Formaldehyde

General information

Key Points

Fire
- Flammable
- Reactive with strong oxidising agents, bases and acrylonitrile
- Emits toxic fumes of carbon monoxide and carbon dioxide when heated to decomposition; and hydrogen gas on reaction with strong bases
- In the event of a fire involving formaldehyde, use alcohol resistant foam, or normal foam if not available, and liquid tight protective clothing with breathing apparatus

Health
- Due to its gaseous nature, inhalation and eye exposure are most likely
- Possible carcinogen, toxic and corrosive
- Inhalation of formaldehyde can lead to irritation of the nose, mouth and throat. In severe cases, respiratory distress and swelling of the larynx and lungs may occur
- Ingestion of formaldehyde can cause burns and ulcers in the stomach or intestines in the early stages after ingestion. Chest or abdominal pain, sickness, diarrhoea and haemorrhages in the stomach or intestines may also result. Other clinical features include rapid breathing, yellowish discolouration of the skin, blood in the urine and kidney failure
- Exposure of the eyes to formaldehyde causes immediate stinging and burning with spasm of the eyelids and tearing. High concentrations may cause burns to the cornea
- Skin contact with concentrated formaldehyde gas can cause burns to the skin

Environment
- Avoid release into the environment
- Inform Environment Agency of substantial incidents

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Background

Formaldehyde is a colourless, corrosive, flammable gas with a pungent, suffocating odour. Formaldehyde may be present in the environment from either natural or industrial sources.

Formaldehyde is produced in large quantities industrially. It is predominantly used commercially as a solution in water at concentrations in the range of 25 – 56% formaldehyde. Formaldehyde is a common constituent used in the manufacture of many complex materials. It is used in the production of resin polymers for permanent adhesives such as those used in fibreboard, particle board, plywood and carpeting. It is also used in foam insulation and as paper and textile finishing treatments. Formaldehyde at approximately 5% in a solution with water is used as a disinfectant and fumigant in hospitals, ships, dwellings and animal handling facilities, as it is effective in killing most bacteria, viruses and fungi.

Formaldehyde is produced in the atmosphere due to the degradation of methane by sunlight. It is also released during the combustion of organic materials, and as such may be present in smoke from wood fires, automobile emissions and tobacco smoke. Small quantities of formaldehyde may also be produced as a product of metabolism by most organisms.

Formaldehyde is very toxic to humans. The most common routes of exposure to formaldehyde gas are either inhalation or skin contact. However, solutions containing formaldehyde may also be toxic following ingestion.

Inhalation of formaldehyde gas will cause irritation to the nose, mouth and throat and in severe cases may cause respiratory distress and swelling of the larynx and lungs. Inhalation of formaldehyde may cause the onset of asthma in sensitive individuals. Exposure of the eyes to vapour or splashes of formaldehyde solutions causes irritation with immediate stinging and burning, with spasm of the eyelids and tearing. Exposure to high concentrations may cause burns to the cornea. Exposure of the skin to formaldehyde causes irritation with burns to the skin.

Ingestion of formaldehyde solutions can cause burns and ulcers to the gastrointestinal tract in the early stages after ingestion. Formaldehyde ingestion may also cause chest or abdominal pain, nausea, vomiting, diarrhoea and gastrointestinal tract haemorrhage. Other clinical features can include rapid breathing, yellowish discoloration of the skin, blood in the urine and kidney failure.

Repeated or prolonged skin contact with solutions of formaldehyde can give rise to skin sensitisation (allergic contact dermatitis) in some individuals, with symptoms such as redness, itching, rash and swelling of the skin.

Children exposed to formaldehyde would be expected to display similar effects to those seen in exposed adults. Exposure to formaldehyde during pregnancy is not expected to cause damage to the unborn child at doses which do not cause adverse effects to the mother.

Formaldehyde has been classified by the International Agency for Research on Cancer as carcinogenic to humans. It produces nasal tumours following prolonged exposure by inhalation to levels producing chronic irritant effects.
Production and Uses

Key Points

- Formaldehyde can occur naturally in the environment and is also produced industrially.
- Formaldehyde is mainly used commercially as a solution in water.
- It is commonly used in the manufacture of resin polymers to produce permanent adhesives, foam insulation and paper and textile finishing treatments.
- It is used as a disinfectant and fumigant in hospitals, ships, dwellings and animal handling facilities.
- Formaldehyde is also used to fix tissues for histology and pathology.

Formaldehyde can occur naturally in the environment as it is produced from the breakdown of methane by sunlight. Small quantities of formaldehyde may be produced as a product of metabolism by most organisms including humans. Formaldehyde is also released during the combustion of organic materials, and as such may be present in smoke from wood fires, automobile emissions and tobacco smoke.

Formaldehyde is also produced in large quantities industrially. It is predominantly used commercially as a solution in water at concentrations in the range of 25 – 56 % formaldehyde. Formaldehyde is a common constituent used in the manufacture of many complex materials. It is used in the production of polymers such as urea formaldehyde resin, phenolic resins and melamine resin. A common use of these resins is in permanent adhesives such as those used in fibreboard, particle board, plywood and carpeting. They are also used in foam insulation and as paper and textile finishing treatments. Formaldehyde at approximately 5% in a solution with water is used as a disinfectant and fumigant in hospitals, ships, dwellings and animal handling facilities, as it is effective in killing most bacteria, viruses and fungi. A solution of approximately 37% formaldehyde is commonly known as formalin and is used as a tissue fixative for histology and pathology.
Frequently Asked Questions

What is formaldehyde?

Formaldehyde is a colourless, corrosive, flammable gas with a pungent, suffocating odour. It may be present in the environment from either natural sources or it may be produced industrially. The main use of formaldehyde is in the production of resins for permanent adhesives used in fibreboard, particle board, plywood and carpeting. Formaldehyde has also been used as a disinfectant and fumigant.

How does formaldehyde get into the environment?

Formaldehyde can occur naturally in the environment from the breakdown of methane by sunlight. Formaldehyde is also released during the combustion of organic materials, and as such may be present in smoke from wood fires, automobile emissions and tobacco smoke. As formaldehyde is used industrially it may also enter the environment from workplaces where it is manufactured or used.

How will I be exposed to formaldehyde?

The greatest potential for exposure to formaldehyde is in occupations where it is manufactured or used. Anyone working with formaldehyde is at risk of inhaling the vapours if there is insufficient ventilation or if adequate protective equipment is not used. People working with formaldehyde are also at risk of getting splashes of it on their skin if they are not adequately protected. Ingestion of significant amounts of formaldehyde is not a common route of occupational exposure. As formaldehyde may also be present naturally in the environment, individuals may come into contact with very low levels of formaldehyde in air.

If there is formaldehyde in the environment will I have any adverse health effects?

The presence of formaldehyde in the environment does not always lead to exposure. Clearly, in order for it to cause any adverse health effects you must come into contact with it. You may be exposed by breathing, eating, or drinking the substance or by skin contact. Following exposure to any chemical, the adverse health effects you may encounter depend on several factors, including the amount to which you are exposed (dose), the way you are exposed, the duration of exposure, the form of the chemical and if you were exposed to any other chemicals.

Inhalation of formaldehyde gas will cause irritation to the nose, mouth and throat and in severe cases may cause respiratory distress and swelling of the larynx and lungs. Inhalation of formaldehyde may cause the onset of asthma in sensitive individuals. Exposure of the eyes to vapour or splashes of formaldehyde solutions causes irritation with immediate stinging and burning, with spasm of the eyelids and tearing. Exposure to high concentrations may cause burns to the cornea. Exposure of the skin to formaldehyde causes irritation with burns to the skin. Ingestion of formaldehyde solutions can cause burns and ulcers to the gastrointestinal tract in the early stages after ingestion. Formaldehyde ingestion may also cause chest or abdominal pain, nausea, vomiting, diarrhoea and gastrointestinal tract haemorrhage. Other clinical features can include rapid breathing, yellowish discolouration of the skin, blood in the urine and kidney failure.
Can formaldehyde cause cancer?

Formaldehyde is known to be a cancer causing substance and has been classified by the International Agency for Research on Cancer as carcinogenic to humans. It may produce nasal cancer following repeated exposure via inhalation to levels that produce chronic irritation. Exposure to lower levels for shorter periods is not considered to present any carcinogenic risk.

Does formaldehyde affect children or damage the unborn child?

Children will be affected by formaldehyde in the same way as adults. However, the effects seen in children may potentially be more severe.

Exposure of a pregnant mother to formaldehyde is not expected to cause damage to the unborn child at amounts below that which cause significant health effects to the mother.

What should I do if I am exposed to formaldehyde?

It is very unlikely that the general population will be exposed to a level of formaldehyde high enough to cause adverse health effects.