Occupational and Environmental Medicine: The Internist's Role

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The relation between health and the environment is attracting increased attention from the public and the scientific community. As members of the public become increasingly concerned about health hazards in their living and working environments, they often turn to primary care physicians with questions about exposures and risks. The American College of Physicians (ACP) recognizes that internists need a framework for assessing these issues and offers this broad overview for the practicing internist. This paper provides a context for further exploration of the internist's role in occupational and environmental medicine and will serve as a springboard for specific ACP strategies to foster that role.

The field of environmental and occupational medicine is concerned with the diagnosis, treatment, and prevention of disease caused by agents in the environment. Its preventive approach stresses the physical, chemical, and biologic properties of the external environment that affect human health. Although preventive measures have largely targeted infectious agents for most of the last century, the focus has recently widened to diseases caused by many chemical and physical agents. Frequently, these agents are products or by-products of the technologies of industrialization.

Health concerns about the environment are being increasingly debated in social, political, and economic arenas, often with the mass media as a conduit. On both a public and personal health level, the medical profession should be patient advocates and educators in this field. Patients should look to their physicians for advice on prevention and for diagnosis and treatment of environmentally caused conditions as well as for an understanding of well-publicized health hazards that may provoke great anxiety. The internist's role is dual: first, to identify conditions related to environmental risks and, second, to interpret sensibly the mass of media-generated information into a basic understanding of personal risk for each patient.

The difficulties in fulfilling this role stem from at least three factors: inadequate medical education and training, which may not provide internists with opportunities to develop the conceptual base required to deal effectively with the issues; the scientific framework of occupational and environmental medicine, which may entail unfamiliar methods and terminology; and the media-generated information that the public receives, which often appears without warning and in a sensationalized form. These problems, although not insurmountable, must be acknowledged and overcome.

Scope of This Paper

As the *1979 Surgeon General's Report on Health Promotion* states, "There is virtually no major chronic disease to which environmental factors do not contribute, either directly or indirectly" (1). This paper emphasizes health issues that are related to exposure to chemical substances that are either man-made or brought into human proximity in a concentrated form by human activities; exposure to potentially pathogenic aspects of the physical environment (for example, ionizing radiation), whether occurring naturally or as a result of human activities; and increased exposure to biologic hazards (agents causing infection, allergy, or irritation) as a result of human activities.

This paper omits aspects of the environment that are related to lifestyle (for example, tobacco smoking, ethanol consumption, diet) and socioeconomic status. These factors are no less important, but are themselves complex enough to require separate comment. It also omits important occupational concerns, such as workload, work assignments, and body and machine (ergonomic) interactions.

The distinction between environmental and occupational medicine is not sharp; a recent Institute of Medicine report called the separation and fragmentation of the disciplines "artificial" (2). Both are heavily oriented toward prevention and share conceptual underpinnings and the methodologies of hazard identification, risk assessment, risk characterization, and risk communication. The College echoes the Institute's recognition of the value of these subjects being taught and evolving clinically together. Most known causal associations of particular environmental agents and human disease were discovered in studies of workers. Thus, most of our examples are of occupational exposure.

As a clinical specialty, environmental medicine is in its infancy. It is distinct from the controversial practice known as "clinical ecology," which often relies on unproved theories of "environmental illness" (3). Occupational medicine, on the other hand, is a well-recognized medical specialty, with board certification and specialty journals. Many of the procedural elements of occupational medicine, such as regulation and reporting, lie beyond the scope of this paper; a fuller discussion of these issues can be found in the 1984 ACP position paper on the internist's role in occupational

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medicine (4). Here we emphasize the importance of assessing health hazards in both workplace and non-workplace environments, as internists incorporate the principles of occupational and environmental medicine into their practices.

Chemical Environmental Agents

Since World War II, the number of synthetic chemicals in the environment has risen dramatically. In 1984, a committee of the National Research Council estimated that approximately five million chemical compounds had been synthesized (5). Not unexpectedly, this increase has paralleled a dramatic rise in the uses for these chemicals. Industrialized nations have produced a dazzling array of synthetic fibers, plastics, solvents, fuels, detergents, pigments, metal alloys, pharmaceuticals, and pesticides. Moreover, a synthetic industrial process may yield not only the finished chemical product but, potentially, toxic waste as well. In all, the National Research Council committee found that about 65 725 chemical compounds merited concern because of the potential consequences of human exposure (5). Data on human and animal toxicology for most of the compounds used in commerce are inadequate.

Naturally occurring chemical substances remain important causes of substantial morbidity when brought into contact with humans. For example, aflatoxins, compounds that are elaborated by fungi growing in stored grain, may be carcinogenic to humans (6). Lead has been mined and used in various ways, including as a base for paint. Although such use of lead has now been strictly limited in this country, substantial lead contamination in older city areas is an important cause of intellectual dysfunction in children (7, 8).

Physical Environmental Agents

Although not as numerous as chemical hazards, various physical environmental agents can also have important health consequences. Environmental cold, for example, may cause fatal hypothermia in homeless persons (9). At the other temperature extreme, the crude mortality rate can triple in some areas during summer heat waves (10). Increasing attention is being directed to the myriad health problems that may occur over the course of the next several decades as a result of man-made changes in the composition of atmospheric gases (the "greenhouse effect") (11). Other physical environmental exposures, such as exposures to ultraviolet radiation, vibration, and noise, are also of concern, particularly in occupational situations.

Because of its potential for harm and the tremendous anxiety it causes, radioactivity (ionizing radiation) is unique as a physical environmental agent (12, 13). Radiation exposure from nuclear power plants has come under intense scrutiny since the accidents at Three Mile Island and Chernobyl (14). Continuing concern is reflected in recent public debates about possible human exposure to radioactive wastes from nuclear weapons facilities (15). An increasing body of evidence suggests that a carcinogenic hazard is posed by the accumulation of naturally occurring radon gas in many residential dwellings in the United States (16, 17).

Biologic Environmental Agents

Although not all infectious diseases fall under the aegis of occupational and environmental medicine, we do include biologic hazards that result from human interventions in the environment. Examples include Legionnaire disease, may be often spread through air-conditioning systems (18), and coccidioidomycosis, which has been reported to develop in archeologists and other workers who are exposed to soil and dust (19). The importance of allergens as environmental etiologic agents is underscored by recently described epidemics of a particularly severe form of asthma, apparently caused by air-borne dust released from the unloading of soybeans from ships (20-22).

Education in Occupational and Environmental Medicine

The myriad of newly recognized hazards can be daunting to internists, most of whom may have had few encounters with these issues in their medical training. Of 127 medical schools responding to a 1988 survey by the Association of American Medical Colleges, only 1 reported having a required course in environmental health, whereas 104 schools indicated that the teaching of environmental health concepts was spread among other required courses. Two schools had a required course in occupational health and 91 included material on occupational health in other courses (23). The dearth of coursework, the lack of specific training in occupational and environmental medicine, and the shortage of specially trained physicians in the field to serve as researchers, consultants, and teachers (2), have been extensively documented.

An education in these areas should solidly ground the student in toxicology and the pathogeneses of diseases caused by physical environmental agents. Moreover, basic concepts of epidemiology, risk, and risk assessment and their application to groups and individuals should be taught. The curriculum should impart an appreciation of concepts relating to dose-response mechanisms, including route of absorption, metabolism and degradation, and the time-dose characteristics of an exposure.

Occupational and environmental health concerns have traditionally received little, if any, attention in internal medicine residency programs. Previous statements by the Accreditation Council for Graduate Medical Education on special requirements for residency training programs in internal medicine have not mentioned these issues. However, a recently approved version, effective 1 October 1989, states that "training program(s) must place emphasis not only on medical problems, but also on cultural, socioeconomic, ethical, occupational, environmental, and behavioral issues" (24). Although the distinctions among medical, environmental, and occupational problems may be questioned, the statement's intent clearly was to increase the attention given to occupational and environmental issues. Once formal training is completed, physicians may have difficulty in increasing or updating their knowledge of environmental issues. Published lists of continuing medical education topics contain few courses dedicated to environmental topics.

Risk Assessment and Risk Characterization

This lack of education and training is complicated by occupational and environmental medicine's scientific framework and methods. Within this framework, hazardous exposures can be categorized by the kind of evidence that points to adverse health effects. "Clear-cut" hazards are those for which scientific evidence strongly suggests a causal association with one or more specific adverse health outcomes in humans. Examples of diseases caused by exposure to "clear-cut" hazards include leukemia (from exposure to benzene); bronchospasm (from toluene diisocyanate); angiosarcoma of the liver (from vinyl chloride); and mesothelioma, asbestosis, and lung cancer (from asbestos) (25-29).

"Clear-cut" occupational and environmental hazards are frequently identified by epidemiologic studies. Epidemiology continues to be the appropriate method for examining exposure-outcome association when illness has already developed or may have developed as a result of an environmental exposure. Because human exposure is a prerequisite for an epidemiologic study, however, this method is clearly unsuited for assessing the threat posed to human health by many agents.

"Potential" hazards comprise a second category of occupational and environmental hazard, for which data on human health effects are either limited or nonexistent. Specific agents may arouse concern because of features they share with other agents that have known deleterious effects or because they adversely affect animals or in-vitro systems in assays of carcinogenicity, mutagenicity, teratogenicity, or other toxicity (30-33). The need to interpret and apply such data to clinical situations creates an additional level of complexity that substantially augments the scope of knowledge that physicians must have to deal effectively and rationally with this class of environmental agents.

Public health and environmental agencies often use formal quantitative risk assessment to evaluate the danger (particularly the carcinogenic hazard) related to the exposure of groups to both clear-cut and potential occupational and environmental hazards. Such "risk assessment" generally involves a calculation of the estimated probability that a particular adverse health outcome will affect a group member as a result of a given level of exposure to the environmental agent. The calculated probability is usually expressed as the excess lifetime risk for a particular health event. Many regulations are designed to reduce the estimated excess lifetime risk to 10^{-5}, 10^{-6}, or less. The accuracy of the estimated risk is highly dependent on the assumptions used in its calculation (*see* Appendix 1), although the specific assumptions may vary considerably among risk assessors. Substantially different risk assessments thus may be based on the same body of scientific observations (32-34). The physician must be able to put these statistics into proper perspective for the patient when communicating levels of risk. For example, estimates of the risk for cancer for some risk groups posed by exposure to apples contaminated with the plant growth control agent daminozide (Alar, Uniroyal Chemical Company, Bethany, Connecticut) and its breakdown product ranged from 9 in a million to 240 in a million (34, 35). Valuable perspective can be gained from noting that the lifetime risk for death from being struck by lightning is 35 in a million; from unintentional injuries in the home, 840 in a million; and from traffic accidents (using seat belts), 8750 in a million (36).

Patients' Concerns

The nature of the information that the public receives complicates the physician's role. The mass media often suddenly draw attention to an environmental hazard, thus prompting public concern. Headlines may attribute particular "cases" of disease to a specific "environmental" cause and state "risk" in terms that ignore the extent of uncertainty associated with its calculation. The unpredictability of the timing and uncertainty about the accuracy of this information can leave the primary care physician unprepared for the questions patients raise. The discovery of a hazardous waste site near homes (as occurred at the Love Canal) or of a hazardous chemical in food (for example, apples containing residues of Alar) generates substantial public concern and leads many patients to their physicians for advice. Adverse health outcomes that cause the greatest public concern include cancer, reproductive effects (birth defects or impairment of fertility), and neurologic damage.

Information generated by the "right to know" movement may also affect physicians. The federal government and some states have passed legislation that requires employers to disclose to workers the presence of hazardous chemicals (particularly carcinogens) in the workplace and to report releases of such substances in the environment (37-40). In addition, sellers may be required to inform buyers about possible hazards in commercial products. For example, the recently enacted "Proposition 65" in California requires a vendor to inform the consumer if the product being sold contains any carcinogen or agent that adversely affects reproduction (41).

The public's current interest in how the environment may adversely affect health requires the practicing physician to be aware of the health ramifications of environmental problems. Moreover, a physician should acquire the knowledge that is needed to evaluate environmental factors in the differential diagnosis of various clinical presentations and syndromes. Continuing (postgraduate) medical education in the principles and methods of the discipline is highly desirable. Physicians should seek and professional societies should develop more of these opportunities. Mechanisms should be developed for the rapid dissemination of authoritative information on environmental problems about which there arises sudden concern. Such information should specifically comment on what constitutes appropriate advice to give to patients in particular circumstances.

To provide effective counseling on environmental matters, physicians must determine the exposures that are relevant to each patient. The history should reflect the possibilities of past or present exposures to hazardous agents. Although a more directed history may be adequate for a secondary or tertiary consult, primary care physicians should obtain information that is as complete as possible on their patients' environmental exposures, and such information should be updated periodically (4, 42).

Because occupational exposures to environmental agents are frequently more intense or prolonged than comparable exposures outside the workplace, the occupational history is of primary importance. Because patients frequently change their type of work over the course of time and because illnesses mediated by environmental exposures may have long latency periods, information on past employment may be quite relevant. Workers' exposures may differ greatly within the same industry or even within the same building; it is therefore important to determine not just the type of work done, but also to identify specific activities and substances (43). Examples of job categories and associated exposures are listed in Appendix 2. The 1984 ACP paper on occupational medicine details the kinds of information that are relevant to this part of the history (4), and a sample history-taking form is reproduced in Appendix 3. Given the staggering incidence of work-related injury and illness each year, the occupational history rivals family and social histories in providing important data in the clinical encounter.

In addition to the patient's occupation, the occupations of other household members may contribute to a patient's environmental exposures. Environmental agents inadvertently transported home from the workplace by one member of the household have resulted in clinically significant exposure of other household members (44). The patient should also be asked about avocations or hobbies that might result in hazardous exposure. As a second step, more general questions can be asked about the home environment (such as use of pesticides, solvents, caustics, and other potentially hazardous substances).

Information Sources for the Practitioner

After information on a patient's exposures has been obtained, it must be interpreted. For chemical hazards, interpretation can be difficult because of the many chemical substances used as components of commercial products. A good poison control center can often provide useful information on the diagnosis and treatment of the patient who is symptomatic from an acute chemical exposure. Such centers may be less helpful in providing information on an asymptomatic patient's long-term risk for cancer from a low-level chemical exposure. The recent Institute of Medicine report recommended the development of a new type of "single access point" information source, modeled after poison control centers, to provide medical practitioners with clinically pertinent information on widely varying environmental agents (2). The Institute is currently developing this concept further.

Without a single access point, physicians should become familiar with the referral and information sources in their communities, as these sources vary by geographic area. They include academic medical centers with programs in occupational and environmental medicine, poison control centers, local and state health departments, and related agencies (such as the Occupational Safety and Health Administration and the Centers for Disease Control). Under right-to-know legislation, Material Safety Data Sheets, which contain important information for practitioners, are required for many toxic chemicals manufactured in the United States. However, these data sheets are not always easy to obtain from manufacturers or employers.

Other information sources vary in their clinical utility and ease of use. Lists of chemical components found in specific commercial products, available in book form and in computerized databases, should be used in conjunction with up-to-date references listing the adverse effects associated with exposures to particular chemical substances (45-52). Professional societies should help the practitioner by sponsoring expert reviews of important issues in occupational and environmental medicine.

Some of the most useful computerized databases are TOXLINE and the Hazardous Substances Data Bank (both maintained by the National Library of Medicine), the Registry of Toxic Effects of Chemical Substances (maintained by the National Institute for Occupational Safety and Health), and the Chemical Carcinogenesis Research Information System (maintained by the National Cancer Institute). Several reference books about these subjects may also be very useful (45-52).

The list of information sources cited here is by no means exhaustive, and the number of potentially useful sources of data is increasing rapidly. Systematically developed, up-to-date listings of publicly available data sources for environmental health and toxicology have been developed by the Information Resources Management Group at the Center for Environmental Health and Injury Control of the Centers for Disease Control in Atlanta, Georgia, and are currently available without charge (52, 53).

Patient Management

After the relevant information is gathered and interpreted and before counseling about health risks related to environmental agents, physical examination and laboratory testing for the presence of any disease for which the patient may be at risk should be considered. The appropriateness of screening the asymptomatic patient for subclinical disease will vary according to the sensitivity and specificity of the screening test, the likelihood that the disease is present, the likelihood that a given subclinical condition will evolve into clinically apparent disease, and the effectiveness of possible interventions. If clinical disease is found, indicated treatment should be started. If further exposure can be expected to exacerbate the disease process, the patient should be advised to take steps to eliminate the exposure.

Counseling should always address specific questions the patient raises about environmental exposures. The patient should be informed about the extent and quality of the scientific evidence supporting the perceived hazard. If the patient is incurring an exposure that the available data suggest is associated with a health risk, the patient should be counseled according to the guidelines described below.

The recently publicized controversy over Alar in apples illustrates the role of the physician (34, 35). At one point, the public heard strikingly contradictory views about the product's safety from experts representing the product's manufacturer, U.S. government agencies, and environmental groups. Physicians who are knowledgeable about this issue could counsel their patients, helping them to understand better the nature of the hazard, its possible magnitude in relation to other risks to which many persons are exposed daily, and the reasons for disagreement among experts (*see* Appendix 1).

Asymptomatic patients who have had exposure to an agent that poses a substantial risk for adverse health effects but who do not yet show those effects should nevertheless be counseled about their risk. The patient should be advised of the risk, how he or she might reduce or eliminate the exposure, and the likely results of reducing or eliminating the exposure. For example, a person with past or current exposure to asbestos should be firmly and convincingly counseled against cigarette smoking because of its multiplicative effect on the patient's already increased risk for lung cancer.

How best to express risk to an individual patient is a difficult and largely unexplored question. Options include relative risk, attributable risk, lifetime risk, and years of expected life lost. Nevertheless, a quantitative perception of a health risk may be crucial to a patient's decision about how he or she will deal with that risk. For example, the patient may have to balance the health benefits of leaving an occupation involving some hazardous exposure with the economic hardship that might result. Thus, where data are sufficient, a physician's discussion of health risks should be in quantitative or semiquantitative terms. The full range of options for reducing a hazardous exposure should be discussed, along with "lifestyle" factors that increase risk. In the example cited, advising a patient to quit a job before other remedies (such as exposure reduction, job relocation, legal or regulatory action) had been explored would be inappropriate.

The importance of effective risk communication is illustrated by the case of a park in Seattle that was closed in 1984 because of concern about pollutants in the soil. (The park had been built on the site of a former coal gasification plant.) A panel of experts concluded that the annual inhaled dose of the primary carcinogen (benzo-a-pyrene) was 5.1 μg/y, assuming a "worst case" scenario for exposure. The panel compared this amount with the annual dose of the same carcinogen from breathing the air in Detroit (4.9 μg/y) and from sitting for approximately 6 hours per week in a room filled with cigarette smoke (35.8 μg/y), and recommended that the park be re-opened (54). Whenever possible, physicians should use these kinds of characterizations to counsel their patients about health risks.

It is unlikely that all physicians involved in primary care will feel comfortable with and capable of providing comprehensive evaluation, treatment, and counseling about environmental exposures, as described above. The Institute of Medicine report suggests that, as a minimum, primary care physicians be able to identify illness related to environmental agents (2). To that recommendation, we add that physicians should learn to recognize patients for whom counseling about risks posed by environmental agents is indicated and should refer the patient appropriately if such counseling is outside the physician's sphere of competence.

Interactions with Public Health Officials

Although a clinician may be able to deal successfully with a patient presenting with a complaint related to an environmental exposure, he or she may not be in the best position to influence the environmental conditions that led to the complaint. In this sort of circumstance, it may be more effective for the physician to pursue the matter further through colleagues working in public health. Physicians should recognize that working through such contacts provides opportunities to prevent adverse health effects in other patients with similar exposures.

The capacity of federal, state, and local public health agencies to respond to environmental hazards has increased substantially over the past decade. Moreover, increasingly strong links are being forged between public health and environmental agencies. These links enhance effectiveness by allying public health expertise in identifying and assessing potential hazards with the expertise of environmental professionals (including scientists, engineers, lawyers, and technicians) who are responsible for planning and implementing remedial action to ameliorate adverse environmental conditions.

Public health professionals can help clinicians in several ways. These professionals may be sources of information in the clinical management of particular patients with environmentally caused or potentially environmentally caused illness. They may also be able to provide essential guidance in distinguishing "clear-cut" from "potential" environmental hazards.

Public health officials may also benefit from closer interaction with clinicians on environment-related issues. Current surveillance activities conducted by public health officials are insufficient to monitor most environmentally caused disease. In many cases, the sole means of identifying an important environmental public health problem may be through clinicians' reports. A recent example is practitioners' recognition of the eosinophilia-myalgia syndrome and its apparent association with the ingestion of L-tryptophan-containing products (55, 56). Primary care physicians should realize the importance of reports of associations between exposures and disease and should work closely with public health professionals in identifying new potential hazards.

Conclusion

The internist's role in occupational and environmental medicine is evolving as much as the discipline itself. Internists should begin to develop paradigms for patient care and risk counseling in environmental issues. The American College of Physicians recommends that:

1. Medical training at all levels—undergraduate, postgraduate, and continuing education—places increased emphasis on topics that are relevant to occupational and environmental medicine.

2. Physicians routinely evaluate patients' environmental exposures in the context of the diagnostic interview.

The College urges all internists to maintain and update their knowledge in this area and to integrate this knowledge into their practices. Internists should clarify scientific and media information that is of concern to their patients or refer patients to appropriate sources.

3. Physicians work constructively with public health authorities and other professionals in addressing environmental hazards in the community and in the workplace. The complexity of the problems requires close collaboration among many disciplines; internists should become a more integral part of that alliance.

4. Improved informational sources about occupational and environmental medicine, including increased numbers of consultants who are expert in the field, should be made available to practicing internists.

In a continuing effort to clarify and improve the role of the internist in this area, the ACP will develop strategies to implement these recommendations and will focus attention on specific environmental agents that are of concern to both patients and physicians.

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Appendix 1. *Risk Assessment*

In the absence of "hard data"—the usual case—risk assessment inevitably requires provisional acceptance of a formidable set of assumptions and the frequent use of estimates to bypass the problems posed by the lack of specific measurements. The physician must frequently assume that a carcinogenic risk to humans can be adequately inferred from animal data, that a specific formula is adequate to calculate equivalent doses for species with different lifespans, or that a mathematic model can adequately extrapolate dose-response data downward by as much as several orders of magnitude from relatively high-dose laboratory exposures to relatively low-dose environmental exposures. The expression of a risk assessment may disguise the level of uncertainty associated with it (57). The excess risk is often quantified as a single number, regardless of whether the data on which it is based come from animal (experimental) or human (epidemiologic) studies, whether the data used to estimate the dose-response curve are many or few, and whether or not the exposure has been shown to produce the particular health effect of concern in humans (32, 57). For exposures involving the general population, an excess lifetime risk of 1 in 100 000 or 1 in 1 000 000 (10^{-5} or 10^{-6}) is often the maximum risk that is considered acceptable, particularly for severe illness such as malignant tumors (32, 33).

Risk assessments are useful as guides in the formulation of public health policy, as in the setting of exposure limits. To some extent, they may also aid practitioners in counseling patients about specific environmental hazards, but their current usefulness in this regard is limited by the uncertainties involved in their calculation, the varying tolerance of individual patients for different levels of risk, and the fact that some patients clearly do not fit the assumptions on which the risk calculations were based. For example, a calculated lifetime cancer risk based on the assumption of a constantly administered dose over a 70-year lifespan is clearly inapplicable to the situation of a 65-year-old patient whose exposure to an agent began 6 years ago, particularly if the long latent period between carcinogen exposure and disease (often 20 years or more) is considered. More generally, a person's risk from a potentially carcinogenic exposure may vary with sex, genetic predisposition, and age as well as with the length and intensity of exposure (58-60).

Appendices 2 and 3 are found on pages 980 and 981.

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References are continued on page 982.

Appendix 2. *Representative Job Categories, Exposures, and a Partial Listing of Diseases To Consider when Taking an Occupational History**

Job Categories	Exposures	Possible Diseases
Agricultural workers	Pesticides, infectious agents, gases, sunlight	Pesticide poisoning, "farmers' lung," skin cancer
Anesthetists	Anesthetic gases	Reproductive effects, cancer
Animal handlers	Infectious agents, allergens	Asthma
Automobile workers	Asbestos, plastics, lead, solvents	Asbestosis, dermatitis
Bakers	Flour	Asthma
Battery makers	Lead, arsenic	Lead poisoning, cancer
Butchers	Vinyl plastic fumes	"Meat wrappers' asthma"
Caisson workers	Pressurized work environments	"Caisson disease," "the bends"
Carpenters	Wood dust, wood preservatives, adhesives	Nasopharyngeal cancer, dermatitis
Cement workers	Cement dust, metals	Dermatitis, bronchitis
Ceramic workers	Talc, clays	Pneumoconiosis
Demolition workers	Asbestos, wood dust	Asbestosis
Drug manufacturers	Hormones, nitroglycerin, etc.	Reproductive effects
Dry cleaners	Solvents	Liver disease, dermatitis
Dye workers	Dyestuffs, metals, solvents	Bladder cancer, dermatitis
Embalmers	Formaldehyde, infectious agents	Dermatitis
Felt makers	Mercury, polycyclic hydrocarbons	Mercuralism
Foundry workers	Silica, molten metals	Silicosis
Glass workers	Heat, solvents, metal powders	Cataracts
Hospital workers	Infectious agents, cleansers, radiation	Infections, accidents
Insulators	Asbestos, fibrous glass	Asbestosis, lung cancer, mesothelioma
Jack hammer operators	Vibration	Raynaud phenomenon
Lathe operators	Metal dusts, cutting oils	Lung disease, cancer
Laundry workers	Bleaches, soaps, alkalis	Dermatitis
Lead burners	Lead	Lead poisoning
Miners (coal, hard rock, metals, etc.)	Talc, radiation, metals, coal dust, silica	Pneumoconiosis, lung cancer
Natural gas workers	Polycyclic hydrocarbons	Lung cancer
Nuclear workers	Radiation, plutonium	Metal poisoning, cancer
Office workers	Poor lighting, poorly designed equipment	Joint problems, eye problems
Painters	Paints, solvents, spackling compounds	Neurologic problems
Paper makers	Acids, alkalis, solvents, metals	Lung disorders, dermatitis
Petroleum workers	Polycyclic hydrocarbons, catalysts, zeolites	Cancer, pneumoconiosis
Plumbers	Lead, solvents, asbestos	Lead poisoning
Railroad workers	Creosote, sunlight, oils, solvents	Cancer, dermatitis
Seamen	Sunlight, asbestos	Cancer, accidents
Smelter workers	Metals, heat, sulfur dioxide, arsenic	Cancer
Steel workers	Heat, metals, silica	Cataracts, heat stroke
Stone cutters	Silica	Silicosis
Textile workers	Cotton dust, fabrics, finishers, dyes, carbon disulfide	Byssinosis, dermatitis, psychosis
Varnish makers	Solvents, waxes	Dermatitis
Vineyard workers	Arsenic, pesticides	Cancer, dermatitis
Welders	Fumes, nonionizing radiation	Lead poisoning, cataracts

* Reprinted with permission from **Rom WN, ed.** *Environmental and Occupational Medicine*. Boston: Little, Brown; 1983.

Appendix 3. *Occupational/Environmental History Form**

1. Identification

Name: ____________________ Social Security ____________________

Address: ____________________ Sex: M F

____________________ Birthday: ____________________

Telephone: home __________ work __________

2. Occupational Profile

Fill in the table below listing all jobs at which you have worked, including short-term, seasonal, and part-time employment. Start with your present job and go back to the first. Use additional paper if necessary.

Workplace (Employer's name and address or city)	Dates worked		Did you work full time?	Type of industry (describe)	Describe your job duties	Known health hazards in workplace (dusts, solvents, etc.)	Protective equipment used?	Were you ever off work for a health problem or injury?
	From	To						

3. Occupational Exposure Inventory

1. Please describe any health problems or injuries you have experienced connected with your present or past jobs:
2. Have any of your co-workers also experienced health problems or injuries connected with the same job: .... No Yes
   If yes, please describe:
3. Do you or have you ever smoked cigarettes, cigars, or pipes? .... No Yes
   If so, which and how many per day:
4. Do you smoke while on the job, as a general rule? .... No Yes
5. Do you have any allergies or allergic conditions? .... No Yes
   If so, please describe:
6. Have you ever worked with any substance which caused you to break out in a rash? .... No Yes
   If so, please describe your reaction and name the substance:
7. Have you ever been off work for more than a day because of an illness or injury related to work? .... No Yes
8. Have you ever worked at a job which caused you trouble breathing, such as cough, shortness of wind, wheezing? .... No Yes
   If so, please describe:
9. Have you ever changed jobs or work assignments because of any health problems or injuries? .... No Yes
10. Do you frequently experience pain or discomfort in your lower back or have you been under a doctor's care for back problems? .... No Yes
    If so, please describe:
11. Have you ever worked at a job or hobby in which you came into direct contact with any of the following substances by breathing, touching, or direct exposure? If so, please check the box beside the substance.

☐ Acids	☐ Beryllium	☐ Chromates	☐ Heat (severe)	☐ Nickel	☐ Radiation	☐ Trichloroethylene
☐ Alcohols (industrial)	☐ Cadmium	☐ Coal dust	☐ Isocyanates	☐ Noise (loud)	☐ Rock dust	☐ Trinitrotoluene
☐ Alkalis	☐ Carbon tetrachloride	☐ Cold (severe)	☐ Ketones	☐ PBBs	☐ Silica powder	☐ Vibration
☐ Ammonia	☐ Chlorinated naphathalenes	☐ Dichlorobenzene	☐ Lead	☐ PCBs	☐ Solvents	☐ Vinyl chloride
☐ Arsenic	☐ Chloroform	☐ Ethylene dibromide	☐ Manganese	☐ Perchloroethylene	☐ Styrene	☐ Welding fumes
☐ Asbestos	☐ Chloroprene	☐ Ethylene dichloride	☐ Mercury	☐ Pesticides	☐ Talc	☐ X-rays
☐ Benzene		☐ Fiberglass	☐ Methylene chloride	☐ Phenol	☐ Toluene	
		☐ Halothane		☐ Phosgene	☐ TDI or MDI	

If you have answered "yes" to any of the above, please describe your exposure on a separate sheet of paper.

4. Environmental History

1. Have you ever changed your residence or home because of a health problem? .... No Yes
   If so, please describe:
2. Do you live next door to or very near an industrial plant? .... No Yes
   If so, please describe:
3. Do you have a hobby or craft which you do at home? .... No Yes
   If so, please describe:
4. Does your spouse or any other household member have contact with dusts or chemicals at work or during leisure activities? .... No Yes
   If so, please describe:
5. Do you use pesticides around your home or garden? .... No Yes
   If so, please describe:
6. Which of the following do you have in your home? (Please check those that apply.)
   ☐ Air conditioner ☐ Air purifier ☐ Humidifier ☐ Gas stove ☐ Electric stove ☐ Fireplace ☐ Central heating

* Adapted from reference 43.

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