



**Mount
Sinai**

*Selikoff Centers for
Occupational Health*

Diesel Exhaust Exposure



What is diesel exhaust?

Diesel exhaust (DE) is a mixture of gases and tiny particles that 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. The gases and particles in DE contain many toxins.

Some toxic chemicals in DE gases:

- carbon monoxide
- sulfur dioxide
- aldehydes (formaldehyde, acrolein, acetaldehyde)
- benzene
- 1, 3-butadiene
- polycyclic aromatic hydrocarbons (PAHs)
- nitro-PAHs
- sulfuric acid
- trace metals (such as cadmium and arsenic)
- nitrogen oxides

DE particles are too small to see, and at typical outdoor levels, may not have a distinct odor. 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.

How can someone be exposed to diesel exhaust?

Many people are exposed daily to DE from traffic pollution. People who work with vehicles and equipment that use diesel or are near roads and freeways are at an especially high risk for breathing in air contaminated with DE. Some occupations at risk for exposure include truck drivers, auto maintenance garage workers, bridge and tunnel workers, and construction workers.

What are the health effects of diesel exhaust exposure?

Sudden short-term exposure to DE can cause:

- Irritation of the eyes, throat, and lungs
- Lightheadedness, headaches, fatigue, and nausea
- 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
- Lung cancer
- Heart disease or worsening of pre-existing heart conditions



A 2012 review of DE by the International Agency for Research on Cancer (IARC) concluded that DE causes lung cancer in humans. DE is also suspected to be linked to other cancers, including cancers of the bladder, larynx (voice box), stomach, blood system, and ovaries.

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.

If you experience any symptoms including breathing difficulties, persistent cough, or headaches within two days of exposure, you should seek medical attention immediately.

- Gather as much information as you can about the exposure (how long, how close to the source).
- Go to the nearest hospital emergency department.
- 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 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.

How is exposure tested and treated?

Sudden exposure:

When you seek medical attention for heavy DE 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 exposure of DE is 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 exposure to DE includes immediate removal from exposure. Oxygen administration (which may include hyperbaric oxygen therapy if significant CO poisoning is confirmed) or other treatments may be necessary depending on what is found during your exam.

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 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 and many have causes besides DE. Heart and lung disease can be diagnosed with regular medical tests including: lung function (breathing) tests and chest x-rays for lung disease; blood IgE levels for allergic disease; and low-dose chest CT scans 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 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 breathing tests before, during, and after work. This can show if your breathing problems are related to your work. However, 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.

Testing the air:

Air testing is the one way to determine your exposure and risk of disease. 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. The 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. However, there are workplace limits for some of the gases found in diesel exhaust, such as carbon monoxide, nitric oxide, and nitrogen dioxide.

How can exposure be prevented?

EMPLOYERS can:

- Replace older diesel engines with newer, lower polluting ones.
- Retrofit existing diesel engines with pollution control devices and/or use lower polluting fuels.
- Implement a regular inspection and maintenance program for diesel engines.
- Introduce a no idling policy and adopt methods to reduce idling.
- 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:

- Reduce employees' time near exhaust when possible.
- Position diesel exhaust away from air intakes.
- When outdoors, position the exhaust stack downwind of the work site.
- 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.

Suggested Readings

- Environmental Protection Agency- National Clean Diesel Campaign: www.epa.gov/diesel
- Occupational Safety and Health Administration:
https://www.osha.gov/dts/hazardalerts/diesel_exhaust_hazard_alert.html
- International Agency for Research on Cancer
https://www.iarc.fr/en/media-center/pr/2012/pdf's/pr213_E.pdf

This information is intended for general reference purposes only and is not intended to address specific medical conditions. It is not the intention of this fact sheet to provide specific medical advice, but rather to provide users with information to better understand workplace exposures. This information is not intended to be used as a substitute for professional medical advice or a medical exam.

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Mount Sinai *Selikoff Centers for Occupational Health*

The Mount Sinai Selikoff Centers for Occupational Health are dedicated to providing **cutting-edge clinical services** with a focus on **prevention** to keep workers **healthy** and their workplaces **safe**. Our physicians are leaders in the field of occupational medicine, providing care to injured and ill workers and retirees in the **New York City** and **Lower Hudson Valley** regions.

Our **highly skilled** and **multilingual team** of physicians, nurse practitioners, industrial hygienists, ergonomists, and benefits specialists provide comprehensive **patient-centered** services. We also help employers evaluate the work environment and establish integrated occupational health protection and health promotion programs to advance the general health and well-being of their entire workforce.

Our **medical experts** and **outreach team** members visit organizations, unions, and employers to bring **quality training** and **education** programs to the communities serviced by our clinical centers.

For an appointment or more information:

www.mountsinai.org/selikoff

888.702.0630

NEW YORK CITY

MANHATTAN CLINICAL CENTER

1468 Madison Avenue
Annenberg Building, 3rd Floor
Manhattan, NY 10029

STATEN ISLAND CLINICAL CENTER

2052 Richmond Road, Suite 2A
Staten Island, NY 10306

MID-HUDSON VALLEY

YONKERS CLINICAL CENTER

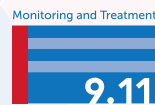
1020 Warburton Avenue, Suite 1
Yonkers, NY 10701



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