

## Gasoline Engine Emissions and Health

### Cars and Pollution

Emissions from an individual car are generally low, relative to the smokestack image many people associate with air pollution. But in numerous cities across the country, the personal automobile is the single greatest polluter, as emissions from millions of vehicles on the road add up. Driving a private car is probably a typical citizen's most "polluting" daily activity.

### Sources of Auto Emissions

The power to move a car comes from burning fuel in an engine. Pollution from cars comes from by-products of this combustion process (exhaust) and from evaporation of the fuel itself.

### Exhaust Pollutants

- **Hydrocarbons:** Hydrocarbon emissions result when fuel molecules in the engine do not burn or burn only partially. Hydrocarbons react in the presence of nitrogen oxides and sunlight to form ground-level ozone, a major component of smog. Ozone irritates the eyes, damages the lungs, and aggravates respiratory problems. It is our most widespread and intractable urban air pollution problem. A number of exhaust hydrocarbons are also toxic, with the potential to cause cancer.<sup>1</sup>
- **Nitrogen Oxides (NO<sub>x</sub>):** Under the high pressure and temperature conditions in an engine, nitrogen and oxygen atoms in the air react to form various nitrogen oxides, collectively known as NO<sub>x</sub>. Nitrogen oxides, like hydrocarbons, are precursors to the formation of ozone. They also contribute to the formation of acid rain.<sup>1</sup>
- **Carbon Monoxide:** Carbon monoxide (CO) is a product of incomplete combustion and occurs when carbon in the fuel is partially oxidized rather than fully oxidized to carbon dioxide (CO<sub>2</sub>). Carbon monoxide reduces the flow of oxygen in the bloodstream and is particularly dangerous to persons with heart disease.<sup>1</sup>
- **Carbon Dioxide:** Carbon dioxide (CO<sub>2</sub>) does not directly impair human health, but it is a greenhouse gas that traps the earth's heat and contributes to the potential for global warming.<sup>1</sup>
- **Benzene:** A carcinogen that is added to gasoline to decrease the frequency of improper combustion, which can lead to engine malfunction. Long-term exposure to even lower concentrations of the chemical has also been shown to cause reduced red-blood cell counts and anemia.<sup>2</sup>

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<sup>1</sup> EPA Office of Mobile Sources: Automobile Emissions: An Overview, 1994  
<http://www.epa.gov/oms/consumer/05-autos.pdf>

<sup>2</sup> EPA tightens tailpipe emissions of cancer-causing chemicals, 2007  
<http://www.naturalnews.com/021605.html#ixzz1LlvZMTO8>

## **Evaporative Emissions**

Hydrocarbon pollutants also escape into the air through fuel evaporation. With today's efficient exhaust emission controls and today's gasoline formulations, evaporative losses can account for a majority of the total hydrocarbon pollution from current model cars on hot days when ozone levels are highest.<sup>1</sup>

### **IN VERMONT: Motor vehicles (all types) contribute to air pollution<sup>3</sup>**

- Motor vehicles are the largest source of carbon monoxide (61%). More than 120,000 tons of carbon monoxide are emitted annually from motor vehicles in Vermont.
- Motor vehicles are the largest source of hydrocarbons (48%). More than 10,000 tons of hydrocarbons are emitted annually from motor vehicles in Vermont.
- Motor vehicles are the largest source of nitrogen oxides (79%). More than 15,000 tons of NOx are emitted annually from motor vehicles in Vermont.

### **IN VERMONT: Health and Environmental Concerns<sup>3</sup>**

- Toxic and carcinogenic air pollutants threaten human health even at very low concentrations.
- Pollution from motor vehicles contributes to formation of ground-level ozone.
- Breathing ozone may lead to serious harm to health, including premature death, shortness of breath, inflammation of the lining of the lungs, increased risk of asthma attacks<sup>4</sup>.
- Children, people with lung disease and the elderly are especially vulnerable to ground-level ozone.
- Ground-level ozone from vehicles inhibits plant growth and can cause widespread damage to crops and forests.
- Air pollution from motor vehicles contributes to the formation of acid rain and global climate change.

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<sup>3</sup> Vermont Agency of Natural Resources – Air Pollution Control Division, 2005

<sup>4</sup> Facts about Ozone Pollution, American Lung Association Fact Sheet, April 2011