



Asthma, Particulates, and Diesel Exhaust

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Asthma exacerbations are caused by irritants known as “triggers.” Common triggers include particulate matter and other substances in tobacco smoke and vehicular exhaust, dust mites, pet dander, cockroach feces, mold spores, pollen, and strong odors. Activity, respiratory infections, and climate (temperature and humidity) can also precipitate asthma attacks.

Particulate matter (PM), one of several major air pollutants, is considered an important asthma trigger in urban locations because of the public’s heavy reliance on cars, trucks, and buses. The U.S. Environmental Protection Agency (EPA) defines PM as a mixture of solid and liquid particles in the air. The EPA and several other federal agencies have labeled it a primary air pollutant and a probable human carcinogen.^{1,2} PM less than 2.5 micrometers in diameter (PM_{2.5}), a common component of exhaust from vehicles, power plants, and industrial facilities,² is of particular concern because its small size allows it to bypass the body’s defenses and easily reach the deepest recesses of the lungs where it is more likely to be retained. Because PM can act as an asthma trigger, causing a decrease in lung function and inflammation of the airways, asthmatics are at a considerable risk of experiencing adverse effects from exposure to it.^{2,4} Dozens of studies worldwide confirm that PM (often from diesel fuel) can aggravate or produce symptoms of asthma and other respiratory illnesses, retard lung development, and cause premature death, especially among people with cardiopulmonary diseases. A study conducted by the National Health and Environmental Effects Research Laboratory found that exposure to PM promotes airway inflammation and hyperresponsiveness.⁵ High levels of PM have been linked with high levels of medication use, hospital and emergency room admissions, and work and school absences.^{2,4}

The EPA estimates that diesel exhaust is the source of more than 20% of the fine PM in New England air.⁶ Diesel exhaust is comprised of hundreds of constituent chemicals, many of which are harmful to both humans and the environment. Under the Clean Air Act, forty of these chemicals are classified as “hazardous pollutants;”

some of them have been designated probable human carcinogens.³ The major pollutants in diesel exhaust include:

- Diesel particulate matter (DPM)
- Polynuclear aromatic hydrocarbons (PAH)
- Nitrogen oxides (NOx)
- Volatile organic compounds (VOC), which include hydrocarbons (HC)
- Sulfur dioxide (SO₂)
- Carbon monoxide (CO)⁷

PM is a significant ingredient in diesel exhaust. Composed of more than 98% PM_{2.5}, these particulates are very small.⁴ The release of DPM into the atmosphere is caused by poor refinement of diesel fuel and incomplete fuel combustion, and

Table 1. Encapsulated History of Diesel Exhaust Policy in the United States

1970:	Congress revised the Clean Air Act, requiring 90% CO, HC and NOx reductions from light-duty diesel vehicles by 1976. Authority to regulate motor vehicle pollution was given to the United States EPA. ¹⁸
1977:	Congress amended the Clean Air Act, requiring heavy-duty vehicles to make 90% CO and HC reductions by 1984, and a 75% NOx reduction by 1985. ¹⁸
1982:	Air Resources Board regulates PM ₁₀ ⁴
1985:	EPA, under the Clean Air Act, set emissions standards for new diesel-powered trucks and buses. ¹⁸
1987:	EPA regulates PM ₁₀ ⁴
1990:	Congress amended the Clean Air Act, including more stringent control over PM from diesel engines. EPA placed restrictions on the sulfur content of diesel fuel. ¹⁸
1993:	EPA put forth regulations for 80% reduction of sulfur content in fuel, and 60% reduction in particulate emissions from urban buses. ¹⁸
1993:	EPS initiated the Urban Bus Retrofit/Rebuild Program. Required that urban buses operating under certain conditions use EPA certified retrofit pollution control technology or be rebuilt using certified low emission components during engine rebuilds. ¹
1994:	EPA reduced PM standards for new diesel-powered truck and bus engines. ¹⁸
1996:	EPA further reduced PM standards for new diesel-powered truck and bus engines. ¹⁸
1997:	EPA adopted new National Ambient Air Quality Standards for particles under 2.5 microns in size. ⁴
2000:	EPA adopted new diesel regulations requiring reduced emissions from new engines, along with the use of ultra low sulfur fuel. Expected to be fully implemented in 2010. ¹⁸

Adapted from: Massachusetts Enhanced Emissions and Safety Test. Diesel Background. <http://vehicletest.state.ma.us/dieselbg.html>

