



**Mount
Sinai**

Selikoff Centers

For Occupational Health

Diesel Exhaust Exposure: What to Do

If you experience the following symptoms after exposure to diesel exhaust at work, you should seek medical attention immediately:

- ✓ Shortness of breath, persistent cough, chest pain, dizziness, headache, nausea or fatigue immediately after exposure
- ✓ Chest discomfort or breathing problems within the next two days
- Gather as much information as you can about the exposure (how long, how close to the source).
- Go to the nearest hospital emergency department.
- Contact the Poison Control Center at 1-800-222-1222 for treatment advice.
- Once the urgent situation has been taken care of, you may contact the nearest occupational health clinic for recommendations and medical follow-up. To find the nearest clinic in New York State go to www.health.ny.gov/environmental/workplace/clinic.htm . In other states go to www.aoc.org . Report exposure to your employer immediately.
- Complete an incident or exposure form. If none is available, write a memo informing them of the incident (date, time, location, what you were doing in the area, how long you were in the area, and who else was present). Keep copies and insist that documents are placed in your personnel files.
- If you have a union, keep them informed.

This fact sheet is not a substitute for medical care. Its purpose is to direct exposed workers to the proper medical providers.

How exposure occurs

Diesel exhaust (DE) is emitted by the engines of diesel powered trucks, buses, cars, trains and boats. DE is also emitted by off-road diesel engines that power agricultural, maintenance and construction equipment, such as tractors, sweepers, and generators. Many people are exposed daily to DE from traffic pollution. DE is a mixture of gases and tiny particles. Both gases and particles contain many toxins.

Some Toxic Chemicals in DE gases:

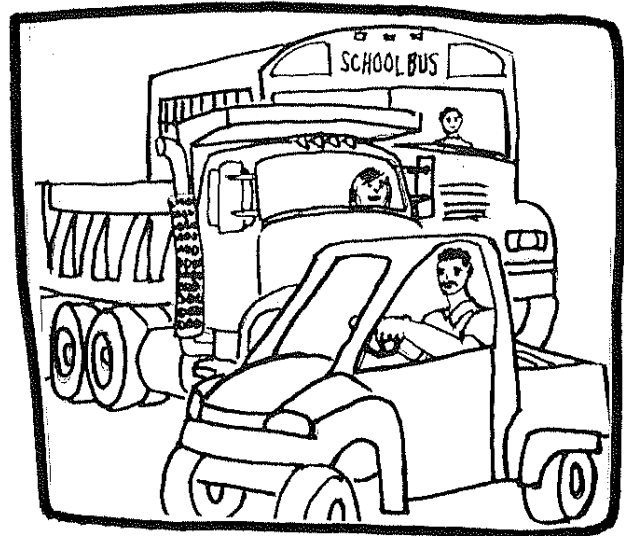
carbon monoxide	nitrogen oxides
	sulfur dioxide
aldehydes (formaldehyde, acrolein, acetaldehyde)	
benzene	1, 3-butadiene
polycyclic aromatic hydrocarbons (PAHs)	
	nitro-PAHs

Some Toxic Chemicals in DE particles:

	sulfuric acid
PAHs	nitro-PAHs
trace metals (such as cadmium and arsenic)	

Many of these toxins are also found in other combustion products, such as gasoline engine

exhaust and cigarette smoke. DE particles are too small to see. It is common to find hundreds of thousands of these invisible particles in every cubic inch of air we breathe on a street with diesel-powered vehicles. At typical outdoor levels, DE may not have a distinct odor.



Exposures can be worse if DE accumulates in an enclosed, unventilated space, such as a vehicle, room, or trench.

Health effects

Sudden short-term exposure to DE can cause:

- Irritation of the eyes, throat and lungs; lightheadedness; headaches; fatigue; nausea; and respiratory symptoms like coughing and mucus.
- Worsening of allergies and triggering of asthma attacks.

Long-term exposure to DE can cause:

- Chronic cough and mucus, chest tightness and wheezing, and decreased lung function.
- Worsening of lung diseases such as asthma, emphysema and chronic bronchitis.
- Heart disease or worsening of pre-existing heart conditions.
- Lung cancer.

A 2012 review of DE by the International Agency for Research on Cancer concluded that DE causes lung cancer in humans. Several studies have looked for links between DE and other cancers, including cancers of the bladder, larynx (voice box), stomach, blood system and ovaries. More research is needed to determine if there is a risk of these and other cancers from DE.

The chemicals in DE contribute to heat-trapping greenhouse gases, and can react in the atmosphere to produce smog, acid rain and ozone. These pollutants, along with pollution from gasoline engines, can add to the disease burden of DE. Adverse reproductive effects, such as low birth weight and premature birth, have been associated with increases in traffic-related air pollution.

The health effects of new diesel engines are currently under study. Although they may emit far less regulated pollutants than older engines, the nature of the exhaust from new or retrofitted engines (number, size and composition of the very small particles) may be different. The precautions listed at the end of this fact sheet should apply to all diesel engines until more research is completed.

Medical care for sudden exposure

If you have the symptoms mentioned at the beginning of this fact sheet after a heavy DE exposure, you should seek immediate medical attention as described in the box. Remember that damage from severe exposures may not develop for up to one or two days after exposure.

Your **medical exam** may include a complete physical, a lung function (breathing) test, an electrocardiogram, a chest x-ray and blood tests.

Carbon monoxide (CO) poisoning from DE is possible, but unusual. Very high exposures are required. If doctors suspect this, they can test your blood, your exhaled breath, or use a special meter, called a pulse CO-oximeter, to see if you have been exposed to CO.

Treatment for sudden high exposures to DE includes immediate removal from exposure. Oxygen (which may include hyperbaric oxygen therapy if significant CO poisoning is confirmed) or other treatment may be necessary, depending on what is found during your exam.



Bring this fact sheet to your doctor.

Medical care for long-term exposure

Let your health care professional know if you are regularly exposed to DE at work. Bring this fact sheet with you to your exam.

Your **medical exam** should consist of checking you for signs of heart and lung disease. Even if you are not ill, a medical evaluation can be helpful in early detection of diseases such as asthma, emphysema, chronic bronchitis and heart disease, which have been linked to long-term exposure to DE. These diseases are very common. They have many causes besides DE. Heart and lung disease can be diagnosed with regular **medical tests** including: lung function (breathing) test and chest x-rays for lung disease; blood IgE levels for allergic disease; and low-dose chest CT scan, for people with a high risk of lung cancer. Low-dose CT scans are not recommended for lung cancer detection in low-risk individuals because of the risk from unnecessary follow-up procedures and radiation.

These tests can help identify disease early. Early detection of disease has been linked to better treatment results.

These tests will not, however, tell you whether the disease is related to DE. To help you and your doctor **determine whether your symptoms or illnesses are related to DE exposure**, you should see a doctor who specializes in occupational medicine. A detailed occupational history describing the extent of the exposure is a crucial tool for determining if any heart or lung disease could be related to DE. If you have breathing problems, such as asthma, the doctor can show you how to do a breathing test before and after work, and even during the day. This can show if your breathing gets worse at work.

There are no specific medical tests that show if you were exposed to DE or if your lung or heart condition is related to DE. A chemical called 1-hydroxypyrene is elevated in the urine of workers with recent heavy exposure to polycyclic aromatic hydrocarbons (PAH's). There are many other sources of PAH's in the environment, including cigarette smoke, traffic pollution, and cooked food. Therefore levels

have to be very high to relate them to work. This test is not performed by most commercial laboratories. It does not tell you the risk of disease or effect your medical treatment. Research is ongoing on more specific markers of DE exposure.

Testing the air

Testing the air for DE should be part of your employer's job hazard analysis. Elemental carbon levels indicate if your exposure is relatively high or low. An ultrafine particle counter can identify sources of DE and how well controls work. Air testing is the best way to determine your exposure and risk of disease. The process and work environment, including ventilation, length and closeness of the work, visible haze, odors, and your co-workers' symptoms, are also clues to your exposure level.

The only **workplace air limit** for diesel exhaust in the United States is for mines, where the limit is 160 micrograms per cubic meter of total carbon. There are elemental carbon limits in Europe. There are workplace limits for some of the gases found in diesel exhaust, such as carbon monoxide and nitrogen dioxide.

Preventing exposure



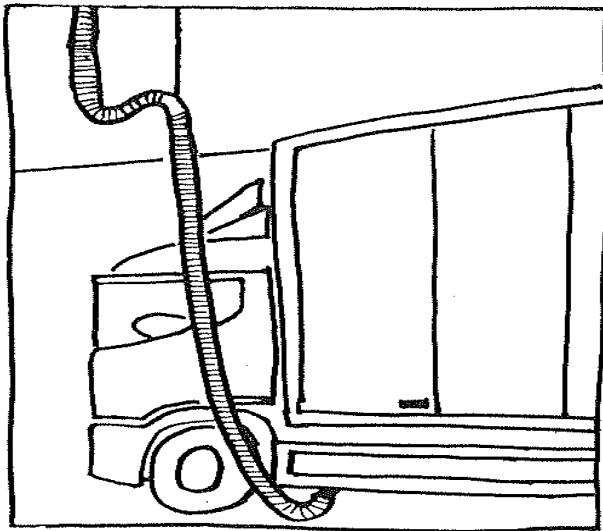
Work with your employer, your union, your safety committee, or your local Committee on Occupational Safety and Health (see Resources) to prevent or reduce exposure.

Your EMPLOYER can:

- Replace older diesel engines with newer, lower polluting ones (see Resources).
- Retrofit existing diesel engines with pollution control devices and/or use lower polluting fuels (see Resources).
- Implement a regular inspection and maintenance program for diesel engines.
- Introduce a no idling policy and adopt methods to reduce idling (see Resources).
- Prohibit running of diesel engines indoors without vehicle exhaust hoses.
- Regularly inspect and maintain ventilation systems used to control DE.
- Computerize delivery systems to reduce mileage.
- Position diesel exhaust stacks away from workers breathing zones.
- For boats, use on-shore alternative power.
- Install CO alarms.

WORKERS AND SUPERVISORS can:

- Position exhaust to reduce potential worker exposure to DE (it is not always necessary to stand next to generators, trucks, etc.).
- Locate diesel exhaust away from air intakes.
- When outdoors, position the exhaust stack downwind of the work site.



When indoors, attach exhaust hoses to exhaust pipes before starting engines.

- Inspect vehicle cabins for cracks or holes and have them repaired or sealed with weather stripping.
- Protect your skin from direct exposure to diesel soot.
- Follow practical operating procedures such as reduced idling policies. In New York City vehicles cannot idle more than 3 minutes, or more than one minute in front of schools. See Resources, below, for idling laws in other states and cities.

Children and the community

For DE, the above information is generally applicable to persons of all ages. For children's health you can check with your local Pediatric Environmental Health Specialty Unit at <http://aoec.org/PEHSU/index.html>. More information for pregnant women can be obtained from the Organization of Teratology Information (OTIS) at www.otispregnancy.org.

Resources

- Committees on Occupational Safety and Health:
<http://www.coshnetwork.org/COSHGroupsList>
- National Clean Diesel Campaign:
www.epa.gov/diesel
- Engine replacement and retrofits:
www.epa.gov/cleandiesel/index.htm
www.arb.ca.gov/diesel/diesel.htm
- Idling reduction technologies:
<http://www.epa.gov/smartway/technology/idling.htm>
- Summary of idling laws:
http://www.atrionline.org/research/idling/ATRI_IdlingCompendium.pdf

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Hudson Valley Clinical Center
1020 Warburton Avenue
Yonkers, NY 10701
914-964-4737

Manhattan Clinical Center
Mount Sinai Medical Center
New York, NY 10029
888-702-0630

Staten Island Clinical Center
690 Castleton Avenue, 2nd FL
Staten Island, NY 10310
888-702-0630