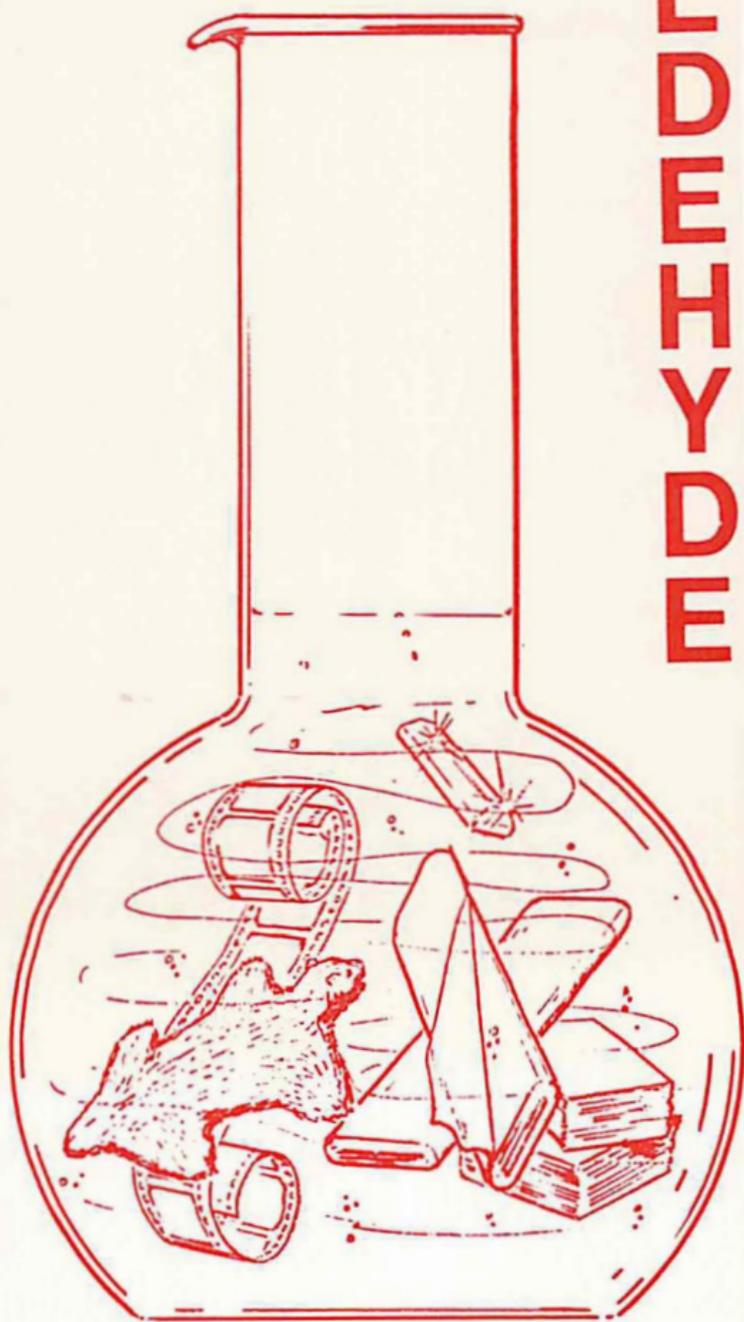


U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH



WORKING WITH

FORMALDEHYDE

WORKING WITH FORMALDEHYDE

Formaldehyde is a colorless, highly reactive gas that is composed of hydrogen, carbon, and oxygen. It combines readily with many other materials and can be dissolved in water, alcohol, or ether, but not in most other organic solvents. Formaldehyde is usually used in a liquid solution with water and methanol, called formalin, or in the solid form — as a powder, granules, or flakes, called paraformaldehyde. Some formaldehyde gas is evolved in air from containers of formalin and paraformaldehyde left open to room air.

Because formaldehyde is a strong irritant, it can harm workers who use it without proper precautions and adequate controls.

How Formaldehyde Is Used

Formaldehyde is a powerful antiseptic, germicide, fungicide, and preservative that is used widely in tanning and preserving hides and furs, embalming, and in the formulation of disinfectant, germicidal, and fungicidal fluids. It is used to improve the fastness of dyes on fabrics, waterproofing and strengthening fabrics, processing and preserving rubber latex, and preserving foodstuffs. It is useful also as a seed and soil disinfectant, hardening paper and paper products, developing photographic film, and refining gold and silver.

The largest industrial use of formaldehyde today, however, is in the manufacture of resins for plastic and synthetic fabric manufacturing processes. These resins range from solid products for thermosetting powdered plastic materials to water-soluble products used to treat textiles for their permanent-crease and permanent-press garment industry.

How Formaldehyde Can Affect You

Irritation of the eyes, nose, mouth, and throat are the most common worker health effects from inhalation of formaldehyde gas. Formaldehyde has a very pungent, offensive odor that is noticeable even in very small concentrations, producing burning and tearing of the eyes. Higher concentrations usually bring difficulty in breathing, intense burning of the eyes, nose and throat, profuse tearing, and severe coughing. Prolonged exposure to high concentrations may cause headache, heart palpitations, and serious inflammation of the bronchial tubes and lungs. In extreme cases, death may result due to swelling or spasm of the vocal cords. Asthmatic symptoms, such as wheezing, may occur, even at very low concentrations, in persons with an allergic sensitivity to formaldehyde.

Workers repeatedly exposed to low concentrations of formaldehyde during normal work periods seem to develop a physical tolerance to formaldehyde and can work in concentrations that are intolerable to many outsiders. Chronic symptoms that are associated with repeated exposure are itching eyes, dry and sore throat, disturbed sleep, and unusual thirst upon awakening.

Swallowing formalin solution will cause prompt and severe digestive system irritation. Immediate symptoms are intense pain in the mouth, throat, and stomach; vomiting; and sometimes diarrhea; these may be followed by vertigo, stupor, convulsions, unconsciousness, and possibly death. Damage to the central nervous system and kidneys may also result.

A very small amount of concentrated formaldehyde in the liquid or powder form in the eyes will cause severe irritation and possible damage to the cornea.

Dermatitis may result from formaldehyde contact with the skin. Formaldehyde acts on the skin cells both as an irritant and as a tanning agent. The dermatitis usually appears first as a

reddening of the skin and then small blisters may form similar to those caused by poison ivy. Formaldehyde may also make the fingernails soft and brownish. Skin irritation seldom results from exposure to formaldehyde gas in the air, but individuals who have developed an allergic sensitivity show dermatitis symptoms from exposure to concentrations easily tolerated by nonallergic persons.

Formaldehyde may react with ionic chloride compounds such as hydrochloric acid to produce bis-chloromethyl ether, a substance which causes lung cancer in animals and humans. Therefore, formaldehyde should not be stored in areas where it may come in contact with ionic chloride compounds.

Formaldehyde gas is highly flammable and potentially explosive in high concentrations. Solid forms of formaldehyde are combustible and high concentrations of their dust in air will explode if ignited. Fire hazards are greater in storage areas than in work areas because concentrations great enough for a fire cannot be tolerated by humans.

How to Control Formaldehyde Hazards

Effective control to prevent harmful exposure to formaldehyde requires an awareness of potential illness and setting-up and using effective protective measures. The latter can include comprehensive engineering, processing, environmental, medical, and hygienic practices and controls.

Effective protection in work areas where employees spend a normal work period should include control of the use of formaldehyde including the enclosure of processes where practical, and adequate general and local exhaust ventilation to keep concentrations within acceptable levels. The area should be evacuated if the work area concentration reaches a level that causes severe personal discomfort.

Workers handling formaldehyde in any form

should wear safety goggles, gloves, and protective clothing. Any skin area that comes in contact with formaldehyde should be washed immediately with a mild soap and thoroughly rinsed with lots of running water. If formaldehyde enters the eyes, they must be thoroughly washed with lots of water immediately and then examined by a physician.

Fullface respirators or canister type gas masks can provide emergency protection for short exposure periods to high concentrations of formaldehyde gas.

Any person distressed following formaldehyde exposure should be removed from the area immediately. Pure oxygen may be administered to anyone overcome by gas inhalation. Burning and weeping of the eyes usually stops after a few minutes in fresh air, but discomfort in the nose, throat, and chest may take several hours to disappear. Dermatitis conditions usually respond well to medication prescribed by a physician.

If formaldehyde is swallowed, a physician should be contacted immediately.

To minimize fire and explosion hazards, all formaldehyde storage areas must be well ventilated to prevent the accumulation of dangerous concentrations.

What Effects Should Be Reported

Employees exposed to formaldehyde gas in their work area should report to the plant nurse or physician such symptoms as itching eyes, dry or sore throat, disturbed sleep, or unusual thirst upon awakening. Employees handling liquid or solid forms of formaldehyde should report any unusual skin reaction, no matter how minor.

Management's Responsibilities

Management and medical personnel must make every effort to assure that no employee

with a history of asthma or other allergic sensitivity or a history of skin disorders is assigned to a work area where he or she will be exposed to formaldehyde. Protective goggles, gloves, clothing, and safety facilities, such as emergency showers and eye wash fountains, must be provided where appropriate. Each supervisor should keep employees informed of the hazards of working with formaldehyde and should enforce the safety and protective measures developed for his or her area of responsibility.

Employee's Responsibilities

Each employee should be aware of the hazards associated with exposure to formaldehyde. In addition to observing good housekeeping practices and safety rules issued, each worker must:

1. Report to the plant nurse or physician any symptoms or reactions that might be related to formaldehyde exposure.
2. Use protective clothing and equipment provided.
3. Immediately flush any skin area that comes in contact with formaldehyde in any form.
4. Observe good personal health and hygiene practices.

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