

COMBUSTION PRODUCTS

Being near busy traffic or vehicle exhaust causes exposure that affects lung function.¹ This is worse for those with longer exposure, such as house near traffic.¹ Very small vehicle particles can easily enter an indoor environment.¹

Exposure to diesel exhaust causes lung inflammation even in healthy people.² Risk is greater with longer exposure as well as higher intensity. Even higher risk occurs with indoor exposure to idling vehicles.³

DANGER BELOW EXPOSURE LIMITS

Harmful health effects occur from combustion product particles even at below government and commonly used exposure levels.⁴ Particulate pollutants (such as combustion products) cause and exacerbate illness at levels below EPA and WHO guidelines.⁵ There is a direct dose-response relationship between levels of combustion particle exposure and death rate.⁴

Recent scientific research shows body damage at very low levels of carbon monoxide, suggesting there is no known safe level of carbon monoxide exposure.⁶

HAZARDOUS GASES

Combustion gases contain irritants^{7 8 9} and toxins.^{10 11}

Combustion products of fuels (oil, gasoline, diesel, propane, etc.) contain the irritant oxides of nitrogen and for most fuels, oxides of sulphur. Repeated modest and even "tolerable" level irritant exposure,⁸ or higher level single⁸ or repeated⁹ irritant exposure can cause permanent or long term reactive airway disease rendering the individual with long-standing heightened susceptibility to exacerbating symptoms from future irritant exposures.^{7 9}

Combustion products such as vehicle exhaust and smoke release benzene, a potent cancer agent, and these exposures increase cancer risk.¹⁰

Combustion products also contain carbon monoxide, which can cause sensitization and affect memory and learning.¹¹ Carbon monoxide is toxic to brain/nerve cells, the heart, and other body muscle.⁶ Carbon monoxide exposure can cause long term neurologic damage.⁶

Chemical exposure can also interfere with detoxification.¹¹

LUNG DAMAGE FROM COMBUSTION PARTICLES

Combustion particles when inhaled can cause allergic effects and other chronic respiratory damage.^{3 12 13 14} Combustion particles can accumulate in the lungs.¹⁵

Gases, vapors and other air pollutants cling to particles and the particles then carry these substances into the lungs.¹⁶ They persist longer, because particles are harder to clear from the lungs.

Very small particles cause lung inflammation, damage lung cells, and form lipid peroxides in lung tissue. They can also enter the body through the lungs and/or cause lung scarring.¹⁷

Fine particulates deposit in the respiratory tract.¹⁴ Smaller particles (under 2.5 microns) deposit in the deep lung sacs (alveoli).¹⁴ They cause inflammation that makes lungs more permeable (to toxins, other particles, etc).¹⁴ Fine particles can act as a physical stressor, increasing norepinephrine (adrenalin) and adrenal cortisol (body stress hormone) levels.¹⁴

EXPOSURE SOURCES

All combustion releases carbon monoxide, and most combustion releases particles as well.

Burning landfills and industrial releases are major sources. Vehicles are a problem especially with frequent/repeated and/or heavy traffic exposure, gas or kerosene space heaters, gas appliances and tobacco sources release indoor carbon monoxide.⁶

DIESEL

Exposure to diesel exhaust causes eye and respiratory irritation and can lead to chronic respiratory damage.³ These very small particles entering the blood stream can impair normal function of the autonomic nervous system.¹⁷

Repeated, chronic diesel exhaust exposure can also cause brain damage with documented impairment in memory and other cognitive functions, as well as impaired balance, reaction time and other neurophysiologic functions.³

HEART DAMAGE

Particles can cause changes in EKG (electrocardiogram) tests showing (reduced blood/oxygen supply and/or inflammation).¹⁸ Exposure to combustion particles and gases cause excess cardiovascular disease risk^{19 20 21} and risk of death from stroke and other causes.²¹

HOW COMBUSTION PARTICLES CAUSE HARM

When fine chemical particles are breathed in, they can pass into the blood stream and be distributed to many other body organs and cells.²⁰ Chemical particles in those other locations also cause inflammation in those locations. They cause immune changes. They also cause toxicity²⁰ and increased need for antioxidants due to formation of tissue-damaging substances called free radicals.²⁰

Bigger particles breathed can penetrate and be deposited in the larynx (voice box), trachea and larger airways¹⁴ causing inflammation.^{14 22} Combustion particles impair lung function.²³

Ultrafine particles in large numbers are present in vehicle emission, worse in diesel. These particles have a high ability to attach to lung sacs (alveoli), cause inflammation. They also enter the blood stream¹⁶ and have a large surface area to absorb gases and vapors.¹⁶ They thus carry other vapors into the body.

COMBUSTION PRODUCT EXPOSURE DEPLETES ESSENTIAL ANTIOXIDANTS AND NUTRIENTS

Carbon monoxide exposure^{11 24 25 26} can produce excess nitric oxide in the body^{11 24 25} and NMDA activation.^{25 27} Both of these lead to inflammation.^{26 28 29 30 31} Particles also cause inflammation and increased nitric oxide.^{22 32} These changes all deplete nutrients and require nutrients for repair.^{28 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54}

This damage can be reduced by treatment with glutathione.¹² Fine combustion and other particles can cause increase in the respiratory inflammation marker, exhaled nitric oxide.²² Excess nitric oxide depletes cobalamin (B12) and needs hydroxocobalamin as a scavenger.^{36 37}

OTHER BODY DAMAGE

They can cause damage to genetic material (DNA).¹⁰ This is measured by a substance called 8-hydroxy-2-deoxyguanosine.¹⁶ This type of DNA damage could lead to increased cardiovascular and pulmonary disease, risk of mutations and cancer.¹⁶ Diesel exhaust increases lung cancer.⁵⁵

They also damage essential lipids,¹⁶ causing damage to cell membranes and membranes around internal structures inside cells. Examples of these vital structures are ribosomes making proteins, mitochondria producing energy, etc.). They damage myelin in the brain and nervous system.

Exposure to vehicle traffic exhaust significantly increases body exposure to these particles,¹⁶ and increased DNA damage can be measured after such exposure.¹⁶ It is worse with heavier traffic¹⁶ e.g., commuter, highway traffic, etc.).

Other studies confirm a correlation between DNA damage and exposure to small particles. Inhaled ultrafine particles can penetrate through the lung and within an hour are able to penetrate cells and affect energy-generating mitochondria and other structures within body cells.^{16 56}

Carbon monoxide can also cause inflammation of blood vessel linings.⁵⁷ This can impair oxygen supply to the brain, heart and other organs.

BURNING SYNTHETICS

Persons exposed to combustion products from flame-retardants in plastics, electronics, fabrics and other materials can develop permanent brain and neurologic damage.⁵⁸ Deca is the most widely used flame retardant and during combustion and other exposure breaks down to brominated compounds. These persist in the body for decades and are banned in the European Union and California.)⁵⁸

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