

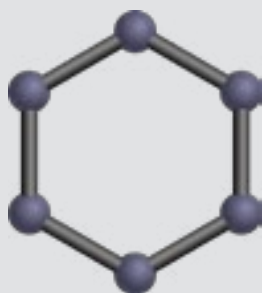
Understanding Benzene:

A chemical to be treated with care

July 2017

Benzene facts

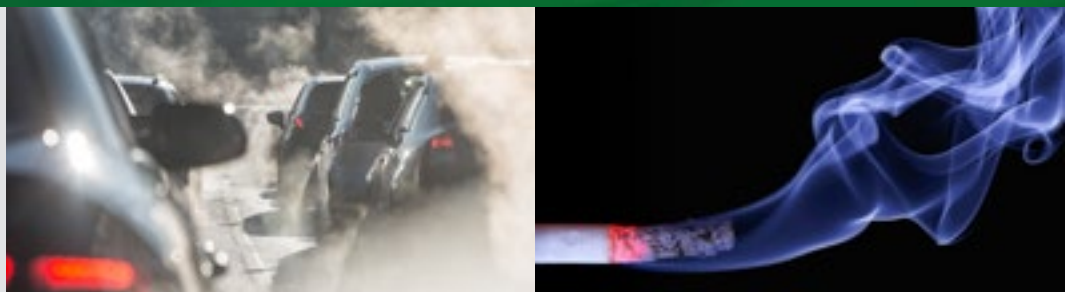
- Chemical symbol: C₆H₆
- It can be detected by smell at levels of 1ppm
- First isolated in 1825 by Michael Faraday



Ambient levels of benzene in the UK have plummeted since the introduction of catalytic converters

Benzene is found in:

- Car exhaust fumes
- Tobacco smoke
- Volcanoes
- Forest fires
- Landfill
- Glues
- Paints
- Detergents
- Furniture wax



What is benzene?

Benzene is a colourless, flammable liquid with a distinctive aromatic odour that evaporates quickly when exposed to air. It is found in crude oils and released during some natural processes, such as volcanic eruptions and forest fires, but most exposure to benzene results from human activity. As it is heavier than air, it can collect in dangerous concentrations near to the ground.

In industry benzene is used as a solvent in paints, varnishes, lacquer thinners, and in the synthesis of numerous chemicals. Workers in industries that make or use benzene can be exposed to benzene – these include oil refineries, chemical plants, gasworks and manufacturers of lubricants, dyes, detergents, drugs, and pesticides, etc. Site workers can encounter it in ground that has been contaminated by these industries. Other people who may be exposed to benzene at work include steelworkers, printers, lab technicians, petrol station employees and firefighters.

People are most commonly exposed by breathing in air containing benzene. Car exhaust fumes are the main source in the general environment, although the introduction of catalytic converters has significantly reduced levels. Tobacco smoke – including that inhaled through passive smoking – is also a significant source of exposure.

It is possible for Benzene to be absorbed through the skin, but this is rarer because liquid benzene evaporates quickly.

Benzene is partially soluble in water – it more usually forms a film on the surface – so small amounts may be washed by rain to contaminate surface waters and soil, but it either evaporates from the surface or is broken down by bacteria.

Benzene is transported under UN number 1114 ("BENZENE") and has the Emergency Action Code 3WE.

The suffix denotes that in the event of a spillage:

- **3** = that foam should be used on benzene fires and to clean spillages
- **W** = that liquid-tight chemical protective clothing with breathing apparatus should be used by those handling the spillage
- **E** = people nearby should be warned to stay indoors with all doors and windows closed – evacuation may need to be considered.

The dangers of benzene

The health impacts of benzene depend on the amount and duration of the exposure as well as the age and medical condition of the exposed person. The immediate consequences of a brief exposure to a high concentration can include headaches, tremors, tiredness, confusion, dizziness and nausea. If exposure is very high, unconsciousness or even death can occur.

If ingested in food or drink, symptoms can include a burning feeling throughout the digestive tract, nausea, tiredness, convulsions and a rapid or irregular heartbeat. Direct exposure of the eyes, skin, or lungs to benzene can cause tissue injury and irritation.

Exposure to more modest levels of benzene over a long period impacts mainly on the blood. It can prevent the bone marrow producing enough red blood cells, resulting in anaemia. It can also damage the immune system by changing blood levels of antibodies and causing the loss of white blood cells. Various blood-related cancers, including leukemia, are also caused by exposure to benzene.

Due to the dangers it poses, benzene levels in the UK are tightly controlled. Benzene has an 8 hour time-weighted average of 1ppm, an LEL (lower explosive limit) of 1.2%/volume and a UEL of 7.8%/volume. Its IDLH (immediately dangerous to life or health) level is 500ppm.



HSE advice regarding benzene

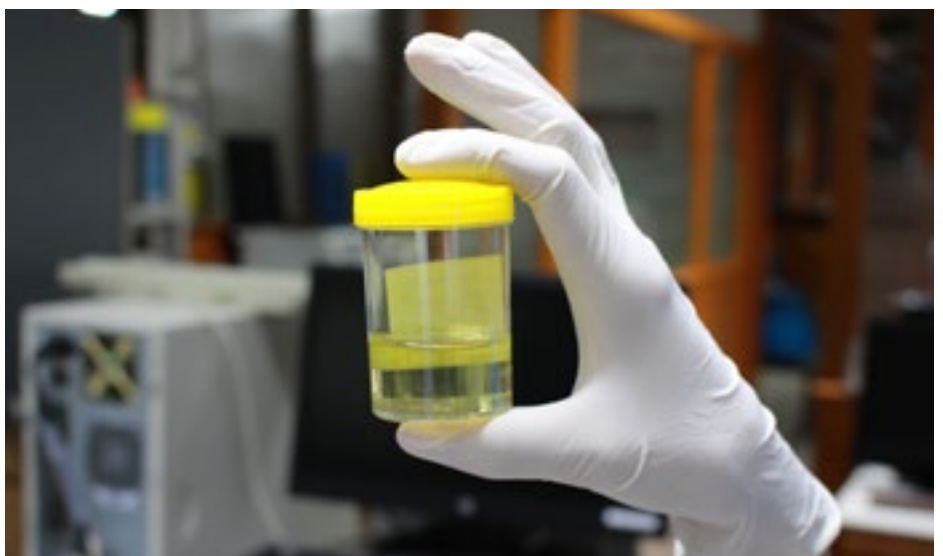
- Use extraction equipment or other control measures correctly
- Use protective clothing and equipment
- Use washing facilities (which must be provided)
- **If you have to wear a respirator, make sure:**
 - it fits properly
 - if it is a tight-fitting mask, that you have been fit tested and are clean shaven
 - it is clean and in good working order
 - the filter is changed regularly
 - it is stored in a clean/dry place, preferably a locker
- Report defects in enclosures, extraction equipment or other control measures to your employers
- Don't eat or drink in work areas where benzene may be present.



Managing the risks

If it is known that there is a risk of benzene exposure there are several possible control measures. These include regular health checks, use of PPE and deployment of ventilation and extraction equipment – activated carbon filtration is effective at managing Benzene. The measures adopted will vary according to the degree of risk presented.

Urine samples are key elements of health checks where workers are likely to be exposed to benzene. In the body, benzene is converted to a series of products including S-phenylmercapturic acid (SPMA). Everyone has their own background level of SPMA, which should be recorded before they come into contact with areas where they will, or might be, exposed to benzene. Once this level has been recorded, samples taken before and after carrying out hazardous operations will reveal, under laboratory testing, the extent of any exposure.





Responding to an unexpected exposure to benzene

If the presence of benzene is not suspected, and therefore control measures are not in place, there are still actions that will help reduce the impact of exposure.

- If benzene has been released into the air, quickly leave the area where the benzene was released. If the release was indoors, get outside.
- Remove clothing that may have benzene on it, but do not pull any over your head; instead, it should be cut off the body.
- If helping other people to remove their clothing, avoid touching any contaminated areas.
- As quickly as possible, wash any benzene from your skin with large amounts of soap and water.
- If your eyes are burning or your vision is blurred, rinse your eyes with plain water for 10 to 15 minutes. If you wear contact lenses, remove them after washing your hands and dispose of them along with any contaminated clothing. Do not put the lenses back in your eyes.
- If you wear spectacles, wash them with soap and water. They can be put back on afterwards.
- Having washed yourself, place contaminated clothing inside a plastic bag, but avoid touching contaminated areas of the clothing. Either wear rubber gloves or put the clothing in the bag using tongs, tool handles, sticks, etc. Anything that touches the contaminated clothing should also be placed in the bag. Seal the bag, then seal that bag inside another plastic bag.
- If someone has swallowed benzene, DON'T try to make them vomit or give them fluids to drink. And do NOT attempt CPR – it may cause someone who has swallowed benzene to vomit. The vomit could be sucked into, and damage, their lungs. Instead, give them water or milk right away, unless the person has symptoms (vomiting, convulsions, or a decreased level of alertness) that make it hard for them to swallow. Seek medical help as soon as possible.

Further information

[World Health Organization](#)

[HSE – Benzene and You](#)

[HSE case study – Benzene exposure to workers during tunnelling](#)

[EU Council Directive Ambient air quality and cleaner air for Europe](#)

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