

Formaldehyde

User Guidance

Occupational Health and
Safety Service
HSD183C



Introduction:

Formaldehyde is a colourless, highly toxic and potentially flammable gas. It is usually found as

a 37% aqueous solution called *formalin*. This solution is stabilised with 10 to 20% methanol. For experimental purposes *formalin* is often supplied or diluted to lower concentrations, frequently ~4%. It is used as an embalming fluid, tissue fixer / preservative, sterilizer and fumigant. Formaldehyde is also used to make, urea-formaldehyde foam, resins, plywood, paints, adhesives, particleboard and plastics, but it is unlikely that significant formaldehyde could be released from these under normal work conditions.

Hazards:



Formaldehyde is a **sensitizing agent** that can trigger an allergic reaction after **single or repeated exposures**. It is classified as a **human carcinogen** (cancer-causing agent) by the International Agency for Research on Cancer (IARC) and a potential **mutagen**. It is **toxic** if swallowed, in contact with skin or if inhaled and it is **corrosive**.

It is a 'Serious Risk to Health'

Note: Flammability issues would normally only arise following a major spill of a 37% solution releasing a significant amount of gas over time.

Respiratory & Skin Sensitization:

Exposure to formaldehyde can lead to allergic reactions in some individuals. Sensitization is an immune response. Some people may be sensitized upon even small repeated exposure while others may never be affected. Formaldehyde can cause asthma, contact dermatitis, anaphylactic reactions and, in rare cases haemolysis in sensitised individuals. One of the implications of this 'individual' response is that consideration **MUST** be given to all those who might be exposed in the

workplace, not just those directly involved in the work. Since repeated low level exposures can result in sensitisation the control measures **MUST prevent or absolutely minimise exposure**.

Should sensitisation be suspected, at any level, the individual(s) should immediately seek guidance and advice from the University's Occupational Health Service.

Health Affects:

Formaldehyde can become irritating to the eyes at low concentrations. Irreversible damage, (corneal ulceration, cloudiness of the eye, death of surface cells and permanent loss of vision) can occur after a single exposure, depending on dose and level of sensitivity.

If you have any 'eye' symptoms you must seek medical advice immediately.

At concentrations as low as 0.1 parts per million (ppm), exposure to formaldehyde could be irritating to the skin, eyes and respiratory tract. (see: WELs below!)

Symptoms of exposure include coughing, wheezing, dermatitis, headaches, watery eyes, nausea, chest tightness and burning sensations in the eyes, nose and throat. Long-term exposure can result in insomnia, headaches, depression, mood changes, attention deficit and impairment of dexterity, memory and equilibrium. If symptoms are detected; **seek advice from the University's Occupational Health Service.**

Chronic Toxicity:

Formaldehyde and the methanol stabilizer are a serious risk to health, are **easily absorbed** and can contribute to systemic toxicity.

Formaldehyde has been shown to decrease fertility and increase the risk of spontaneous abortion (miscarriage) in humans. In addition to cancer, chronic exposure to formaldehyde has been linked to chronic gastritis,

hematemesis (vomiting blood), inflammation of the lungs and airways, pulmonary oedema, respiratory failure, renal failure and permanent alterations of nervous system function

Workplace Exposure Limits (WELs):

The HSE has set two legally enforceable maximum exposure levels by inhalation for formaldehyde. However, both the Long Term (8 hour) and the Short Term (15 minute) Workplace Exposure Limit (WEL) are the same level: **2ppm by inhalation**. This is indicative of this 2ppm level **NOT being a proven safe level of exposure**, particularly with respect to sensitisation and irritation. These legal limits are likely to be reduced to 0.3 and 0.6ppm respectively. However, as with all such chemicals the University strives for 'zero exposure'.

Risk Assessment:

Before using formaldehyde you MUST consider whether it is possible to use a safer alternative. Avoid the use of formaldehyde wherever possible.

If formaldehyde has to be used, those using it must understand it's hazardous properties so that suitable **control measures can be taken to prevent exposure**.

The potential for exposure depends on how formaldehyde is used and this determines the appropriate control measures, remembering that.

small dilute quantities present a smaller risk.

Potential Control Measures:

- Use good laboratory practice.
- Wear;
 - o Laboratory coats
 - o Gloves**
 - o Eye protection (minimum of tight fitting safety glasses)
- **Wherever reasonably practicable**, use engineering controls i.e. local exhaust

ventilation (LEV) / fume cupboards or down draft benches to extract formaldehyde.

- Wear suitable Respiratory Protective Equipment (RPE) if it is **absolutely AND unavoidably necessary** to work with significant quantities of formaldehyde / *formalin* without adequate engineering controls. **NB:** see University RPE Guidance.
- Consider whether air monitoring is needed.
- Have a spillage procedure and dispose of any formaldehyde waste appropriately.
- If spilt on the skin wash immediately with water and seek medical advice

****Check the chemical breakthrough times of the gloves for formaldehyde and methanol. The thicker a glove, the longer the chemical breakthrough time.**

Storage and Stability:

Formaldehyde/formalin is stable under recommended storage conditions. However it is incompatible with aniline, isocyanates, **phenol**, acid anhydrides, strong acids, strong bases, strong oxidizing agents, amines and peroxides, etc; **see SDSs for more information**. Store in a 'bundled-tray' of at least 110% of the container volume.

Health Surveillance:

All those working with formaldehyde must be made familiar with the risks and the possibility of sensitisation. There must be a clear policy in place to **report and act immediately upon any indication of sensitivity developing**. Any skin contamination must be washed off with water (and soap) **immediately**.

Additional Risks:

Formalin can be purchased in large and heavy poly-bottle containers which are vulnerable to rupture if 'abused'. Therefore serious consideration must be given to minimising the container size wherever possible and having mitigating measures in place should a spillage occur i.e. having appropriate spill kits available.

Only store formaldehyde in a ventilated room / cupboard or at least an area capable of being ventilated following an accidental release. Do not store in rooms with no realistic means of ventilation.

Paraformaldehyde is a polymerised product of formaldehyde and can be broken down to yield formaldehyde gas by dry heating. It also yields formalin with water in the presence of a base or heat. Paraformaldehyde usually has a characteristic 'formaldehyde odour'.

Further Information: Safety Office.

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