CE ARTICLE

Taking an Exposure History

by the Agency for Toxic Substances and Disease Registry

On Tuesday afternoon, a 52 year old man with previously diagnosed coronary artery disease controlled by nitroglycerin describes episodes of recurring headache for the past 3 weeks. Mild nausea often accompanies the headache; there is no vomiting. He describes a dull frontal ache that is not relieved by aspirin. The client states that the headaches are sometimes severe; at other times they are a nagging annoyance. The durations range from half an hour to a full day. His visit was prompted also by a mild angina attack that he suffered this past weekend, shortly after awakening on Sunday morning. He has experienced no further cardiac symptoms since that episode.

History of previous illness indicates that the client was diagnosed with angina pectoris 3 years ago and has been taking nitroglycerin 0.4 mg sublingually prophylactically before vigorous exercise. He also takes one aspirin every other day. He has been symptom-free for the past 2½ years. Sublingual nitroglycerin relieved the pain of the Sunday morning angina attack within several minutes. The client does not smoke and rarely drinks alcohol.

He is a trim man with a slightly ruddy complexion. At present, he is afebrile, and his vital signs are blood pressure 120/85, pulse 80, respirations 20. Physical examination including head, ears, eyes, nose, throat, heart, lungs, and neurologic examination is normal. The results of an electrocardiogram (ECG) with a rhythm strip performed in office are unremarkable. Subsequent laboratory testing reveals normal blood lipids, cardiac enzymes, complete blood count (CBC), sedimentation rate, glucose, creatinine, and thyroid function.

The preceding case study describes a client with angina. He has new, nonspecific symptoms of headache and nausea. Suppose this client lived near a hazardous waste site. Would your differential diagnosis change? If the client refinished furniture as a hobby, would you consider this important? Is there a connection between his headaches and cardiac symptoms? How would you investigate the possible correlation? Could he be exposed to chemicals in his workplace? Each of these factors could play a role in the etiology of this client's illness; each exposure could cause disease.

The client described in the case study—a 52 year old male with angina—is portrayed in three different scenarios throughout this document. An exposure history form, completed by the client in each scenario, provides clues that prompt the clinician to investigate the possibility of toxic exposure.

- Scenario 1: This client is an accountant who has had the same job and residence for many years.

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- Scenario 2: This client owns a commercial cleaning service and uses cleaning products at various industrial and commercial sites.
- Scenario 3: This client is a retired advertising copywriter who lives in the vicinity of an abandoned industrial complex.

Most environmental and occupational diseases either manifest as common health problems or have nonspecific symptoms. It is the etiology that distinguishes a disorder as an environmental illness. Unless an exposure history is pursued by the clinician, the etiologic diagnosis may be missed, treatment may be inappropriate, and exposure can continue.

Most people with illness caused or exacerbated by exposure to hazardous substances obtain their health care from clinicians who are not specialists in either environmental or occupational health. Few clinicians, however, routinely elicit information about the home, workplace, or community environment as part of the demographic and social history. In a study of a primary care practice in an academic setting, only 24% of 625 charts had any mention of the client's occupation. Only 2% of the charts had information on exposures, duration of present employment, and past occupations. In addition, clinicians caring for adolescents seldom ask about their work exposure and history during routine health care visits or when evaluating symptoms.

Although many clinicians do recognize the importance of taking a work and exposure history for evaluating certain problems, most have had little training or practice in doing so. Extensive knowledge of toxicology is not needed to diagnose environmental and occupational disease. The same criteria are employed as those used in diagnosing other health problems—history including onset and temporal pattern of symptoms, palliative and provocative factors, physical examination, and laboratory results. If necessary, consultation with industrial hygienists or environmental testing can be used. In addition to current exposures, the clinician must consider the long term or latent effects of past exposures to agents such as asbestos, radiation, and chemical carcinogens.

Investigating environmental and occupational illness is illustrated in this article. The aim is not to demonstrate all exposure possibilities but rather to illustrate the principles and the process of investigating this etiology. The exposure history form developed by the federal Agency for Toxic Substances and Disease Registry (ATSDR) in cooperation with the National Institute for Occupational Safety and Health in 1992 (Figure), which can be completed by the clinician or by the client (to save staff time), will guide the clinician through various aspects of this process. The form elicits many important points of an exposure history including job descriptions and categories associated with hazardous substances, physical and biologic agents, and temporal and activity patterns related to environmental and occupational disease. The form explores past and current exposures.

Taking an exposure history requires only a few minutes of the clinician's time and can be abbreviated, expanded, or focused according to the client's signs and symptoms. The exposure history form is designed for quick scanning of important details and can be copied and used for a permanent database as well as for the investigation of current problems.

The diagnosis of environmental or occupational disease cannot always be made with certainty. Sound clinical judgment must be used, and common etiologies should be considered. The multifactorial nature of many conditions, particularly chronic diseases, must not be overlooked.

An exposure history should be taken on every client. It is of particular importance if the client's illness occurs at an atypical age or is unresponsive to treatment.The clinician must also keep in mind that many organ systems are affected by toxic exposure (Table 1). The latency period from exposure to manifestation of disease can vary, ranging from immediate to delayed (hours or days) to prolonged (decades).

With practice using the exposure history form and a network of referrals, the primary care clinician can play an important role in detecting, treating, and preventing disease resulting from toxic exposures.

ORGAN SYSTEMS AFFECTED BY TOXIC EXPOSURE

The respiratory system is both a target organ and a portal of entry for toxicants. Adult onset asthma and death from asthma are increasing. More than 100 toxicants are known to cause asthma, and many more can exacerbate it.

Irritant and allergic contact dermatitis account for 90% of occupational skin disorders. Other skin disorders with exposure etiologies include pigment alterations, chloracne, urticaria, and malignant neoplasms.

Alcohol abuse is a potential confounding factor in the evaluation of clients with suspected toxic exposure.

Part 1. Exposure Survey

Name: _____ Date: _____

Please circle the appropriate answer. Birthdate: _____ Sex: M F

1. Are you currently exposed to any of the following?

metals	*no yes*	loud noise, vibration, extreme heat or cold	*no yes*
dust or fibers	*no yes*	biologic agents	*no yes*
chemicals	*no yes*	2. Have you been exposed to any of the above *in the past?*	*no yes*
fumes	*no yes*	3. Do any household members have contact with metals, dust, fibers, chemicals, fumes, radiation, or biologic agents?	*no yes*
radiation	*no yes*		

If you answered *yes* to any of the items above, describe your exposure in detail—how you were exposed; to what you were exposed. If you need more space, please use a separate sheet of paper.

4. Do you know the names of the metals, dusts, fibers, chemicals, fumes, or radiation that you are/were exposed to? *no yes* → If *yes*, list them below.
5. Do you get the material on your skin or clothing? *no yes*
6. Are your work clothes laundered at home? *no yes*
7. Do you shower at work? *no yes*
8. Can you smell the chemical or material you are working with? *no yes*
9. Do you use protective equipment such as gloves, masks, respirator, hearing protectors? *no yes* → If *yes*, list the protective equipment used.
10. Have you been advised to use protective equipment? *no yes*
11. Have you been instructed in the use of protective equipment? *no yes*
12. Do you wash your hands with solvents? *no yes*
13. Do you smoke at the workplace? *no yes* At home? *no yes*
14. Do you eat at the workplace? *no yes*

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15. Do you know of any coworkers experiencing similar or unusual symptoms? *no yes*
16. Are family members experiencing similar or unusual symptoms? *no yes*
17. Has there been a change in the health or behavior of family pets? *no yes*
18. Do your symptoms seem to be aggravated by a specific activity? *no yes*
19. Do your symptoms get either worse or better at work? *no yes*
    at home? *no yes*
    on weekends? *no yes*
    on vacation? *no yes*
20. Has anything about your job changed in recent months (such as duties, procedures, overtime)? *no yes*

If you answered *yes* to any of the questions, please explain.

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Part 2. Work History

Name: _____

A. Occupational Profile Birthdate: _____ Sex: M F

The following questions refer to your current or most recent job:

Job title: _____ Describe this job:

Type of industry: _____

Name of employer: _____

Date job began: _____

Are you still working in this job? Yes No

If no, when did this job end? _____

Fill in the table below listing all jobs you have worked including short-term, seasonal, part-time employment, and military service. Begin with your most recent job. Use additional paper if necessary.

Dates of Employment	Job Title and Description of Work	Exposures*	Protective Equipment

*List the chemicals, dusts, fibers, fumes, radiation, biologic agents (i.e., molds, viruses) and physical agents (i.e., extreme heat, cold, vibration, noise) that you were exposed to at this job.

Have you ever worked at a job or hobby in which you came in contact with any of the following by breathing, touching, or ingesting (swallowing)? If yes, please check the box beside the name.

❑ Acids	❑ Cadmium	❑ Dichlorobenzene	❑ Mercury	❑ Phosgene	❑ Trichloroethylene
❑ Alcohols (industrial)	❑ Carbon tetrachloride	❑ Ethylene dibromide	❑ Methylene chloride	❑ Radiation	❑ Trinitrotoluene
❑ Alkalies	❑ Chlorinated naphthalenes	❑ Ethylene dichloride	❑ Nickel	❑ Rock dust	❑ Vinyl chloride
❑ Ammonia	❑ Chloroform	❑ Fiberglass	❑ PBBs	❑ Silica powder	❑ Welding fumes
❑ Arsenic	❑ Chloroprene	❑ Halothane	❑ PCBs	❑ Solvents	❑ X rays
❑ Asbestos	❑ Chromates	❑ Isocyanates	❑ Perchloroethylene	❑ Styrene	❑ Other (specify)
❑ Benzene	❑ Coal dust	❑ Ketones	❑ Pesticides	❑ Talc	
❑ Beryllium		❑ Lead	❑ Phenol	❑ Toluene	
		❑ Manganese		❑ TDI or MDI	

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B. Occupational Exposure Inventory *Please circle the appropriate answer.*

1. Have you ever been off work for more than one day because of an illness related to work? *no yes*
2. Have you ever been advised to change jobs or work assignments because of any health problems or injuries? *no yes*
3. Has your work routine changed recently? *no yes*
4. Is there poor ventilation in your workplace? *no yes*

Part 3. Environmental History

Please circle the appropriate answer.

1. Do you live next to or near an industrial plant, commercial business, dump site, or nonresidential property? *no yes*
2. Which of the following do you have in your home? *Please circle those that apply.*

   Air conditioner Air purifier Central heating (gas or oil?)
   Gas stove Electric stove Fireplace
   Wood stove Humidifier
3. Have you recently acquired new furniture or carpet, refinished furniture, or remodeled your home? *no yes*
4. Have you weatherized your home recently? *no yes*
5. Are pesticides or herbicides (bug or weed killers; flea and tick sprays, collars, powders, or shampoos) used in your home or garden, or on pets? *no yes*
6. Do you (or any household member) have a hobby or craft? *no yes*
7. Do you work on your car? *no yes*
8. Have you ever changed your residence because of a health problem? *no yes*
9. Does your drinking water come from a private well, city water supply, or grocery store? _____
10. Approximately what year was your home built? _____

If you answered *yes* to any of the questions, please explain.

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Figure: Exposure history form.

TABLE 1

Organ Systems Often Affected By Toxic Exposure

Organ/System	Exposure Risks
Respiratory	asbestos*, radon*, cigarette smoke, glues
Dermatologic	dioxin*, nickel, arsenic*, mercury*, cement (chromium)*, polychlorinated biphenyls*, glues, rubber cement
Liver	carbon tetrachloride*, methylene chloride*, vinyl chloride*
Kidney	cadmium*, lead*, mercury*, chlorinated hydrocarbon solvents*
Cardiovascular	carbon monoxide, noise, tobacco smoke, physical stress, carbon disulfide, nitrates*, methylene chloride*
Reproductive	methylmercury*, carbon monoxide, lead*, ethylene oxide
Hematologic	arsenic*, benzene*, nitrates*, radiation
Neuropsychologic	tetrachloroethylene*, mercury*, arsenic*, toluene*, lead*, methanol*, noise, vinyl chloride*

**This substance is a topic in the ATSDR case studies in environmental medicine; see additional resources list on how to obtain more information.*

However, a history of alcohol use does not necessarily exclude an environmental or occupational etiology. Symptoms of liver disease due to toxic exposure can mimic viral hepatitis.

About 4,000 new cases of renal disease of unknown etiology are diagnosed annually. Organic solvents and heavy metals are two classes of toxicants known to adversely affect renal function.

Neurotoxins can cause peripheral neuropathy, ataxia, parkinsonism, seizures, coma, and death. Many chemicals cause mild central nervous system depression that may be misdiagnosed as personality disorders or that can progress to psychoses or dementia. Sensory impairment can also be caused by exposure to toxicants (e.g., visual disturbances caused by methanol) and physical agents (e.g., hearing impairment caused by loud noise).

About 200,000 infants are born annually with some form of birth defect. The causes of most of these defects are unknown.

The cardiovascular and hematologic systems are frequent targets of toxicants. Cardiovascular changes, as well as exacerbation of preexisting cardiovascular conditions, can result from exposure to noise and to chemicals such as carbon monoxide and tobacco smoke. Benzene can cause bone marrow changes leading to aplastic anemia, acute leukemia, and chronic myelogenous leukemia.

TOXICANTS IN THE HOME/ ENVIRONMENT

The clinician should consider the following sources, which are discussed below, when eliciting information on exposures in the home and environment:

- Indoor air pollution.
- Common household products.
- Pesticides and lawn care products.
- Lead products and waste.
- Recreational hazards.
- Water supply.
- Soil contamination.

Indoor Air Pollution

Tobacco Smoke. Environmental tobacco smoke is a mixture of more than 4,700 compounds. Mainstream smoke is exhaled by the smoker, and sidestream smoke comes off the smoldering end of the cigarette and is inhaled by adjacent persons (passive smokers). Sidestream smoke contains more carcinogenic hydrocarbons and respirable particles than mainstream smoke. All smokers should be encouraged to stop smoking; if household members will not refrain from smoking, they should smoke only in well ventilated or isolated areas.

Wood Stoves/Gas Ranges. Thirteen million wood stoves are in use in the United States, and 800,000 are sold annually. When not properly maintained and vented, wood stoves emit noxious gases including carbon monoxide, oxides of nitrogen, particulates, and hydrocarbons. Studies have shown that children living in

homes heated with wood stoves have a significant increase in respiratory symptoms compared with children living in homes without wood stoves.

Gas ranges, which may produce nitrogen oxide, a respiratory irritant, are used for cooking in more than half of United States homes. In low income areas, gas stoves may be used not only for cooking but as a supplemental source of heat. Proper ventilation and routine inspection and maintenance are necessary in residences where wood or gas stoves are used.

Building Materials. Building materials, home improvement products, and textiles used in the home can pose health risks. For example, formaldehyde volatilizes from particle board, insulation materials, carpet adhesives, and other household products. This is a particular problem in the confined spaces of mobile homes. Formaldehyde exposure can cause rhinitis, nausea, dry skin or dermatitis, and upper respiratory and eye irritation. It has also been reported to precipitate bronchospasm in persons who have asthma.

Asbestos was widely used from 1950 to the early 1970s in areas requiring sound proofing, thermal proofing, or durability (e.g., floor and ceiling coverings, heating and water pipe insulation). It was often applied as a spray on material. Asbestos that is in good condition and not respirable is generally not a risk. However, when it becomes frayed or friable (i.e., easily crumbled), asbestos fibers can be released into the air.

Exposure to these fibers has been associated with lung cancer, asbestosis, and mesothelioma. The occurrence of disease is influenced by type of asbestos mineral inhaled, concentration and dimension of the fibers, and exposure duration. In 1986, the Environmental Protection Agency (EPA) estimated that friable asbestos may be present in as many as 35,000 schools in the United States, potentially exposing 15 million schoolchildren and 1.4 million adults. Smoking cigarettes, in addition to asbestos exposure, increases the risk of cancer by an order of magnitude above smoking alone or asbestos exposure alone. Children may be at greater risk than adults because of their long life expectancy, high activity rates, high breathing rates, more time spent near the floor where fibers accumulate, and greater likelihood of contact (through curiosity or mischief).

Radon. Radon, a colorless, odorless gas, is a decay product of uranium found in significant concentrations in some areas. Radon itself does no harm, but its progeny attach to airborne particulates such as cigarette smoke and can be inhaled. During subsequent decay, the progeny emit high energy alpha particles that may injure adjacent bronchial cells, thereby causing lung cancer. Five to 10% of single family homes in the United States have been estimated to exceed the EPA radon recommended guideline of four picocuries per liter of air. EPA estimates that approximately 14,000 lung cancer deaths per year are attributable to radon.

Common Household Products

A 1987 EPA study found approximately 12 common organic pollutants in concentrations two to five times higher in air inside homes than in outdoor air from use of household products. Product warning labels are often inadequate and pertain to acute exposures only. Long term or repeated use of some household chemicals, such as chlorinated hydrocarbons, can result in cancer. Commonly used compounds that can have serious adverse effects are methylene chloride (found in paint strippers and thinners, and adhesive removers), tetrachloroethylene (used in dry cleaning of clothes), and paradichlorobenzene (found in room air fresheners, toilet bowl deodorizers, and moth crystals).

Pesticides and Lawn Care Products

Pesticides and lawn care products are potentially hazardous, especially to children. Pesticide exposure can occur through dermal contact, inhalation, or ingestion. At least 1,400 active ingredients can be found in more than 34,000 available preparations of insecticides, herbicides, fungicides, and other antibiologic preparations. These agents have different mechanisms of action and toxicity. Estimated annual use of these chemicals is 2.6 billion pounds.

Despite the ban on certain pesticides in the United States, exposure can still occur through improper use, storage, and disposal. Some banned pesticides are used in foreign countries and may return to this country on imported foods. Proper use and storage of household pesticides and proper cleaning of food, especially

raw fruits and vegetables, can help protect consumers.

Lead Products and Waste

Lead poisoning continues to be a significant health problem in the United States. Although lead was banned from paint for home use in 1972, millions of homes, particularly those built before 1950, still contain high amounts of lead in paint that is peeling and accessible for ingestion by children. Lead exposure also occurs through drinking water, especially in homes that have lead plumbing or lead soldered pipes. Significant exposures have occurred in children who played in lead contaminated soil. Acidic foods, such as juices, stored in imported pottery may leach lead from ceramic glazes. Some ceramic glazes used by hobbyists also may contain lead. Air can be contaminated with this metal through use of leaded gasoline. Parents can inadvertently bring it home on their clothing and shoes, or in their cars if they work in jobs where they are exposed to lead dusts or lead containing compounds.

More than a million United States workers are potentially exposed to lead daily in hundreds of occupations such as construction work, radiator repair, metals recycling, battery manufacturing, smelting, and pigments formulating. Good workplace and personal hygiene practices can prevent the majority of these "take home" exposures.

The 1985 intervention level of 25 micrograms per deciliter (μg/dL) has been revised downward to 10 μg/dL. Childhood lead exposure has been associated with lower class ranking and higher absenteeism in school, poor eye hand coordination, slow reaction time, and lower vocabulary test scores. Consequences of childhood lead exposure have been shown to endure into adulthood.

Recreational Hazards

Recreational areas and products can pose a hazard to health. Fishing and swimming in contaminated lakes and streams can expose participants to toxins contained in polluted waters. Wooden playground structures that have not been treated with protective sealants may allow children to have dermal contact with potentially hazardous wood preservatives; these include arsenic containing compounds, pentachlorophenol, and creosote. Some play sands and clays have been reported to contain asbestos-like fibers.

Other materials used in arts and crafts involve potentially hazardous silica, talc, solvents, and heavy metals such as lead and cadmium. Toxic materials may be encountered in making stained glass and jewelry, woodworking, model building, and oil and airbrush painting. One need not be directly involved in these activities to become exposed; merely being in the vicinity of a work area may cause exposure. Federal legislation (Labeling of Hazardous Materials Act) requires that all chronically hazardous materials be labeled as inappropriate for children's use.

Water Supply

Both public water supplies and private wells can be a source of toxic exposure, especially for industrial solvents, heavy metals, pesticides, and fertilizers. For example, an EPA groundwater survey detected tri-chloroethylene in approximately 10% of the wells tested. It is estimated to be in 34% of the nation's drinking water supplies. Up to 25% of the water supplies have detectable levels of tetrachloroethylene. Methylene chloride may remain in groundwater for years. Some solvents can volatilize from showers and during laundering of clothes, thereby creating risk of toxicity via inhalation. Nitrates, a common contaminant of rural shallow wells, pose a risk of methemoglobinemia, especially to infants.

Soil Contamination

Ingestion of contaminated soil poses a risk of toxicity, especially to children under the age of six because of natural mouthing behaviors. Lead is a common soil contaminant. Dioxin also adsorbs into soils. Certain pesticides such as chlordane can remain in the soil for years.

USING THE EXPOSURE HISTORY FORM

A work and exposure history has three components: Exposure Survey, Work History, and Environmental History. The main aspects of an exposure history (summarized in Table 2) will be elicited through the exposure history form (Figure). Although a positive response to any question on the form indicates the need for further inquiry, a negative response to all questions does not necessarily rule out a toxic exposure etiology or significant previous exposure.

All clients should complete exposure history forms, although the form need not be evaluated extensively in every clinical situation. As in all data gathering activities, sound clinical judgment must be exercised.

Part 1. Exposure Survey

Past and current exposures are recorded on pages 1 and 2 of the exposure history form, which is designed for easy completion by the client and quick scanning for pertinent details by the clinician. The questions investigate the following: known exposure to metals, dust, fibers, fumes, chemicals, physical agents, and biologic hazards; details about known toxicant exposure; other persons affected; temporal patterns and activities, changes in routines and worksite characteristics, and protective equipment use.

If the client answers yes to one or more questions on Part 1, the clinician must follow up by asking the client progressively more detailed questions about the possible exposure. Special attention should be directed to the route, dose, duration, and frequency of any identified exposure.

Scenario 1 below illustrates the use of Part 1 of the form with the client described in the case study. The client's chart reveals that he has worked as an accountant in the same office for the past 12 years. On the completed form, he indicates that no other workers are experiencing similar or unusual symptoms, and he denies recent changes in his job routine. The client answered yes to three questions: "Are family members experiencing the same or unusual symptoms?"; and "Do your symptoms get either worse or better at work? on weekends?" His explanations of these answers reveal a possible temporal relationship between his symptoms and home. The clue and the clinician/client dialogue follow.

TABLE 2

Components of an Exposure History

Part 1. Exposure Survey

A. Exposures
- Current and past exposure to metals, dust, fibers, fumes, chemicals, biologic hazards, radiation, noise, vibration
- Typical work day (job tasks, location, materials, agents used)
- Changes in routines or processes
- Other employees or household members similarly affected

B. Health and Safety Practices at Worksite
- Ventilation
- Health surveillance
- Employee exams
- Personal protective equipment (e.g., respirators, gloves, coveralls)
- Lockout devices, alarms, training, drills
- Personal habits (smoking, eating in work area, washing hands with solvents)

Part 2. Work History

Description of all prior jobs, including short term, seasonal, part time employment, and military service

Description of present job(s)

Part 3. Environmental History

Present and prior home locations
Jobs of household members
Home insulating, heating, and cooling system
Home cleaning agents
Pesticide exposure
Water supply
Recent renovations/remodeling
Air pollution, indoor and outdoor
Hobbies: painting, sculpting, welding, woodworking, piloting, autos, firearms, stained glass, ceramics, gardening
Hazardous wastes/spills exposure

My wife is having more headaches than usual. The headaches seem to lessen at work. Weekends are the worst. Seems like I've been sick every weekend for the past month.

Clinician: I see that you noted that your wife is having headaches.

Client: Yes. She has frequent headaches. In the last 3 or 4 weeks she has had more than usual. She usually has one every month or so; this past month she had three.

Clinician: You also state that your headaches are worse on weekends.

Client: Yes, they seem to be. If I wake up on a Saturday or Sunday with a headache, it usually gets worse as the day progresses. In fact, that's usually when I feel nauseated too.

Clinician: Do your symptoms seem to be aggravated by certain activities around the home? A hobby or task?

Client: No, I usually wake up with the headache. I don't think there's a connection with anything I do.

Clinician: Do your symptoms change at all at work?

Client: Now that you mention it, if I wake up with a headache, by the time I get to work—it takes about 25 minutes—the headache is usually gone.

Clinician: Your angina attack occurred on a Sunday morning. Describe your weekend leading up to the attack.

Client: It was a fairly quiet weekend. We had dinner at home Friday evening and just relaxed. On Saturday, I spent the day packing old books and storing them in the attic and chopping and stacking firewood. I took one nitroglycerin tablet before doing the heavy work, at about 2 p.m. Saturday night we had friends over for dinner. We had a fire in the fireplace and visited until about 11 p.m. I had one glass of wine with dinner. I was beginning to feel a little stiff and sore from the work I did that afternoon. Sunday morning I woke up with a headache again. A few minutes after awakening, while I was still in bed, I had the attack. It was mild, not the crushing pain I've had in the past. I had the headache all day.

The preceding dialogue reveals that the client's symptoms may be associated with the home environment and his cardiac symptoms, headache, and nausea may be related. His symptoms seem to be exacerbated at home and lessen at work. Further questioning is needed to pursue this lead.

Clinician: What does your wife do for a living?

Client: She's an attorney.

Clinician: Do either one of you have a hobby?

Client: My hobby is photography. My wife is an avid gardener.

Clinician: Do you have your own darkroom?

Client: No, I occasionally use a friend's. For the past year I've had my film and prints processed commercially.

Clinician: Does your wife use any pesticides or chemicals in the garden?

Client: No, she does strictly organic gardening and uses only natural means of pest control.

Clinician: Do you work on your car?

Client: No.

Clinician: Have you gotten any new furniture or remodeled your home in the past few years?

Clent: No.

Clinician: What is your source of heating and cooking in the home?

Client: We have a natural gas, forced air heating system. We cook with gas and use the fireplace a lot in winter.

Clinician: How long have you lived in this home and how old is your furnace?

Client: We've lived there for 23 years. The furnace was replaced about 12 years ago.

Clinician: I see that you recently insulated your home. What exactly did you do?

Client: Yes. Last month I added extra insulation to the attic, insulated the crawl space, replaced all the windows with double paned windows, and weatherized all doorways.

Clinician: Have you noticed that the headaches coincide with days you have used the fireplace?

Client: There could be a connection. I definitely use the fireplace more on weekends. This past Saturday I had a fire blazing all day.

A temporal relationship between the headaches and being in the home has been revealed. Some sources of toxicants have been eliminated (formaldehyde and other volatile organic chemicals from new furniture and rugs, toxic chemicals used in hobbies or gardening). A correlation may exist between symptoms and use of the fireplace. The fireplace could increase negative pressure in the house, causing backdrafting of furnace gases. The furnace is old; it may be malfunctioning or producing excessive carbon monoxide. The client's symptoms, including his angina attack, would be consistent with carbon monoxide poisoning.

Although the client's symptoms could be associated with his preexisting disease, evidence is strong enough at this point to investigate the possibility of environmental expo-

sure. Contacting the local gas company to request that it check the furnace and stove for malfunctions and leaks would be appropriate. The fireplace should be checked for proper drafting and for deposits of creosote in the chimney.

A carboxyhemoglobin (COHb) level on the client may confirm carbon monoxide poisoning. The client should be advised to ventilate the house until the furnace is checked or to stay out of the house until the gas company deems it safe. Symptoms of headaches usually do not occur below 15% COHb, but the half life of COHb is only several hours.

A COHb level performed on this client is reported to be 6%, which is high for a nonsmoker. The gas company discovers a cracked heating element in the 12 year old furnace, which resulted in carbon monoxide fumes circulating throughout the house. The use of the fireplace most likely increased the backdrafting of fumes. The furnace is replaced, the exposure ceases, and the client's symptoms abate. He experiences no further cardiac symptoms.

The exposure history form may also alert the clinician to past exposures. Most often, neither the job title nor the client's initial description of job duties reveals clues of exposure. It is usually helpful to have a client describe a routine work day, as well as unusual or overtime tasks. Clients tend to use jargon when describing their jobs. It is the clinician's challenge to persistently question the patient to elucidate possible exposures; it is not necessary to have foreknowledge of a particular trade. Start with general questions and work toward the more specific.

Page 1 of the form reveals another clue—this client was exposed to asbestos about 30 years ago. The questioning that the clinician conducts, despite having neither knowledge of the client's trade nor understanding of the jargon, follows.

I was a shipwright from 1958-1964. Asbestos lagging was used on the pipes and hulls. I was also exposed to fiberglass and welders' fumes.

Clinician: You state here that you were exposed to asbestos, fiberglass, and welders' fumes way back in '58.

Client: Yes, during my days as a shipwright.

Clinician: Did you actually handle the asbestos?

Client: No, the pipe laggers were the tradesmen that handled the asbestos. Oh, you might be setting a bracket or plate next to a pipe and accidentally hit the pipe and dislodge some asbestos, but otherwise, shipwrights didn't handle it. You only had asbestos where there were steamlines from the boiler carrying high pressure steam to other units like a winch or an auxiliary motor.

Clinician: What does a shipwright do? What was a routine day for you?

Client: There was no routine day. The shipwrights were the cream of the journeymen crop; we did everything from outfitting, to establishing the cribbing on the launching gang, to shoring. I worked on the outfitting docks. We did ship reconversions. I did a lot of work on the forepeak and hawse pipes when I wasn't working below decks.

Clinician: What exactly were your tasks below decks?

Client: Most transporters were converted to passenger ships after the war; there was a lot of shifting of equipment and pipes. Basically, the ships were gutted. They would be completely revamped. The shipwrights would do all the woodworking, finish work, plates, and so on. Then, when everything was in place, it would be insulated and the pipes would be lagged.

Clinician: So you worked throughout the ship? And when you finished your tasks the laggers would come in?

Client: No, no. There might be 10 different tradesmen working in an afterpeak at one time. You'd be working next to welders, flangers, pipefitters, riveters, laggers; you name it. These conversions were done round the clock, 7 days a week; it could take a year and a half to complete a conversion. All the tasks were being done simultaneously.

Clinician: How long would the lagging take?

Client: The lagging could take 6 to 10 months; sometimes longer. They were constantly cutting these sections of asbestos to fit the pipes. Then they would attach the sections with a paste and wrap it with asbestos wrapping.

Clinician: Could you see the asbestos in the air?

Client: Oh yes. Sometimes it was so thick you couldn't see 5 feet in front of you. It was white and hung in the welders' fumes like smog.

Clinician: Did you use any protective equipment? Masks, respirators?

Client: No. Nobody ever said it was dangerous. We were bothered more by the fiberglass and welders' fumes than anything. We thought fiberglass was more dangerous because it was itchy and caused a rash. The air was blue from the welding fumes; if you worked in that for a year, you knew it was affecting you. It inspired me to go back to school and get my accounting degree. But we were blue collar workers; we were more concerned with welders' flash, a boom breaking, or someone getting crushed between plates than we were with asbestos.

Clinician: You worked as a shipwright for 6 years?

Client: Yes, about that. Five of those years as an outfitter on conversions.

The dialogue in which the clinician engaged the client neither determines whether the client's asbestos exposure was significant, nor does it confirm that he suffered adverse effects from the exposure. It is merely a starting point for investigation. The questioning establishes that approximately 30 years ago this client received a possibly severe exposure to asbestos fibers for a duration of 5 or 6 years. Because quantitative data on this client's exposure is impossible to obtain, a qualitative description ("Sometimes it was so thick you couldn't see 5 feet in front of you") can facilitate assessment of the exposure when consulting with an occupational health specialist. In this scenario, the disclosure should prompt the clinician to monitor the client closely for early detection of treatable health effects from asbestos exposure. A chest x-ray would be advised and pulmonary function tests should be considered. Vaccination for influenza may be warranted, depending on the results of the chest x-rays. Consulting an occupational health specialist could help determine the best way to evaluate and treat this client.

In this scenario, the clinician has successfully diagnosed an illness due to an environmental toxic exposure (carbon monoxide) and has noted a significant past exposure (asbestos), which needs follow up. Had the clinician failed to pursue an exposure history, the client's current illness might have been misdiagnosed, treatment might have been inappropriate, or measures might not have been implemented to prevent further carbon monoxide exposure leading to a risk of continued progression of the angina, as well as coma and death involving other household occupants.

Part 2. Work History

Part 2 of the exposure history is a comprehensive inventory of the client's occupations, employers, and current and potential exposures in the workplace. No questions on allergies and principal symptoms have been included on the presumption that the clinician will provide more detail elsewhere in the medical record.

In evaluating Part 2 of the form, the clinician should note every job the client had, regardless of duration. Information on part time and temporary jobs could provide clues to toxic exposure. Details of jobs may reveal exposures unexpected from the job titles. Asking if any processes or routines have been changed recently can be helpful. Military service may have involved toxic exposure.

Scenario 2 below involves another instance of a 52 year old male with angina as described in the case study. He suffered an angina attack and complains of recurring headaches and nausea. This client is the owner of a commercial cleaning service. He performs some of the cleaning himself. Scanning pages 1 and 2 of the form, the clinician notes that, in his work, the client is exposed to cleaning chemicals including detergents, ammonia, and cleansers. The client does not notice any temporal relationship of symptoms to activity. Questioning the client extensively about the cleaning products fails to yield any suspicious exposure possibilities. Perusal of Part 2: Work History, however, reveals another clue. The clinician's investigation follows.

I own and operate a commercial cleaning business. My accounts range from two room offices to industrial complexes. We do regular maintenance and special services.

Clinician: You own a commercial cleaning service?

Client: Yes, I've been in business for 10 years.

Clinician: Do you do the cleaning yourself?

Client: I don't do as much as I used to. I have a crew of about six full time employees. I do more managing than cleaning, but I have been known to roll up my sleeves and pitch in when need be.

Clinician: You clean residences and commercial businesses?

Client: Yes, I have 20 residential accounts and 15 commercial accounts.

Clinician: What are the commercial accounts?

Client: The downtown administrative offices of the school district, several realty offices downtown, and the business offices of the viscose rayon mill. I have six accounts in the Shaw Building downtown, small medical offices, and five retail stores in the Hilltop Mall.

Clinician: So your headaches have been occurring for about 3 weeks now? Have there been any changes in your routine, work or otherwise, in the last 3 weeks?

Client: I've worked more hours than usual. I've been doing a special project for the rayon mill. They built new offices. We moved all the old offices into the new building. That has entailed cleaning and moving furniture, files, books, and exhibits. It's been tedious. Fortunately, most of the staff has been either out on vacation or at an international conference in Europe; so the building has been empty. We've been able to set our own pace and come and go any day or time that suits us, so long as we clear it with security.

Clinician: Are any other workers having similar symptoms?

Client: No, nobody else has complained about feeling sick.

Clinician: What exactly do they produce at that plant?

Client: They make viscose transparent paper. I used to work there during summers when I was in college. It was hot, hard work. And the whole place smelled like sulfur—rotten eggs. We used wood pulp cellulose, treated it with acids and other chemicals, and made cellulose filaments. I worked on the blending, ripening, and deaeration process.

Clinician: Can you smell the chemicals in the office building you're working in?

Client: Some days there's a faint odor. Nothing like when I worked on the xanthating process. The business office building is on the northeast end of the complex. It's pretty remote from the processing plant.

Clinician: So how many extra hours have you worked the past 3 weeks?

Client: Only about 10 hours each week. This past weekend I put in an extra 7 hours. I had to finish setting up the exhibits. I didn't trust the crew to handle the fragile exhibits, so I did the job myself.

Clinician: And on Sunday morning you had the angina attack. Tell me about your weekend leading up to the attack.

Client: On Friday, I worked late setting up a huge model of the xanthating process. It was tedious work and I was sort of stressed by the time constraints to get the job done. I had broken a bottle from the exhibit when I disassembled the thing weeks ago. I was working especially carefully this time. On Saturday morning, I ran back to the plant to tie up all the loose ends and finish. In the afternoon, my wife and I spent several hours walking on the beach, despite an awful headache I had. We went to bed fairly early, about 10 p.m. On Sunday morning, I had the attack. But the nitro helped almost immediately, and I had no other problems. It was pretty mild.

Clinician: What was in this bottle you broke?

Client: I'm not sure, really. The bottle said carbon disulfide but the chemical did not smell like the carbon disulfide we used in the mill when I worked there. This stuff had a sweet odor. It was quite strong but it didn't have the nauseating rotten egg smell of the plant.

Clinician: How did you clean it up?

Client: I just soaked it up with rags and threw them out. The carpet dried fairly quickly.

Clinician: Did you get any of the chemical on you?

Client: When the bottle fell and shattered, it soaked my pant leg and the toes of my shoes. I probably got some on my hands, too, when I cleaned it up.

Clinician: How much of the chemical was in the bottle? Did you report the accident to anyone at the plant?

Client: The bottle was about a liter in size. It was full. No, I didn't report the accident. Frankly, I'm embarrassed about it. I thought I would just talk with the manager when he returns from Europe later this week.

Clinician: What did you do with the bottle?

Client: I put the broken pieces in a paper bag and tossed it into my truck.

Clinician: Can you get it so we can read the label?

Client: Sure. I'll call you as soon as possible.

The preceding conversation reveals a possible connection with the spill and this client's symptoms. It warrants further investigation. The

results of the client's physical examination are normal.

The client retrieves the broken bottle. The label on the bottle identifies the chemical—carbon disulfide—and the manufacturer. After obtaining permission from the patient, the clinician calls the manufacturer for information on carbon disulfide.

Clinician: My client is a contract employee at a local textile company. In the process of his work he broke a bottle that was labeled carbon disulfide. He didn't report the accident and just cleaned it up himself. I am concerned that he may be experiencing health effects from the exposure.

Manufacturer: It would not surprise me. Carbon disulfide is dangerous stuff. Strict industrial controls are in effect to prevent exposure.

Clinician: He says the chemical did not smell like the carbon disulfide he remembered working with in the plant years ago. He says it had a sweet odor.

Manufacturer: The odor of the commercial grade used in the plant is altogether different from pure carbon disulfide, which I suspect was what was in the bottle he broke. Pure grade carbon disulfide has a sweet odor.

Clinician: Can you send me information on carbon disulfide?

Manufacturer: Certainly. I'll send you a Material Safety Data Sheet (MSDS) on carbon disulfide today. I suggest that you report the accident to the safety manager at the textile plant.

The clinician receives a MSDS on carbon disulfide and reads the Health Hazard Data section. The clinician discovers that this chemical can exacerbate cardiovascular disorders in persons receiving long term exposure. Nausea and headache are among the acute effects of exposure, and primary routes of entry are inhalation and skin contact/absorption. Consultation with a toxicologist confirms that this client's symptoms could indeed be caused by exposure to carbon disulfide. The clinician orders a CBC, ECG, urinalysis, tests of liver and kidney function, and determinations of COHb and electrolyte levels on this client.

Air sampling in the office in which the incident occurred reveals airborne concentrations of 0.8 parts of carbon disulfide per million parts of air (0.8 ppm). The permissible exposure limit for an 8 hour time-weighted average is 4 ppm. The concentrations were most likely higher at the time of the incident 3 weeks ago. This indicates that besides the acute exposure the client incurred at the time of the accident, he has been chronically exposed to carbon disulfide for the previous 3 weeks, although for a limited number of hours each week while driving with the contaminated rags and bottle in his truck.

Results of the laboratory tests on this client, including the COHb level, all are within normal limits. The client's exposure ceases, and he experiences no further symptoms. The clinician continues to monitor the client's angina, which remains stable. Other employees at risk of exposure from this spill are also examined; none incurred acute exposure or suffered ill effects. At the suggestion of the clinician, the safety manager at the mill instructs the employees in proper safety practices and no further incidents occur.

Part 3. Environmental History

Part 3 of the exposure history form contains questions regarding the home and surrounding environment of the client. Dialogue with the client should include queries about the location of the house, water supply, and changes in air quality.

Proximity to industrial complexes and hazardous waste sites could cause residents' exposure to toxicants in the air, water, or soil. Community contamination is a growing public health concern; affected persons usually seek care first from their primary care providers. If a group of people with similar symptoms and exposures is identified, and an environmental exposure problem is suspected, the clinician should call the state health department or the ATSDR at (404) 639-0615.

Hobbies are potential sources of toxicant exposure. For instance, model building, pottery making, silk screening, gardening, stained glass making, and woodworking all have been associated with hazardous exposure. Ask clients about their hobbies. All members in a household may be exposed to the hazardous substances from one person's hobby. Small children may be especially susceptible.

Scenario 3 involves another client described in the case study. In this scenario, the client has been retired for 2 years. He took early retirement from a stressful job in advertising

shortly after being diagnosed with angina. The client answered no to the questions on the Exposure Survey (Part 1 of the form). He denies exposure to metals, chemicals, fibers, dust, radiation, and physical and biologic agents. He is not aware of a connection between his symptoms and activity or time. To his knowledge other persons are not experiencing similar symptoms.

A clue appears on Part 3 of this client's exposure history—the client lives 2 miles from an abandoned industrial site and prevailing winds blow toward his house. In an effort to investigate this lead, the clinician initiates the dialogue that follows.

I live 2 miles downwind from an abandoned industrial complex.

Clinician: You state that you live several miles downwind from an abandoned industrial site. Do you know what chemicals might have been used at the site or what type of industry it was?

Client: There was a fire at the site several weeks ago. The newspaper said that they used methylene chloride to make some kind of plastics. The firefighters found drums of methylene chloride buried on the property.

Clinician: Do you ever smell chemicals in the air?

Client: Yes, in the mornings when the wind blows from that direction, I sometimes smell a sweet odor. My neighbors have mentioned it too. In fact, they told me that the smell is really strong when they do laundry or dishes, and when they shower.

Clinician: Have you smelled it in your water?

Client: No.

Clinician: What is the source of your water?

Client: I have city water, but my neighbors have private wells.

Clinician: Do you know if any agency is testing your neighborhood for contamination?

Client: Not as far as I know.

The preceding dialogue has uncovered a possibility that the client was exposed to a toxicant. Furthermore, this client may represent an index case; others may also be exposed. To follow up this lead, the clinician contacts the state health department. The health department confirms that the site contains buried drums of methylene chloride and that it is under investigation.

An industrial hygienist employed by the health department informs the clinician that the methylene chloride can indeed exacerbate signs and symptoms of angina. The odor threshold for the chemical is 100 to 300 ppm. An 8 hour exposure to 250 ppm methylene chloride can cause a COHb level above 8%.

The laboratory reports that the client's COHb is 6%, indicating probable exposure to methylene chloride in this nonsmoker. The clinician calls the 24 hour consultation number of the ATSDR, Emergency Response and Consultation Branch, for more information. The clinician is advised that COHb, which forms when methylene chloride metabolizes to carbon monoxide, can be detected in blood at levels of 4% to 9% when ambient air concentrations of methylene chloride are about 200 ppm. Many factors can influence body burden, including exposure level and duration, route of exposure, physical activity, and amount of body fat. A conference call ensues with an emergency response coordinator, a toxicologist, an industrial hygienist, and an occupational health specialist to discuss the client's signs and symptoms. The clinician is given the local Association of Occupational and Environmental Clinics (AOEC) contact, who recommends a specialist who will provide follow up care for this client.

Results of the health department's tests of ambient air reveal no immediate crisis in the vicinity, although the levels are high. Test results of water samples from private wells in the area are pending. ATSDR informs the regional office of the EPA of the situation. EPA provides immediate assistance to the affected area, clean up is initiated, and threats to the surrounding population are mitigated.

IDENTIFYING HAZARDOUS AGENTS

Identifying the toxicant, stopping the exposure, and arresting or reversing the progression of the client's illness are the goals of the exposure history. Often, clients do not know the chemicals to which they have been exposed although they may know the trade names or slang terms for the chemicals. Likewise, household products used by clients may have labeling that is inadequate for proper identification. A variety of printed reference sources are availa-

ble to the clinician, including books, journals, and MSDSs.

Material Safety Data Sheet

The Occupational Safety and Health Administration (OSHA) has developed a right to know regulation covering three basic areas: the generation and distribution of information about chemical hazards; requirements for the labeling of chemicals used in the workplace; and programs for training employees in the safe use of these chemicals. Many state and local right to know laws, however, are more comprehensive than the federal regulation

The MSDS is a component of the right to know law. Manufacturers and importers are required to provide an MSDS for each hazardous chemical in a shipment. Users of the chemicals must keep copies of MSDSs and make them available to workers, clinicians, or others. MSDSs contain information on the chemical properties of the substance, handling precautions, known health effects, and conditions that might worsen with exposure. The information on human health effects, however, can be vague and may have limited clinical value. The MSDS may not provide information on the synergistic effects of multiple chemical exposures. Clinical decisions should not be made solely from information obtained from MSDSs.

SUMMARY AND FOLLOW UP

In each scenario, the clinician's pursuit of the exposure history led to discovery of toxic exposure for each of the three clients. In each case, the diagnosis and treatment might have been inappropriate without an exposure history. The process required only a few minutes of the clinician's time. Each history was focused as indicated by the client's reported symptoms. Using the exposure history in managing the clients' problems, as well as guiding the clients in appropriate preventive behaviors, is the practice of health promotion and disease prevention at its best.

Consultation

Industrial hygienists, who are often employed by state health departments or industry, are a source of information to the clinician investigating a possible toxic exposure. Other specialists, such as clinicians specializing in occupational/environmental health, can be helpful in assessing whether a significant exposure has occurred. Occupational health nurses have expertise and experience that may be valuable to the clinician.

Referral Resources

The AOEC is a network of clinics that provide professional training, community education, exposure and risk assessment, clinical evaluations, and consultative services. Educational Resource Centers (ERCs), established in academic centers by NIOSH to educate professionals in occupational health topics, offer training courses in occupational and environmental health topics.

This article was developed by ATSDR in conjunction with NIOSH. Guest Contributor: Arthur L. Frank, MD, PhD. Guest Editor: Sophie J. Balk, MD. Peer Reviewers: John Ambre, MD, Charles Becker, MD, Jonathan Borak, MD, Joseph Cannella, MD, Howard Kipen, MD, MPH, Richard J. Jackson, MD, MPH, Jonathan Rodnick, MD, and Brian A. Wummer, MD.

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CE MODULE

Taking an Exposure History

This issue of the AAOHN JOURNAL contains a Continuing Education Module on "Taking an Exposure History," and has been approved by AAOHN for 1.2 contact hours of continuing education credit upon successful completion of the posttest and evaluation.

A certificate will be awarded and the scored test will be returned when the following requirements are met by the participant: (1) The completed answer sheet is received at AAOHN on or before July 31, 1996; (2) A score of 70% (7 correct answers) is achieved by the participant; (3) The answer sheet is accompanied by a $10.00 processing fee. Expect up to 6 weeks for delivery of the certificate.

Upon completion of this lesson, the occupational health nurse will be able to:

1. Describe the use of the exposure history survey to investigate environmental and occupational illnesses.
2. Identify common toxicants in the home and work environment and their health effects.
3. List resources for identifying hazardous agents and for referrals for consultation and education.

AAOHN is accredited as a provider of continuing education in nursing by the American Nurses Credentialing Center's Commission on Accreditation. Alabama provider number ABNP0063. California provider number CEP9283. Iowa provider number 267. Louisiana provider number LSBN3.

Contact hour credits received for successful completion of the posttest and evaluation may be used for relicensure, certification, or re-certification. The domain of practice for this lesson is environmental and health relationships.

Directions: Circle the letter of the best answer on the answer sheet provided. (Note: you may submit a photocopy for processing.)

1. A disorder is distinguished as an environmental illness by its:
A. Specific symptoms.
B. Etiology.
C. Treatment.
D. Medical diagnosis.

2. All of the following are essential for the diagnosis of environmental illness except:
A. Extensive knowledge of toxicology.
B. Provocative factors.
C. Physical examinations.
D. Laboratory results.

3. The occupational health nurse recognizes that toxic exposure to carbon tetrachloride, methylene chloride, and/or vinyl chloride would most likely lead to damage to which organ/system?
A. Respiratory.
B. Hematologic.
C. Cardiovascular.
D. Liver.

4. Which organ/system is most likely to be damaged from exposure to noise, carbon monoxide, and/or tobacco smoke?
A. Respiratory.
B. Hematologic.
C. Cardiovascular.
D. Liver.

5. A construction worker who installs drywall and insulation complains of rhinitis, dry skin, nausea, and eye irritation. These symptoms seem to be temporally related to work hours. The occupational health nurse recognizes that this employee is most likely suffering from toxic exposure to:
A. Formaldehyde.
B. Asbestos.
C. Carbon monoxide.
D. Radon.

6. The EPA estimates that the number of lung cancer deaths per year attributable to radon is:
A. 22,000.
B. 19,000.
C. 14,000.
D. 9,000.

7. All of the following are components of the exposure history form except the:
A. Exposure survey.
B. Material Safety Data Sheet (MSDS).
C. Work history.
D. Environmental history.

8. Which of the following is true about the use of the exposure history form?
A. A negative response to all questions rules out a toxic exposure etiology.
B. It must be filled out by the clinician.
C. The clinician should have the knowledge of the particular trade.
D. An exposure history form should be completed for all clients.

9. A client complains of a dull headache of 3 weeks duration which is not relieved by aspirin and is accompanied by nausea. The physical examination and laboratory findings are unremarkable. Data from Part 1 of the exposure survey reveal that symptoms worsen at home and other family members have similar symptoms. On further questioning, the occupational health nurse discovers that the client has recently weatherized and insulated his home and his gas furnace is 15 years old. This family is most likely exhibiting symptoms due to toxic exposure to:
A. Tetrachloroethylene.
B. Carbon monoxide.
C. Methylene chloride.
D. Radon.

10. Which of the following is true in relation to use of the MSDS?
A. Manufacturers are required to provide an MSDS for each hazardous chemical.
B. MSDSs must contain specific information on human health effects.
C. MSDSs must provide information on synergistic effects of chemical exposures.
D. Clinical decisions can be made solely from MSDS information.

ANSWER SHEET

Continuing Education Module

Taking an Exposure History

July 1995

Mark one answer only! (You may submit a photocopy of the answer sheet for processing.)

1.	A	B	C	D	**6.**	A	B	C	D
2.	A	B	C	D	**7.**	A	B	C	D
3.	A	B	C	D	**8.**	A	B	C	D
4.	A	B	C	D	**9.**	A	B	C	D
5.	A	B	C	D	**10.**	A	B	C	D

EVALUATION (must be completed to obtain credit)

Please use the scale below to evaluate this continuing education module.

	4 - To a great extent	3 - To some extent	2 - To little extent	1 - To no extent
1. As a result of completing this offering, I am able to:	4	3	2	1
A. Describe the use of the exposure history survey to investigate environmental and occupational illnesses.				
B. Identify common toxicants in the home and work environment and their health effects.	4	3	2	1
C. List resources for identifying hazardous agents and for referrals for consultation and education.	4	3	2	1
2. The offering content was relevant to the objectives.	4	3	2	1
3. Independent study was an effective teaching method for the content.	4	3	2	1
4. How much time (in minutes) was required to read this offering and take the test?	50	60	70	80

Please print or type: (this information will be used to prepare your certificate of completion for the module).
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