

One of the countless pollutants found in woodsmoke are a group of chemicals known as VOC's (following paragraph excerpted from BurningIssues.org)

VOCs (C2-C7)¹

Volatile Organic Compounds cause serious health problems such as cancer and other effects.

All VOCs contain carbon.

They can cause serious human illness.

Hazardous.

Causes ozone. Ozone causes breathing problems, reduced lung function, asthma, irritates eyes, stuffy nose, reduced resistance to colds and other infections, may speed up aging of lung tissues.

Causes fatigue, generalized depression, increased lethargy or sleep, headaches, substernal pressure, generalized aches and accelerated cardiac action.

17 Environmental Effects - ozone can damage plants and trees; smog can cause reduced visibility

Below is a brief excerpt extracted from 'Characterization of volatile organic compounds (VOCs) in smoke at EXPERIMENTAL fires

Journal of Toxicology and Environmental Health, Part A, 63:191-206, 2001

followed by supplementary information about just two of the eight VOCs found in the study to be at peak levels in woodsmoke,

from ***WHO (benzene)

and *****ATSDR (toluene)

Little attention has been paid to volatile organic compounds (VOCs) present at fire sites, even though they are known to have chronic effects including kidney cancer and liver disease

(Klaasseen et. al., 1996).... **burning spruce wood produced 108 different VOCs**, but the chromatograms were characterized by a smaller number of prominent peaks (2methylpentane, benzene***, toluene*****, and naphthalene) and the presence of four peaks not found in ambient air samples (propene, 1,3-butadiene, styrene, and naphthalene).

*****World Health Organization (WHO) benzene guidelines**

Air

No specific guideline value has been developed for air. **Benzene is carcinogenic to humans, and no safe level of exposure can be recommended.**

For general guidance, the concentrations of airborne benzene associated with an excess lifetime risk of leukaemia of 10⁻⁴, 10⁻⁵ and 10⁻⁶ are 17, 1.7 and 0.17 µg/m³, respectively.⁴

Health effects

Acute effects

- **Acute occupational exposure to benzene may cause narcosis: headache, dizziness, drowsiness, confusion, tremors and loss of consciousness.**² Use of alcohol enhances the toxic effect.⁷

- Benzene is a moderate eye irritant and a skin irritant.²

Effects following chronic exposure

- Benzene is a well-established cause of cancer in humans.^{1,3} **The International Agency for Research on Cancer has classified benzene as *carcinogenic to humans*** (Group 1).^{1,3} Benzene causes acute myeloid leukaemia (acute non-lymphocytic leukaemia), and there is limited evidence that benzene may also cause acute and chronic lymphocytic leukaemia, non-Hodgkin's lymphoma and multiple myeloma. Individuals who have experienced benzene poisoning requiring treatment show a substantially increased risk of mortality from leukaemia.³

- Chronic exposure to benzene can reduce the production of both red and white blood cells from bone marrow in humans, resulting in aplastic anaemia.²

- Both B-cell proliferation and T-cell proliferation are reduced by benzene. Decreased host resistance to infection has been reported in several laboratory animals exposed to benzene. However, other measures of immunotoxicity have not been studied.²

***** (Agency for Toxic Substances & Disease Registry) ATSDR

How Toluene can affect your health?

A serious health concern is that toluene may have an effect on your nervous system (brain and nerves). Nervous system effects can be temporary, such as headaches, dizziness, or unconsciousness. However, effects such as incoordination, cognitive impairment, and vision and hearing loss may become permanent with repeated exposure, especially at concentrations associated with intentional solvent abuse. High levels of toluene exposure during pregnancy, such as those associated with solvent abuse, may lead to retardation of mental abilities and growth in children. Other health effects of potential concern may include immune, kidney, liver, and reproductive effects.

Single exposures to toluene or repeated exposures over a few weeks can cause headaches and sleepiness, and can impair your ability to think clearly. Whether or not toluene does this to you depends on the amount you take in, how long you are exposed, and your genetic susceptibility and age. One very dangerous activity is to expose yourself to a large amount of toluene in a short time by deliberately inhaling/sniffing paint or glue. At first, you will feel light-headed. If exposure continues, you can become dizzy, sleepy, or unconscious, and you might even die. Toluene causes death by interfering with the way you breathe and the way your heart beats. When exposure is stopped, the sleepiness and dizziness will go away and you will feel normal again.

Low to moderate, day-after-day exposure to toluene in your workplace can cause tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, and loss of appetite. These symptoms usually disappear when exposure is stopped. You may

experience some hearing and color vision loss after long-term daily exposure to toluene in the workplace. Combinations of toluene and some common medicines like aspirin and acetaminophen may increase the effects of toluene on your hearing. Researchers do not know if the low levels of toluene that you breathe at work will cause any permanent effects on your brain or body after many years. If you choose to repeatedly breathe in toluene from glue or paint thinners, you may permanently damage your brain. You may also experience problems with your speech, vision, or hearing, have loss of muscle control, loss of memory, poor balance, and decreased mental ability.

Some studies in people have shown reproductive effects, such as an increased risk of spontaneous abortions, from exposure to toluene in the workplace. However, other factors, such as exposure to other chemicals, smoking, and alcohol use, may have affected the results of the studies, so it is not possible to say whether toluene has reproductive effects in people. Additionally, exposure to high levels of toluene could possibly damage your kidneys and liver.

The effects of toluene on animals are similar to those seen in humans. The main effect of toluene is on the brain and nervous system, **but animals exposed to moderate or high levels of toluene also show harmful effects in their liver, kidneys, and lungs and impaired immune function.** Animal studies do not indicate that toluene exposure results in reproductive effects.

Studies in workers and animals exposed to toluene generally indicate that toluene is not carcinogenic (cancer-causing). The International Agency for Research on Cancer determined that toluene is not classifiable as to its carcinogenicity in humans (Group 3). The U.S. EPA determined there is inadequate information to assess the carcinogenic potential of toluene. The American Conference of Governmental Industrial Hygienists determined that toluene is not classifiable as a human carcinogen (A4). The U.S. National Toxicology Program has not considered the carcinogenic potential of toluene.