel. ^{11,12,13} Arenic. ^{11,12} Mustard gas. ¹¹ Bis(chloromethyl) ether, chloromethyl methyl ether. ^{11,12}
158.163	Mesothelioma (MAN of Peritoneum) (MAN of Pleura)	P	-	P	Asbestos industries and utilizers. ^{11,12}	Asbestos. ^{11,12,13,14}
170	Malignant Neoplasm of Bone (OI)	P	-	P	Dial painters, ¹¹ radium chemists and processors. ¹¹	Radium. ^{11,12}
187.7	Malignant Neoplasm of Scrotum	P	-	P,T	Automatic lathe operators, ¹¹ metalworkers, ¹¹ Coke oven workers, petroleum refiners, tar distillers. ¹¹	Mineral/curing oils. ^{11,12} Soots and tars, tar distillates. ^{11,12}
188	Malignant Neoplasm of Bladder (OI)	P	-	P	Rubber and dye workers. ^{11,12}	Benzidine. ^{11,12} alpha and beta naphthylamine. ^{11,12} auramine. ^{11,12} magenta. ^{11,12} 4-aminobiphenyl. ^{11,12} 4-mercaptophenyl. ^{11,12}
189	Malignant Neoplasm of Kidney, Other, and Unspecified Urinary Organs (OI)	P	P	P	Coke oven workers. ^{11,12}	Coke oven emissions. ^{11,12}
204	Lymphoid Leukemia, Acute (OI)	P	-	P	Rubber industry. ^{11,12} Radiologists. ^{11,12}	Unknown. ^{11,12} Ionizing radiation. ^{11,12,13,14}
205	Myeloid Leukemia, Acute (OI)	P	-	P	Occupations with exposure to benzene. Radiologists. ^{11,12}	Benzene. ^{11,12,13,14} Ionizing radiation. ^{11,12,13,14}
207.0	Erythroleukemia (OI)	P	-	P	Occupations with exposure to benzene.	Benzene. ^{11,12,13,14}
283.1	Hemolytic anemia, Non-auto-immune (OI)	P	-	P,T	Whitewashing and leather industry. ¹¹ Electrolytic processes, arenic ore smelting. ¹¹ Plastics industry. ¹¹ Dye, celluloid, resin industry. ¹¹	Copper sulfate. ¹¹ Arsenic. ^{11,12,13} Trimellitic anhydride. ¹¹ Naphthalene. ¹¹
284.8	Aplastic Anemia (OI)	P	-	P	Explosives manufacture. ^{11,12} Occupations with exposure to benzene. Radiologists, ¹¹ radium chemists and dial painters. ¹¹	TNT. ^{11,12} Benzene. ^{11,12} Ionizing radiation. ^{11,12,13,14}
288.0	Agranulocytosis or Neutropenia (OI)	P	-	P	Occupations with exposure to benzene. Explosives and pesticide industries. ¹¹ Pesticides, pigments, pharmaceuticals. ¹¹	Benzene. ^{11,12} Phosphorus. ¹¹ Inorganic arsenic. ¹¹
289.7	Methemoglobinemia (OI)	P	-	P,T	Explosives and dye industries. ^{11,12,13}	Aromatic amino and niro compounds (e.g. aniline, TNT, nitroglycerin). ^{11,12,13,14}
323.7	Toxic Encephalitis (OI)	P	P	P	Battery, smelter, and laundry workers. ^{11,12} Electrolytic chlorine production, battery makers, fungicide formulations. ^{11,12}	Lead. ^{11,12} Inorganic and organic mercury. ^{11,12}
332.1	Parkinson's Disease (Sec.)	P	P	-	Manganese processing, battery makers, welders. ¹¹	Manganese. ^{11,12}

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ICD-9	External Cause	P	P.T	P.T	Occupational exposure	Occupational exposure
357.7	Inflammatory and Toxic Neuropathy (O)	P	P.T	P.T	Electrolytic chlorine production. Battery makers. fungicide formulations. ¹⁰	Organic mercury. ¹⁰
					Pesticides, ¹⁰ pigments, pharmaceuticals. ¹⁰ Furniture refinishing, degreasing operations. ¹⁰ Plastic-coated-labir workers. ¹⁰ Explosives industry. ¹⁰ Bacon manufacturing. ¹⁰ Plastics, hydraulics, coke industries. ¹⁰ Battery, smelter, and laundry workers. ¹⁰ Dentists, ¹⁰ chloralkali workers. ¹⁰ Chloralkali plants, fungicide makers, battery makers. ¹⁰ Plastics industry, ¹⁰ paper manufacturing. ¹⁰	Aromatic and anionic compounds. ¹⁰ Hexane. ¹⁰ Methyl n-butyl ketone. ¹⁰ TNT. ¹⁰ CS. ¹⁰ Tri-n-octyl phosphate. ¹⁰ Inorganic lead. ¹⁰ Inorganic mercury. ¹⁰ Organic mercury. ¹⁰
366.4	Cataract (O)	P	P.T	-	Microphone and radar technicians. ¹⁰ Explosives industries. ¹⁰ Radiologists. ¹⁰ Blacksmiths, glass blowers, bakers. ¹⁰ Moth repellent formulations, fumigations. ¹⁰ Explosives, dye, herbicide and pesticide industries. ¹⁰	Acrylamide. ¹⁰ Microwaves. ¹⁰ TNT. ¹⁰ Ionizing radiation. ¹⁰ Infrared radiation. ¹⁰ Naphthalene. ¹⁰ Dinitrophenol, ¹⁰ dinitro-p-cresol. ¹⁰
366.1	Noise Effects on Inner Ear (O)	P	P	-	Exposure. ¹⁰	Excessive noise. ¹⁰
443.0	Raynaud's Phenomenon (Secondary) (O)	P	-	-	Lumberjacks, ¹⁰ chain sawyers, grinders, chippers. ¹⁰ Vinyl chloride polymerization industry. ¹⁰	Whole body or segmental vibration. ¹⁰ Vinyl chloride monomer. ¹⁰
495.0 to 495.6, .8	Extrinsic Allergic Alveolitis	P	P	P.T	Farmer's lung, baggassosis, bird fancier's lung, workers' lung, mushroom worker's lung, maple bark disease, cheese washer's lung, coffee worker's lung, fish-meal worker's lung, furrier's lung, sequoia, wood worker's lung, miller's lung. ¹⁰	Various agents. ¹⁰
493.0, 507.8	Extrinsic Asthma (O)	P	P.T	P.T	Jewelry, alloy and catalyst makers. ¹⁰ Polyurethane, adhesive, paint workers. ¹⁰ Alloy, catalyst, refinery workers. ¹⁰ Solderers. ¹⁰ Plastic, dye, insecticide makers. ¹⁰ Foam workers, latex makers, biologists. ¹⁰ Printing industry. ¹⁰ Nickel platers. ¹⁰ Bakers. ¹⁰ Plastics industry. ¹⁰ Woodworkers, furniture makers. ¹⁰ Detergent formulations. ¹⁰	Platinum. ¹⁰ Isocyanates. ¹⁰ Chromium and cobalt. ¹⁰ Aluminum soldering flux. ¹⁰ Phthalic anhydride. ¹⁰ Formaldehyde. ¹⁰ Cum arabic. ¹⁰ NiSO. ¹⁰ Flour. ¹⁰ Trimellitic anhydride. ¹⁰ Red cedar and other wood dusts. ¹⁰ Bacillus-derived exoenzymes. ¹⁰
500	Coalworkers' Pneumoconiosis	P	P	P	Coal miners. ¹⁰	Coal dust. ¹⁰
501	Asbestosis	P	P	P	Asbestos industries and utilization. ¹⁰	Asbestos. ¹⁰
502M	Silicosis	P	P	P	Quarrymen, sandblasters, silica processors, ¹⁰ mining, metal, and ceramic industries. ¹⁰ Talc processors. ¹⁰	Silica. ¹⁰ Talc. ¹⁰
503M	Chronic Beryllium Disease of the Lung	P	P	P	Beryllium alloy workers, ceramic and cathode ray tube makers, nuclear reactor workers. ¹⁰	Beryllium. ¹⁰
504	Byssinosis	P	P	P	Cotton industry workers. ¹⁰	Cotton, flax, hemp, and cotton-synthetic dusts. ¹⁰
506.0, 506.1	Acute Bronchitis, Pneumonia, and Pulmonary Edema Due to Fumes and Vapors (O)	P.T	P.T	P	Refrigeration, fertilizer, ¹⁰ oil refining industries. ¹⁰ Alkali and bleach industries. ¹⁰ Silo fillers, arc welders, nitric acid industry. ¹⁰ Paper and refrigeration industries, oil refining. ¹⁰ Cadmium smelters, processors. ¹⁰ Plastics industry. ¹⁰	Ammonia. ¹⁰ Chlorine. ¹⁰ Nitrogen oxides. ¹⁰ Sulfur dioxide. ¹⁰ Cadmium. ¹⁰ Trimellitic anhydride. ¹⁰
570, 573.1	Toxic Hepatitis (O)	P	P	P	Solvent utilization, dry cleaners, ¹⁰ plastics industry. ¹⁰ Explosives and dye industries. ¹⁰ Fire and waterproofing additive formulations. ¹⁰ Plastics formulations. ¹⁰ Fumigations, gasoline, fire extinguisher formulations. ¹⁰ Disinfectants, fumigants, synthetic resin formulations. ¹⁰	Carbon tetrachloride, ¹⁰ chloroform, ¹⁰ tetrachloroethane, ¹⁰ trichloroethylene. ¹⁰ Phosphorus, ¹⁰ TNT. ¹⁰ Chloronaphthalenes. ¹⁰ Methylenedianiline. ¹⁰ Ethylene dibromide. ¹⁰ Cresol. ¹⁰
584, 585	Acute or Chronic Renal Failure (O)	P	P.T	P.T	Battery makers, plumbers, solderers. ¹⁰ Electrolytic processes, arsenical ore smelting. ¹⁰ Battery makers, jewelers, dentists. ¹⁰ Fluorocarbon formulations, fire extinguisher makers. ¹⁰ Antifreeze manufacture. ¹⁰	Inorganic lead. ¹⁰ Arsenic. ¹⁰ Inorganic mercury. ¹⁰ Carbon tetrachloride. ¹⁰ Ethylene glycol. ¹⁰
606	Infertility, Male (O)	P	P	-	Formulations. ¹⁰ DBCP producers, formulations, and applications. ¹⁰	Kepon. ¹⁰ Dibromochloropropane. ¹⁰
692	Contact and Allergic Dermatitis (O)	P.T	P.T	-	Leather tanning, poultry dressing plants, fish packing, adhesives and sealants industry, boat building and repair. ¹⁰	Irritants (e.g., cutting oils, solvents, phenols, acids, alkalis, detergents); allergens (e.g., nickel, chromates, formaldehyde, dyes, rubber products). ¹⁰

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External causes of injury and poisoning (occupational) include accidents and are classified in the ICD-9 under the E codes.

- A = Unnecessary disease
- B = Unnecessary disability
- C = Unnecessary untimely death
- @ = Industry/Occupation listings are examples only
- *O = Only where an occupational exposure can be established
- *P = prevention, T = treatment
- EM = Modified ICD rubric

"Sentinel Health Events (Occupational): A Basis for Physician Recognition and Public Health Surveillance", Rutstein, D.C., Mullan, R.J., Frazier, T.M., Halperin, W.E., Melius, J.M., Sestito, J.P. Archives of Environmental Health, vol. 39, no. 3, May/June 1984, pp. 159-168.