

## EXPOSURE TO FORMALDEHYDE IN THE WORKPLACE

# EMBALMING



### FORMALDEHYDE

- Under normal temperature and pressure conditions, formaldehyde (chemical formula: **HCHO**) is a **colourless gas with an acrid odour** detectable at a concentration below 1 ppm (part per million in air).
- Commercial formaldehyde is mainly in an aqueous solution called “**formol**” and is easily released in gaseous form.
- There are many uses for formaldehyde and its compounds in the workplace. In embalming laboratories, formol is used as a preservative, disinfectant and dehydrating agent.

### EXPOSURE TO FORMALDEHYDE HEALTH RISKS AND EFFECTS

- In the workplace, formaldehyde exposure occurs in various ways. In its gaseous form, it is absorbed by the respiratory tract; when in aqueous solution, it is absorbed through skin contact. Wearing personal protective equipment reduces the risk of exposure and **health effects**.
  - **The current permissible exposure value in air is 2 ppm, ceiling** –meaning a value never to be exceeded during any length of time whatsoever. Formaldehyde is a substance to which exposure must be reduced to a minimum and whose recirculation is prohibited.
  - **In the case of direct skin contact, formaldehyde can cause skin lesions** such as irritation, irritant and allergic dermatitis. The symptoms are itching, tingling and redness. Skin sensitization is likely to occur after contact with aqueous solutions of formaldehyde or even with solids or resins containing free formaldehyde. When a person is sensitized, skin allergy symptoms may occur at every contact with solutions of increasingly low concentration.
  - **Following exposure to contaminated air, the first effect is irritation of the eyes and respiratory tract.** The related symptoms are tingling, redness or burning of the nose and throat, nasal discharge and watery eyes. These symptoms are generally negligible to slight for exposures in the order of 0.75 to 1 ppm.
- They can become bothersome and even intolerable at higher concentrations mainly when they exceed 2 to 3 ppm. The appearance of effects is not related to the duration of exposure. These effects appear soon after the exposure and do not worsen with time. There does not seem to be a cumulative effect from exposure. The effects are reversible and stop shortly after the exposure stops.
- **In the case of occupational exposure over several years, formaldehyde has been related to causing cancer of the nasopharynx.** The International Agency for Research on Cancer has furthermore classified it as a human carcinogen since June 2004. In Quebec, considering the concentrations present in the workplace and the number of exposed workers, the number of cases of cancer of the nasopharynx related to this exposure remains very low. According to prudent estimates, less than one Quebec worker per year would develop cancer attributable to formaldehyde following daily exposure for 40 years.
  - **Formaldehyde is measured using IRSST methods.** To evaluate a time-weighted average exposure value, formaldehyde is sampled using a tube or a passive dosimeter; analysis is done in the laboratory by chromatography. The ceiling value is measured by direct-reading instruments, but the presence of some other products can affect the results of these analyzers.

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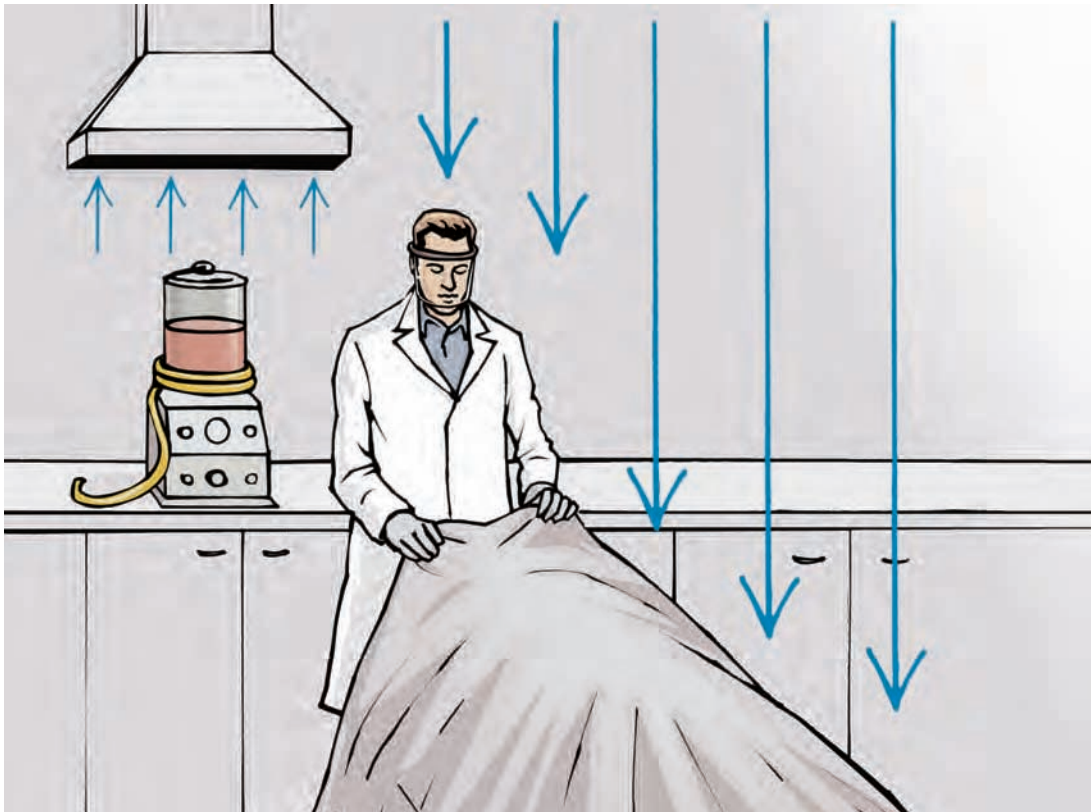
## EMISSION SOURCES AND HAZARDOUS TASKS

- The sources of formaldehyde emissions are the body to be treated and the device by which the formaldehyde solution is injected. In other words, the hazardous tasks are the preparation of the solution and the embalming process.

EMISSION SOURCES	MAXIMUM CONCENTRATIONS MEASURED IN 13 EMBALMERS (PPM)
<b>Body:</b> embalming	< 0.3 to > 2.0
<b>Injection device:</b> solution preparation during use	< 0.3 to > 2.0

## FACTORS AFFECTING HCHO EMISSION ARE:

- the formaldehyde solution used: concentration and quantity
- the embalming step, its duration and the complexity of the case
- the body's physical characteristics: condition, size, medical history, time since death
- the work load: the number of workstations and bodies treated simultaneously
- the type and efficiency of the ventilation





## MEANS OF IMPROVEMENT

- The most effective way to control workers' exposure to a chemical contaminant is by **replacing the product with a less hazardous one**. In embalming, different substitution products are mentioned in the literature but none is the subject of consensus. The possibility of **reducing the concentration of the formaldehyde solutions** should be studied.
- Different changes could be made to **workstation layout** and **work organization**. Examples include positioning the body to reduce the path of the fluids as much as possible, confining difficult cases, and physically separating the preservation tasks (injection of solutions) from the restoration tasks (esthetic care and dressing).
- **The work procedures** must minimize formaldehyde emissions: closing of jars not being used, proper storage of products, immediate disposal of impregnated cloths, periodic checking of equipment.
- **Installation of a fume hood** above the injection device would minimize formaldehyde diffusion in the work environment.
- The concept of vertical displacement **ventilation above the embalming table**, as illustrated, would keep the formaldehyde concentration below the ceiling value of 2 ppm in the embalmer's breathing zone. Using a ventilated table combined with general ventilation is also an option.
- For tasks that involve a high concentration of formaldehyde, **prevention procedures** such as wearing personal protective equipment must be well defined and followed.

## OTHER CONSIDERATIONS

- Procedures in the event of **spills, leaks or breakage** must be available and known by the workers.
- Procedures must also take into account **environmental protection** requirements. Under the Quebec Regulation regarding hazardous materials, it is prohibited to release waste formaldehyde solutions into sewer systems without previously obtaining a permit.

**EMPLOYEE INFORMATION AND TRAINING ON THE RISKS ASSOCIATED WITH FORMALDEHYDE, THE EMISSION SOURCES AND MOST POLLUTING TASKS, THE MEANS OF CONTROL (INCLUDING WORK TECHNIQUES AND METHODS), AND ON PERSONAL PROTECTIVE EQUIPMENT, ARE KEY ASPECTS IN CONTROLLING EXPOSURE.**

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## PERSONAL PROTECTIVE EQUIPMENT

As stipulated in the Quebec Act regarding occupational health and safety, the goal is to eliminate dangers at the source. When required, protective equipment must be selected according to needs:

- The type of respirator that will best **protect the respiratory tract** depends on the level of protection needed. A respirator's level of protection indicates its effectiveness. It represents the theoretical relationship between the concentration in the work environment and the concentration inside the respiratory protective equipment. A factor of 10 therefore means that the concentration inside the mask is 10 times lower than that in the work environment.
- In the case of formaldehyde concentrations below 20 ppm and up to the permissible value, **wearing a filter cartridge mask is recommended**. Depending on the required protection factor, a full mask with face shield (protection factor of 100) or a half-mask (protection factor of 10) is to be used. In the case of a half-mask, safety goggles must also be worn.
- In the case of concentrations above 20 ppm that cause an immediate danger to life or health (IDLH), wearing a self-contained breathing apparatus or air-supply respirator is mandatory.

**NOTE :** Neither a surgical mask, a class FFP 2 anti-odour mask or a N-95 particle mask is designed to protect against formaldehyde.

- For **hand protection**, nitrile, neoprene or butyl gloves offer a good resistance to formaldehyde.
- **To protect the body**, the Regulation concerning the application of the Public Health Protection Act specifies in section 54 that "In the performance of their work, the embalmer and his staff must wear a waterproof smock, headgear and rubber gloves; these articles of clothing must be washed after each operation." A disposable coverall or a disposable plastic apron may be used.

## FOR MORE INFORMATION

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