INDOOR AIR QUALITY

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PUBLIC HEALTH ISSUE:

Poor indoor air quality (IAQ) is caused by a number of factors and can cause a variety of general symptoms, including headaches, eye irritation, sinus pain, and fatigue. Poor IAQ can also exacerbate existing respiratory illness or intensify eye, ear, nose and throat, conditions. Inappropriate air temperature or humidity levels can cause sinus problems and general discomfort. Excessive amounts of carbon dioxide (CO_2) from inadequate ventilation (fresh air) can cause headaches and drowsiness. Although the symptoms of poor indoor air can be debilitating, there is no current association with cancer. Nuisance odors (e.g. septic, garbage) may not cause actual illness, but can produce symptoms of irritation among certain sensitive individuals.

Perhaps the greatest health concerns are from exposure to carbon monoxide (CO) poisoning, which can cause headaches, nausea, unconsciousness and, eventually, death, as well as radon and asbestos which may pose an increased risk for cancer.

ROLE OF THE HEALTH OFFICER:

- Investigate complaints of poor indoor air quality to ensure that they are not related to septic problems or poor sanitation.
- Refer requests for information from citizens to the New Hampshire Department of Environmental Services.
- Encourage all symptomatic or ill persons to visit a primary care physician.

Two important areas of concern for Indoor Air Quality include ventilation control and pollution source control.

VENTILATION/FRESH AIR:

Ventilation is a process by which outside fresh air is passed inside a building by mechanical fans, or enters passively through cracks, open windows or doors. If enough fresh air is not brought into a building, many sources of pollution inside can be concentrated. Air comfort qualities such as temperature and humidity are also important concerns in building ventilation. The goal should be to balance the temperature in each room to accommodate all occupants and maintain the humidity levels at a range above 30% in order to reduce the likelihood of the occupant's nasal passages drying out, and below 50% in order to control the growth of molds and mildew.

The primary IAQ contaminant is a build up of carbon dioxide from people breathing and exhaling air within the building, which is a result of inadequate ventilation. Although there are currently no enforceable regulatory standards for CO_2, general recommendations are to keep levels below 800 parts per million (ppm) for an unoccupied space and below 1000 ppm for an

occupied space[1]. To achieve this level, it is ventilation is recommended to be at a minimum of 20 cubic feet of fresh air per minute (cfm) for each person occupying the building[1]. Certain areas (e.g. laboratories, exercise areas) may require a higher amount of ventilation. Seasonally, ventilation problems increase during the November to April period, when more people are indoors and ventilation rates are often reduced to save on heating costs. Affected individuals may complain of fatigue, sleepiness, headaches or a "stuffy" odor. Testing of ventilation needs to be performed by a heating expert or environmental consultant with a CO_2 meter and airflow gauge.

POLLUTION SOURCES:

There are dozens of potential reservoirs for indoor air pollutants, including polluted air being drawn into a building from outdoors. The most common sources of indoor pollution include: 1) cleaning materials, paints and solvents; 2) new building materials and carpets; 3) allergens, such as dust mites or mold spores; and 4) faulty heating system exhausts. The first two pollution sources can usually be discovered by discussing the recent history of building renovations and investigating chemical storage areas for leaks or mishandling. An environmental consultant may need to be hired to measure the air for specific chemicals, which may be associated with the occupant's symptoms or a nuisance odor.

Allergens and faulty heating systems can be less obvious and will require a trained professional to evaluate, identify and mitigate the problems. Allergens are found in enclosed, dark or damp areas. These allergens then spread throughout the building via the air ventilation system. A common reservoir for dust mites is carpeting or upholstery, which has become wet and was not dried or cleaned properly afterwards. If allergens build up to a high level, they may create allergic rhinitis (runny nose, itchy eyes), or lead to asthmatic attacks in sensitive individuals. Mold spores can grow in damp fabrics, but will also grow in any standing water, humidity drip pan, refrigerator, heater or other area where water collects. Wet areas need to be dried and controlled with disinfectants to avoid allergen growth.

At this time there are no regulatory methods or exposure limits for airborne fungi spores for indoor air quality. Typically air samples for airborne fungi spores are collected in affected areas and compared to the ambient (outside) air samples. Elevated concentration of fungi can lead to allergic reactions in susceptible populations of people. A recent study of dust mite allergen exposure indicated that allergen levels above 2 micrograms per gram of sieved house dust created an 'enhanced risk' of developing asthma.

Faulty heating systems are the most dangerous of indoor air pollutants, due to the acute toxicity (poisoning) of exhaust fumes. The primary hazard, carbon monoxide, can cause dizziness, nausea, headaches, and drowsiness, and at high levels can lead to coma and death. Problems can arise from leaking chimneys, incomplete combustion, or negative pressure inside the building, which can actually draw exhaust air back down a flue. Poor maintenance or long periods of cold weather often lead to heating exhaust problems. Carbon monoxide can be measured with a quantitative gauge, or a simple alarm can be purchased at most hardware stores. The U.S. Consumer Product Safety Commission, the U.S. Centers for Disease Control and Prevention, and many other organizations recommend installing carbon monoxide alarms in homes.

[1]New Hampshire Code of Administrative Rules *Env-A 2200 Clean Air in State Buildings*

PERSONAL CONDITIONS/BEHAVIORS:

Persons affected by indoor air quality problems should be evaluated individually to determine if living or working conditions, or personal behaviors could be part of the cause. Each person who complains of symptoms related to a particular building should be seen by a physician to ensure there are no underlying health problems that are not related to the building environment. For example, if the ergonomics of a job station require long hours of eye, neck or back strain, (such as computer use) it is possible that headaches and other complaints may be related to physical stress rather than the indoor air. An interview of affected individuals, which explores their job tasks, stress level, and home life will help to determine the potential causes of their complaints.

INSPECTING BUILDINGS FOR POTENTIAL AIR QUALITY CONCERNS:

A CHECKLIST FOR HEALTH OFFICERS

- Obtain a description of the building condition (age, design, problems, etc.), and type of heating/ventilation.
- Obtain a description of any symptoms or odors experienced by the occupants.
- Interview occupants who are concerned about IAQ to determine how their concerns or symptoms may be linked to the building air or other causes such as job type, personal behaviors, etc.
- Determine the last date when the heating, ventilation and air conditioning (HVAC) system was serviced.
- Inspect the ventilation system to see if the filters are in good working order.
- Identify from where fresh air is being drawn into the building.
- Inspect the building for signs of mold, mildew, water damage or excess dust on the floors, carpets or upholstery.
- Inspect the building for toxic pollution sources such as chemical storage, use of solvents, paints, glues, adhesives, fuels, cleaning supplies or other materials that may produce noxious vapors.

For More Information on Indoor Air Quality:

US Environmental Protection Agency, Region 1
(888) 372-7341
www.epa.gov/iaq