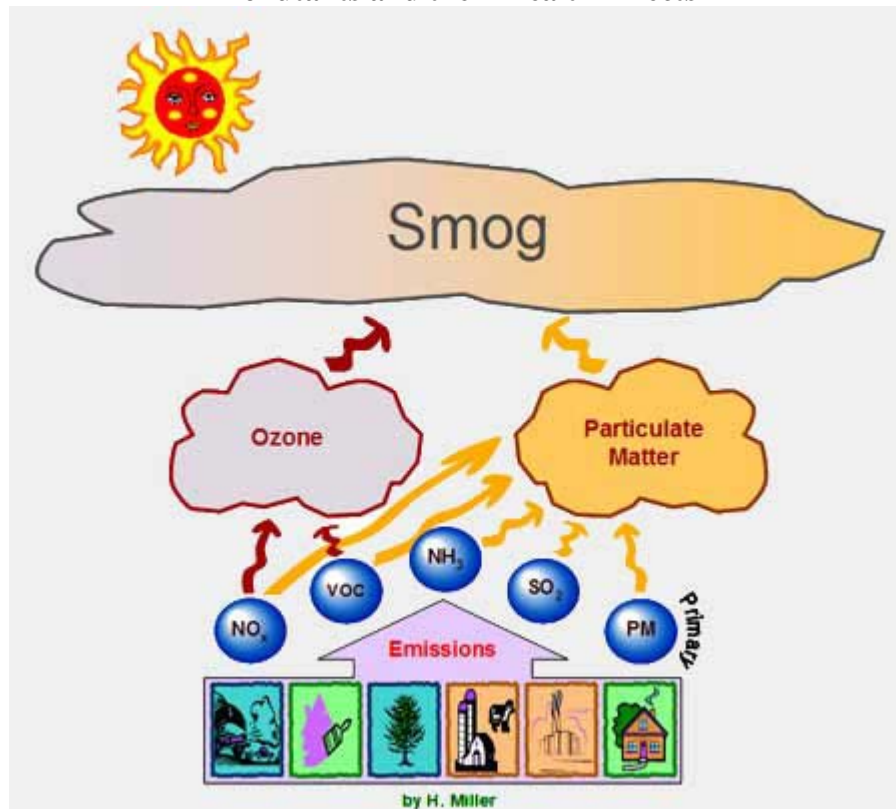


A CASE FOR SWITCHING TO ALTERNATIVE FUELS PART 1

Pollutants and their Health Effects



http://support.keepyousafe.com/graphics/pic_voc1.jpg

This article reviews linkages between pollutants and human health in brief. It is believed that an understanding of these linkages will be useful when we later examine the respective alternative fuels in the next reviews. The following pollutants are typically emitted from vehicles and will be discussed in this article; ozone, particulate matter, carbon monoxide, nitrogen oxides, volatile organic compounds and sulphur dioxides.

Ozone (O₃)

Ozone (three oxygen atoms) is not emitted directly into the air but at ground – level as a product of a chemical reaction between oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight (NO_x and VOCs will be discussed in the next paragraphs). Scientific studies [1] have linked ground-level ozone exposure to a variety of problems, including:

- airway irritation, coughing, and pain when taking a deep breath;
- wheezing and breathing difficulties during exercise or outdoor activities;
- inflammation, which is much like a sunburn on the skin;
- aggravation of asthma and increased susceptibility to respiratory illness like pneumonia and bronchitis; and,
- permanent lung damage with repeated exposures.

Particulate matter (PM)

Particulate matter is a complex mixture of extremely small particles and liquid droplets. These include acids (nitrates and sulphates), organic chemicals, metals, and soils or dust

particles. The size of particles is directly linked to their potential for causing health problems. The main health concerns relate to particles that are 10 micrometers in diameter or smaller. These are particles that generally pass through the throat and nose, and enter the lungs which can cause serious health effects such as cancer.

Carbon monoxide (CO)

Carbon monoxide is a colourless, odourless, poisonous gas composed of one atom each of carbon and oxygen. It is formed when carbon-based fuel is not burned completely. Carbon monoxide can cause harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues which may lead to unconsciousness, neurological damage and ultimately, death.

“A snap-shot on the scientific explanation of why Oxygen can easily be substituted by carbon monoxide”- [Oxygen is transported around the body via the red blood cells by binding to a substance within the red blood cells called haemoglobin. Carbon monoxide when at significant levels also binds to haemoglobin but does so about 240 times more tightly than oxygen. This means that is both carbon monoxide and oxygen are inhaled, carbon monoxide will preferentially bind to haemoglobin which will ultimately lead to the body starving of oxygen].

Nitrogen Oxides (NOx)

Nitrogen Oxides include; nitric oxide (NO), nitrogen dioxide (NO₂) and nitrous oxide (N₂O). These compound are formed by the reaction between oxygen and nitrogen during high-temperature combustion. NOx affects human health by causing eye and lung irritation and are believed to lower the body's resistance to infection.

Volatile Organic Compounds (VOCs)

Volatile Organic Compounds (VOCs) are compounds containing at least one carbon atom, excluding carbon monoxide and carbon dioxide, which evaporate readily to the atmosphere. VOCs include hydrocarbons, halocarbons and oxygenates. When VOCs are released to the atmosphere by emissions, they can react with other chemicals, notably oxides of nitrogen, in photochemical reactions to form ground-level ozone and particulate matter. These two air pollutants health effects to humans have already been discussed elsewhere.

Sulphur Dioxide (SO₂)

Sulphur dioxide causes a wide variety of health because of the way it reacts with other substances in the air. Long-term exposure to significant levels of sulphur dioxide gas particles cause respiratory illness and aggravate existing heart disease.