



# Glutaraldehyde and Respiratory Symptoms: A Clinical and Industrial Hygiene Investigation

## Summary

An independent study<sup>1,2</sup> was conducted by Professor C.A.C. Pickering and Dr. A. Vyas at the Occupational Respiratory Unit of Wythenshawe Hospital, Manchester, U.K., to investigate the relationship of respiratory and other symptoms in endoscopy nurses exposed to glutaraldehyde-based instrument sterilants. The findings indicate that in the current population studied, there were neither clinical nor investigational indications of the presence of asthma, and there was no evidence that glutaraldehyde is a respiratory sensitizer. The only statistically significant association between the presence of symptoms and glutaraldehyde exposure was for nasal effects during peak exposure.

## Background

It has been known for many years that overexposure to glutaraldehyde vapor generated at ambient temperature can lead to symptoms of irritation. These sensory irritant symptoms<sup>3</sup> can include ocular, nasal, and respiratory tract effects. Anecdotal information and some recent studies have attempted to link glutaraldehyde vapor exposure with respiratory sensitization and occupational asthma. These literature reports, however, have not provided enough information to allow a quantitative assessment of the prevalence and nature of the signs and symptoms associated with glutaraldehyde vapor over-exposure, and investigations have been incomplete.

The current study was undertaken to determine the nature of health-related effects and any exposure-response relationships between glutaraldehyde vapor and work-related symptoms. The study included 340 currently employed nurses and 18 former employees who left work in the previous 5 years because of health-related problems.

## Results

- Of 340 nurses, 232 (approx. 2/3) reported symptoms; most were related to eye, nose, and lower respiratory tract. The prevalence of work-related symptoms was lower than that for non-work-related symptoms (Table 1).



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**Table 1:** Relative Incidence of Symptoms in Nurses Working with Glutaraldehyde-Based Instrument Sterilants

Symptom	Relative Incidence	
	Work-Related	Non-Work-Related
Ocular	13.2%	15.5%
Nasal	20.0%	23.5%
Lower Respiratory	9.0%	34.5%

- Personal air sampling measurements found a peak mean glutaraldehyde concentration of 0.009 ppmv (range 0-0.27 ppmv) and a mean background concentration of 0.003 ppmv (range 0-0.075 ppmv). Only nasal symptoms were statistically associated with peak (not background) exposure.
- Peak-flow diaries indicated the absence of asthma.
- Lung function tests showed a slightly lower FEV<sub>1</sub><sup>4</sup> for those workers with lower respiratory symptoms. This difference was not statistically significant and not considered as being of physiological significance.
- One nurse was positive for glutaraldehyde specific IgE, while 13 current employees and one former employee were positive for latex IgE. Twenty nurses showed positive skin prick tests for latex.
- Of 18 previous employees, 12 left because of lower respiratory symptoms. Of the 10 who still had symptoms, 9 no longer used glutaraldehyde.

## Conclusions

This study represents one of the few independent studies to determine the prevalence and type of exposure-related symptoms in users of glutaraldehyde-based instrument sterilants and is the most extensive. As expected, based on the known irritant effects of glutaraldehyde, some nurses experienced ocular, nasal, or lower respiratory symptoms. Of the 340 nurses involved in the study, 232 (approx. 2/3) exhibited some irritant symptoms. Only nasal symptoms, however, showed a statistically significant relationship to peak vapor levels. Significantly, in this large group of nurses, there was no evidence of asthma and no clinical or objective findings that glutaraldehyde is a respiratory sensitizer.

## Footnotes

- 1) Vyas, D., Pickering, C.A.C., *Survey of Hospital Endoscopy Nursing Staff with Particular Reference to Symptoms, Respiratory Function, Immunology and Occupational Exposures*, manuscript in preparation.
- 2) Study commissioned by Union Carbide Corporation, Danbury, Conn., U.S.A.
- 3) Materials having peripheral sensory irritant effects are capable of reversibly interacting with sensory nerve endings in exposed body surfaces, such as the skin or covering/lining membranes of the eye and respiratory tract. As a result, there is a feeling of discomfort where the site of contamination occurs, together with the development of certain reflex effects. For example, exposure of the eye to an airborne sensory irritant causes a stinging sensation in the eye accompanied by excess tearing and blinking. This is an entirely normal biological response to sensory irritant materials and gives warning of exposure to such materials together with some degree of protection, e.g. on the eye, both blinking and excess tearing will limit exposure. Furthermore, such effects are generally experienced at concentrations below those producing any inflammation or injury. For glutaraldehyde, a study with a volunteer panel has shown that the threshold for sensory irritation by vapor exposure is 0.3 ppmv for humans. Since this value is above all current exposure guidelines, the appearance of sensory irritant effects will indicate that there is overexposure to glutaraldehyde vapor. At 1.0 ppmv, there is marked sensory irritation to the eye, causing the overexposed individual to vacate the area, and thus producing a voluntary limitation of exposure.
- 4) FEV<sub>1</sub>. Forced expiratory volume in 1 second. The volume of air that can be forcibly expired (following a maximum inspiration) in the first second of the expiration. Can be used to detect obstruction of air flow.

