Occupational Safety and Health Information Series

THE SAFE OCCUPATIONAL USE OF GLUTARALDEHYDE IN THE HEALTH INDUSTRIES

OCCUPATIONAL SAFETY & HEALTH SERVICE

DEPARTMENT OF LABOUR
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Introduction

These guidelines have been prepared by the Health and Technical Services of the Occupational Safety and Health Service of the Department of Labour. The impetus for this publication has arisen because of the increasing concern expressed by people, predominantly in the health industries, working with glutaraldehyde.

The guideline is intended to give practical information and advice to participants in the place of work. It is a supporting publication to the new Health and Safety in Employment Bill currently before Parliament and the proposed Management of Substances Hazardous to Health (MOSHH) Regulations.

Both the Bill and the Regulations place a duty on the employer to control hazards in the workplace. Elimination is the favoured means of control or, if this proves impractical, then isolation. If the hazard is unable to be isolated, it may be minimised by various means such as ventilation or, as a last resort, by personal protection.

The employer has a duty of communication which requires all members of the workforce to be made aware of the hazards they face and the means adopted by management to control these hazards.

This guideline deals with glutaraldehyde as it is used in the X-ray photographic process, where it is one of several hazards, and in the sterilisation of medical and dental equipment, where it acts as a singular hazard. The advice given is general to the process in the first instance and specific in the second. It is intended to allow employers and their employees to control the risks posed by this chemical and these processes.

Members of the Employers' Federation, the Council of Trade Unions, Healthcare product suppliers, the Photographic Industries Association and the Area Health Boards have been involved in a working party preparing this document. It is hoped that this product of industry, workers' representatives and the Occupational Safety and Health Service will help to control this hazard to the health and well-being of New Zealanders at work.

Aim of this Guideline

This guidance document has been produced with two specific goals:

- To provide a general overview of the hazards posed by glutaraldehyde in its two most common uses in the health industry.
- To provide the people exposed to glutaraldehyde and their employers with the principles for control of this hazard.

It is not possible for a document such as this to provide specific solutions to problems. OSH believes that organisations looking for specific control solutions should either obtain them in-house through their occupational safety and health service or from private occupational safety and health providers, after consultation between the management and their staff.

The terms used in this publication, and the order of dealing with the problem, follow those used in the Health and Safety in Employment Bill currently before Parliament. Although this Bill has not yet been passed by Parliament, the method of controlling risks in the place of work is recommended by OSH as the logical approach to hazards such as glutaraldehyde.

Responsibility for a Safe Working Environment

The general provisions of the proposed Health and Safety in Employment Bill (1992) require that employers achieve excellence in the management of the health and safety within their places of work. For excellence to be achieved, both employers and employees must play their part.

The requirements of the proposed Management of Substances Hazardous to Health (MOSHH) Regulations (1992) apply more specific controls upon the use and storage of substances defined as "products hazardous to health". The Regulations must be applied to glutaraldehyde or any product containing glutaraldehyde which falls within this definition. Users of glutaraldehyde should obtain a copy of the MOSHH Regulations, and the *Guidance Notes for the Management of Substances Hazardous to Health Regulations (1992),* for a more detailed presentation of the legal requirements involved.

In brief, the MOSHH Regulations require an employer to carry out the following:

Identify: All products hazardous to health on site.

Assess: Make a written assessment of the risks that these products present to those in the place of work. (This assessment will vary according to the size of the organisation and the number of substances used and the risk posed by these substances. Nevertheless, the single practitioner using glutaraldehyde needs to briefly record that he or she has recognised the hazards posed as part of the "risk control" plan developed according to the principles below.)

Control: Use the best method to control the hazard to ensure that the exposure is reduced to the lowest practical level. Atmospheric or personal monitoring may be used to evaluate the efficiency of the control measures employed.

The best method of control is *elimination* of that substance (e.g. by substitution of another substance equally effective but less toxic)

followed, in order of preference, by *isolation, enclosure, mechanical ventilation,* and lastly *personal protective equipment*.

Communication: Ensure that the use of all products hazardous to health is accompanied by suitable training and information. All containers are required to be labelled, and a current material safety data sheet (MSDS) must be accessible to workers.

Surveillance: Ensure that, where necessary, all employees exposed to products hazardous to health are kept under regular health surveillance.

CONSULTATION BETWEEN EMPLOYERS AND EMPLOYEES

Employers must fulfil their obligation under the legislation to communicate with and involve their employees in the control of health and safety in the place of work. They must have a clear understanding of the actual (not theoretical) conditions that exist in the place of work, as well as an understanding of the specific concerns of their employees.

There are a variety of ways of ensuring this communication. In large organisations, health and safety committees may be practical. The *Code of Practice for Health and Safety Representatives and Health and Safety Committees* gives guidance as to this mechanism and is available from local OSH offices (listed in Appendix C). For small employers, communication can be on an individual basis or by integrating health and safety matters into systems currently used for more general matters (e.g. weekly practice meetings, quality circles or total quality programmes).

Physical Properties of Glutaraldehyde

Glutaraldehyde is commonly available commercially as 1%, 2%, 25% or 50% aqueous solutions. The 1% and 2% solutions are used as cold sterilising agents, especially for medical, surgical, veterinary and dental equipment. Glutaraldehyde has also found use as a tissue fixative; a biocide in air conditioning plants; a chemical intermediate; an ingredient in embalming fluid; a fabric softener and a tanning agent. In radiography, glutaraldehyde may be present in the radiographic bulk solutions at concentrations up to 45%. Concentrations in the X-ray developer itself do not exceed 0.5%.

Unbuffered solutions of glutaraldehyde are slightly acidic. On adjusting the pH to 7.5 to 8, the anti-microbial effects are greatly increased.

PROPERTIES OF GLUTARALDEHYDE

Synonym	1,5-Pentanedial
Formula	OCH(CH2)3HCO
Structure	O=C-(CH2)3-C=O | | H H
Appearance	Colourless crystals
Solubility	Completely miscible with water and ethanol Slightly soluble less polar organic solvents
Molecular Weight	101.1
Boiling Point	187-189 ^{0}C (with decomposition)
Vapour Pressure	0.0152 mm Hg (50% solution) 0.0012 mm Hg (02% solution)
Odour Threshold	0.04 ppm (Odour varies or may be absent depending on the particular commercial preparation)
WES[1]	0.2 ppm (Ceiling) (A ceiling limit must not be exceeded at any stage of the working period. In the case of glutaraldehyde it is well recognised that health effects can occur even when the ceiling limit has not been exceeded.)

Assessment of Hazards in the Workplace

This section outlines a method to assess the hazards that exist in the workplace. In essence the process is: first *identify* the chemicals present, then *assess* the risk posed. Identification of the different risk factors leads directly to appropriate *control* measures.

This section is written in a general form so that it can be applied to any assessment of hazardous chemical in the place of work. Specific annotations concerning glutaraldehyde are placed after the more general statements.

HAZARD IDENTIFICATION

Positive Identification of Chemicals and their Components

A positive identification of the chemicals used is an essential first step. The chemical names of all the components in the product should be obtained. Reference to the manufacturer's information alone will not always allow this positive identification. Reference texts, OSH, the Institute of Environmental Health and Forensic Sciences (part of the old DSIR) or the National Poisons Centre should be consulted if the information provided seems incomplete.

RISK ASSESSMENT

Routes of Contact

Ways in which the chemical can enter the body need to be appreciated. These will depend on how the person may make contact with the chemical (skin absorption, swallowing, breathing) and the properties of the chemical (does it dissolve in water, can it become airborne as a dust, vapour or aerosol).

The routes of exposure indicate which aspects of the control of the workplace (ventilation, protective clothing) need close scrutiny.

Glutaraldehyde may enter the body through the lungs or the skin and both routes of contact will need assessment. It is unlikely to be ingested accidentally.

Degree of Exposure

Airborne Levels: Measuring the amount of chemical in the breathing zone of the worker is often possible. Results from these tests are usually expressed in milligrams of substance per cubic meter of air or parts per million (ppm) (Refer to Appendix B) and may be compared with Workplace Exposure Standards. This is possible in the case of glutaraldehyde, which has a ceiling level of 0.2 ppm.

Workplace Exposure Standards are intended to be used as guidelines for assessing the adequacy of the measures taken to limit exposure to airborne substances in the place of work.

In cases of sensitisation, the risk is not proportional to the concentration and health problems can occur with extremely small exposures.

Ventilation Assessment: Where the route of exposure is through the lungs, ventilation is often used to reduce the concentration of the substance. Making air behave properly is technically very difficult, and the ventilation should be assessed by an experienced ventilation engineer. (Refer to the section on ventilation, which outlines the principles involved but does *not* give solutions to individual situations).

The design of the ventilation should be assessed to see if it is capable of performing to the required standard. Its actual performance should be measured.

Procedures

The risk posed by the hazard may be increased if procedures followed by operators are incorrect. Operators need training and education in the correct work procedures, how to mix bulk solutions, how to dispose of any spillages, how to use and maintain protective equipment, and how the chemical should be stored.

Personal Symptoms

Symptoms reported by staff may give an indication as to the route and extent of exposure. Symptoms are, by definition, subjective, and care will be needed in asking staff about them. It is important to consider what other chemicals are being used in the process as they may have a part to play in the symptomatology.

Control of Glutaraldehyde and other Chemicals in the Radiographic Processes

INTRODUCTION TO X-RAY PHOTOGRAPHIC PROCESSES

The processing of X-ray films involves four steps, which in automatic processors will be carried out in sequence without interruption. Development, to produce the image, is carried out in a caustic solution which swells the emulsion to allow solution access. It is the developer that contains the glutaraldehyde as a hardening agent for the gelatin emulsion. Hardening prevents physical damage to the emulsion later in the processing cycle. It also starts the shrinking down of the swollen emulsion, expelling solutions and assisting the later drying step.

Fixing, in an acidic solution, removes the unexposed emulsion crystals and completes the hardening process. The film is then washed to remove the processing solutions and ensure long-term storage viability for the radiographs. Finally, drying removes the excess water.

It is important to realise that other chemicals besides glutaraldehyde may be implicated in the health problems that have arisen in this industry. The following guidelines on ventilation should apply to any X-ray film processor, irrespective of whether the developer contains glutaraldehyde.

There are a large variety of processor sizes available, down to a desk-top processor, and they should always be installed according to the manufacturer's specifications and guidelines. It is essential that the

specifications for venting and exhaust be met.

It is strongly recommended that X-ray processors and associated mixing systems be isolated from the other work areas within a radiology department and that, in particular, they *not* be closely associated with the radiographic sorting and viewing areas.

If the processor is installed for "through the wall" film feed, then the darkroom (film feed side) must be at a positive pressure with respect to the processor (light side) room. This is to prevent fumes being drawn back through the film feed slot. An air extraction system *must not* be fitted to the darkroom side as that would defeat this requirement.

SAFE OPERATIONAL REQUIREMENTS FOR PROCESSORS

This section discusses ventilation solutions. General room ventilation must work in synergy with local exhaust ventilation for the most effective removal of atmospheric contaminants. Although this document is written for the health industries, the comments in this section apply to other industries where radiographic processors are used (e.g. industrial X-ray processes).

It is essential that all air conditioning and venting systems be designed and installed by air conditioning engineers to ensure that specifications are met.

Most automatic X-ray processors provide an exhaust (venting) system that serves two functions:

- To remove chemical and moisture vapours via a safe external vent.
- To help manage the heat load in the work area.

The key requirements of a satisfactory installation are as follows:

- The exhaust system must be independent of general building air conditioning and it must also be vented externally.
- It needs to provide fan extraction such that the processor manufacturer's specifications can be met.
- The fan extraction must operate continuously (i.e. 24 hours per day) when chemicals are present in the processor, irrespective of whether the processor is being used.
- For tabletop and non-vented processors, a fume hood/ extraction system should be provided. This must be operational whenever the processor contains chemicals.

To aid in the removal of any fumes that do escape the processor/ venting system, it is also recommended that a fume hood or extraction system be provided above the processor. This must be designed as part

of the total air extraction/conditioning system to ensure that the correct air flow profiles and rates are met and that fumes are not drawn over the worker's breathing zone.

If more than one processor unit is placed close together, a single extraction system may suffice. It may be necessary to provide independent extraction for each processor and expert advice will be required. A practical test of an adequate installation is the absence of odour and of symptoms among staff.

GENERAL ROOM AIR VENTILATION

Exhaust ventilation for the whole room should also be used. It serves to remove any harmful vapours that do escape into the room and also provides the correct temperature for both personnel comfort and equipment operation.

The total air movement in the room should be balanced to keep the room at a slight negative pressure. This will keep any vapour within the room. The room inlet and outlet should be situated so that the air can circulate through the room before being drawn out again. If the inlet and outlet are too close together, the air movement can just revolve through a small volume near the ceiling and provide inadequate ventilation. If there is doubt about the use of room ventilation, a smoke test is suggested to evaluate its effectiveness.

The motive power for the air conditioning system should be independent to the main plant air conditioning system. It may be possible to run fans in series so that the failure of one will not stop air flow totally.

In the absence of more specific requirements, it is suggested that at least 2.5 litres per second of fresh air per metre^2 of room size is desirable[2]. Therefore, the rate of air entry is dependent on room size and the total system's operation should be confirmed by appropriate engineers. As with the processor venting, correct room air conditioning copes with two requirements, both associated with personnel comfort/health. It serves to remove any (harmful) vapours that do escape into the room and also to provide the correct temperature for both personnel comfort and equipment operation.

MIXING OF SOLUTIONS

The same principles used for processors should also be applied to the chemical mixing and supply areas. In particular, it is recommended that an exhaust hood and extraction system be placed above each mixing device, whether it be automatic or manual. When pouring and mixing is occurring, adequate personal protective equipment must be worn. (Refer to the section on safe working practices.)

MAINTENANCE

To ensure that an installation continues to operate as originally designed and specified, the equipment manufacturer's recommendations for preventative maintenance should be adhered to. This should include periodic checks that the exhaust venting (and/or extraction) system is being correctly maintained and that the room air conditioning is similarly functional.

PROCESSOR DRAINAGE

As well as any local authority requirements that must be met for effluent discharge, the drainage system should be designed so that fumes from the effluent can not escape into the workplace. Again, engineering expertise should be utilised to ensure this.

Guidance notes[3] exist for radiographic film processing procedures. These have been used in the preparation of this document and are available from the author (see references).

Sterilisation, Cleaning and "High Level" Disinfection of Medical and Dental Equipment

Glutaraldehyde has a specific role in the sterilisation, cleaning and "high level" disinfection* of medical and dental equipment which is unsuitable for autoclaving. In this role it presents a singular hazard to those exposed to it. Currently, with the increasing use of endoscopic surgery and examinations, theatre staff in particular find themselves using glutaraldehyde in a manner that gives rise to health problems. As the use of such equipment becomes common practice in smaller health enterprises, these unsafe practices and the consequent health problems will only increase unless proper work practices are instituted.

ENDOSCOPES

Sterilising of endoscopes in glutaraldehyde should take place to minimise the spillage and leakage of liquid and liberation of vapour.

There are a number of methods and specific systems available for the cleaning, "high level" disinfection and sterilising of endoscopes. Whatever method is used, the aim should be to minimise the exposed

* Sterilisation kills all types of microbes, including spore forms, and requires the use of glutaraldehyde for from 3 to 10 hours, depending on the formulation used. "High level" disinfection" kills all vegetative bacteria, acid-fast mycobacteria, pathogenic fungi and viruses within a "practical period of time" (reported as 5 to 20 minutes).

liquid surface. The size of the liquid-air interface is one of the main controlling factors on the amount of vapour liberated.

If there is a risk of glutaraldehyde escaping in vapour form, there must be adequate local exhaust venting available, e.g. a fume cupboard. A fume cupboard should:

- Fully enclose the process. Given the size of the equipment requiring cleaning etc., the area of the fume cupboard must be sufficiently large to accommodate the process.
- Have adequate and properly designed effluent drainage.
- Have sufficient air flow away from the operator to the building's exterior to prevent fumes reaching the operator.

Problems can arise when the equipment is removed from the glutaraldehyde, washed and moved to the surgeon for use. Several possible solutions to these potential problems exist, and the best possible strategy for each problem should be decided by consultation with the affected parties.

Whether this equipment is used within a large organisation or in the smaller establishments, the basic rules of handling glutaraldehyde remain the same. These are:

- There should be a written commitment to a specific risk control plan.
- As few people as possible should be subject to exposure.
- Mixing and disposal areas should be separated from the work area where possible.
- There must be adequate ventilation (see previous section).
- The success or otherwise of the measures adopted should be audited.
- If the organisation lacks the resources itself, it may be necessary to seek advice from private occupational safety and health providers.

Safe Work Practices

SUBSTITUTION

Wherever feasible, glutaraldehyde should be replaced by a less toxic substance (or one that presents a lesser risk).

The use of alternatives for the sterilisation of sensitive instruments has been proposed. Glutaraldehyde-free development "high level" disinfection/sterilisation systems are being trialled in some countries and may be available in New Zealand in the future. However, it seems that for the next few years glutaraldehyde will remain the sterilising/disinfecting agent of choice.

The work practices and control procedures employed should be designed to minimise skin, eye and inhalation exposure. Glutaraldehyde is very soluble in water and does not have a high vapour pressure in working solutions — the saturation concentration over a 2% glutaraldehyde solution is approximately 2 ppm. Nevertheless, handling procedures that result in a high surface area of the solution being exposed to the air should be avoided. Release of glutaraldehyde from solutions is also increased at elevated temperatures. The following recommendations are made towards achieving good work practices:

PERSONAL PROTECTION

Limit skin contact with glutaraldehyde by avoiding unnecessary handling and wearing suitable personal protective equipment. Dispensing operations should be designed to control splashes and the formation of aerosols.

Suitable Gloves

Gloves manufactured from nitrile, neoprene rubber or butyl rubber provide adequate protection to the wearer. These are usually unsuitable for handling and maintaining the sterility of delicate equipment. Latex surgical gloves do not provide adequate protection against glutaraldehyde. However, in the situation where sterility and manual dexterity is required for glutaraldehyde-sterilised equipment, this document recommends the use of double-gloving with latex gloves, with the gloves being washed and discarded after one use in an appropriate container.

Aprons should be worn to protect against chemical splashes.

Respiratory Protective Equipment

It is apparently common practice in some hospital operating theatres to rely on the surgical mask or a charcoal impregnated disposable dust mask to control the risk of fume inhalation. These masks are totally inadequate as protection against glutaraldehyde.

To protect against glutaraldehyde fume inhalation, a half-face respirator with appropriate organic vapour cartridges would be the least degree of protection required, and individual face fit would need to be achieved. The employer would have to provide adequate training in the use and maintenance of such equipment and ensure the adequate provision of replacement parts.

This type of respiratory protection is impractical in the theatre situation and risk control measures would be better directed towards ventilatory control.

Eye Protection

When pouring quantities of glutaraldehyde, "splash" eye protection should be worn to prevent eye irritation. Contact lenses can trap glutaraldehyde behind them and cause intense irritation. Staff with contact lens should ensure that they are wearing adequate splash protection in these situations.

All surfaces splashed with glutaraldehyde solution should be cleaned with a wet cloth. Remove residual glutaraldehyde solution from gloves, containers and other objects by washing under gently running water. Strong flushing or washing of glutaraldehyde equipment increases the chances of an aerosol being formed and increases the risks of skin contact and inhalation. Gentle washing is strongly recommended.

Ensure that glutaraldehyde solution does not persist in sinks and other receptacles — wash away with ample water. A check should be made to ensure that "venting back" of glutaraldehyde cannot occur in the disposal system.

Seal or cover all containers holding glutaraldehyde solutions. Many of the receptacles provided for glutaraldehyde usage do not have a tight-fitting seal and allow the leakage of glutaraldehyde fumes. It is recommended that the employers and the suppliers address this problem.

If ventilated cabinets or other engineering controls are provided, ensure they are used correctly to minimise exposure.

Exhaust ventilation should be run continuously where the build-up of glutaraldehyde vapour is feasible.

The small medical and dental practice must ensure that glutaraldehyde is used in a well-ventilated area with work practices that will control the risk to their staff.

The duty of communication that the Health and Safety in Employment Bill places on the employer not only includes the requirement to inform their staff of the hazards they face but also requires *ongoing education* concerning the risks faced.

First Aid Measures

EMERGENCY FACILITIES

Emergency washing facilities such as a shower or hose attachment should be available close to the work area to wash contaminated skin or clothing. An eye fountain should also be available close to workers to dilute eye splashes in emergencies.

Skin Exposure

- Remove contaminated clothing, using appropriate gloves if available.
- Wash contaminated skin with copious amounts of water from a shower, hose or bucket — immediate dilution of the glutaraldehyde is the aim.

Inhalation

- Remove the victim from the contaminated area.
- Keep victim warm and quiet. If unconscious, if breathing is distressed, or if victim is cyanosed (blue in colour):
  - Ensure the airway is open — press the head backwards and lower jaw forwards so that the chin juts out.
  - Place the victim in the recovery position.
  - Support breathing by mouth to mouth resuscitation if necessary.
  - Seek medical attention urgently.

Swallowing

- If conscious, give plenty of water to drink. Do not cause vomiting.
- If unconscious, do not give anything by mouth. Remove false teeth, clean mouth of glutaraldehyde, mucus and vomit. Follow instructions for unconscious victims given above.
- Treat for shock and obtain medical attention urgently.

Eye Exposure

- If glutaraldehdye gets into the eye, wash immediately with clean running water, lifting both lids repeatedly while doing so and keeping the eye open. Continue this without break for at least 15 minutes.
- If the irritation still persists, seek medical attention without delay.
- If the affected person is wearing contact lenses, the eye should be flushed constantly until the person is able to remove the contact lens.

HEALTH EFFECTS OF GLUTARALDEHYDE

Effect	Mechanism	Comments
Dermatitis	Usually irritant but can have an allergic basis	Skin contact may be prevented by wearing appropriate gauntlets and impervious aprons. Correct work practices are essential.
Rhinitis and sore throats	Usually irritant	Adequate isolation of glutaraldehyde by effective ventilation is essential.
Eye irritation	Usually irritant	Adequate isolation of glutaraldehyde by effective ventilation is essential.
Occupational asthma	Both irritant and allergic	Those with symptoms attributable to the irritant effects of glutaraldehyde should be protected by adequate ventilation. Those who have developed an allergic reaction may have to contemplate avoiding any contact.
Other more general effects	Mechanisms unclear	A few people exposed to chemicals go on to suffer a number of generalised symptoms involving both the nervous system (memory loss, difficulty in concentrating etc.) and other symptoms such as fatigue, tiredness.

Health Effects and Suggested Surveillance

It is recognised that glutaraldehyde can cause health problems among exposed workers even when the degree of exposure is well below the recommended limits[4].

Studies suggest that glutaraldehyde usually has its effect through direct irritation rather than allergy, and that symptoms increase with the amount of exposure[5]. Listed above are the common recorded health problems associated with glutaraldehyde:

All people working regularly with glutaraldehyde should:

- Answer a comprehensive health questionnaire before they start working with glutaraldehyde.

- Be reminded of the hazards of glutaraldehyde on a regular basis by the employer.
- It is recommended they be examined by a doctor with interests in occupational health when symptoms occur. A model questionnaire is given in Appendix A.

Sensitisation can occur after any number of exposures to a substance. Only a few people out of the many exposed become sensitised, but having become sensitised these people can develop symptoms from exquisitely small exposures. Irritant symptoms or their severity from a hazardous substance do not predict sensitisation.

Although no direct evidence implicates glutaraldehyde in any complications of pregnancy, in common with many other chemicals exposure can be a source of considerable concern to women contemplating or just becoming pregnant. OSH's recommendation in all these cases is that the management treat this concern sympathetically, and after discussion with the woman concerned, seek to place her in a non-exposed occupation for the duration of the pregnancy.

References

1. Occupational Safety and Health Service, Department of Labour. *Workplace exposure standards and biological exposure indices for New Zealand*. GP Publications Ltd., Wellington, 1992.
2. NZS 4303:1990 *Ventilation for acceptable indoor air quality*. Standards Association of New Zealand.
3. Gordon M. *Guidance notes for the provision of a safe work environment and safe work practice for radiographers and darkroom technicians.* 1987 (Available from Ms Marjorie Gordon, Wi Tako St. Manakau RD31, Levin. Price: $5 incl. postage.)
4. Sherwood Burge. Occupational risks of glutaraldehyde. *British Medical Journal* (1989) 299 - 342.
5. Norback D. Skin and respiratory symptoms from exposure to alkaline glutaraldehyde in medical services. *Scandinavian Journal of Work and Environmental Health* 14 (1988) 366 - 371.

APPENDIX A Health Questionnaire

Name

Date of birth

Address

M F

Tel. No.

Employer's Name and Address

Tel. No.

Proposed job

Department:

Starting Date

Have you been trained in the risks associated with the use of glutaraldehyde?

Yes No

Question No:

1 Have you worked with glutaraldehyde before? Yes No

2 Did glutaraldehyde cause you any ill health effects? Yes No

3 Have you had any of the following health problems:

Hayfever Yes No

Asthma Yes No

Dermatitis or eczema Yes No

Drug allergies Yes No

Occupational dermatitis Yes No

4 Do you wear contact lenses? Yes ☐ No ☐

5 List the chemicals used in the process you are working in:

☐

6 While working with glutaraldehyde have you had a burning or tingling sensation in:

Eyes	Yes ☐	No ☐
Nose	Yes ☐	No ☐
Throat	Yes ☐	No ☐

7 While working with glutaraldehyde have you had trouble with your breathing such as:

WHEEZING OR WHISTLING in your chest at any time in the last 12 months? Yes ☐ No ☐

If you have noticed wheezing, have you been at all breathless when wheezing? Yes ☐ No ☐

Have you had any wheezing or whistling identified above when you DID NOT have a cold? Yes ☐ No ☐

Do you have a persistent COUGH ? Yes ☐ No ☐

If you have a persistent cough, do you cough up phlegm on most days? Yes ☐ No ☐

Do you have SHORTNESS OF BREATH? Yes ☐ No ☐

If you have shortness of breath, which statement below best describes your shortness of breath?

I get short of breath walking on the flat Yes ☐ No ☐

I get short of breath walking up a slight incline Yes ☐ No ☐

I get more shortness of breath than other people my age Yes ☐ No ☐.

Have you been WOKEN by an attack of shortness of breath at any time in the last twelve months? Yes ☐ No ☐

8 Have you noticed any problems with skin irritation such as:

- White crinkling of the skin? Yes ☐ No ☐
- Dry flaking and itching of the skin? Yes ☐ No ☐
- Red inflamed itching of the skin? Yes ☐ No ☐

9 Have you noticed any problems with your nasal airways such as:

- Persistently blocked or sore nose? Yes ☐ No ☐
- Persistent sneezing? Yes ☐ No ☐
- Persistent post-nasal discharge? Yes ☐ No ☐

10 Have you noticed any problems with your throat such as:

- Persistent sore throat? Yes ☐ No ☐
- Persistently hoarse voice? Yes ☐ No ☐
- The need to keep clearing your throat? Yes ☐ No ☐

11 Have you suffered from headaches much more than you should recently? Yes ☐ No ☐

12 Do you notice any variation with your symptoms when away from work?
Describe:

13 Do you notice any other effects not covered above?
Describe:

APPENDIX B Methods for Sampling and Analysis of Glutaraldehyde

The method used for the determination of glutaraldehyde in air should be capable of estimating personal short-term exposure at or below the ceiling level of 0.2 ppm*.

Ideally, samples should be taken with a system that measures peak levels of glutaraldehyde, sampling air from the breathing zone of the worker. Of the methods that provide adequate sensitivity and freedom from interference, those involving reaction with 2,4-Dinitrophenyl hydrazine are currently favoured. Glutaraldehyde may be collected directly as the hydrozone derivative on treated filters or tubes[2], or reacted subsequent to being trapped in water using a midget impinger[3]. The hydrozone is taken up in an organic solvent and quantified by high-pressure liquid chromatography with UV detection.

Lion Laboratories (UK) manufacture a direct reading hand-held meter referred to as a Glutaraldemeter. The detection range for the instrument, which employs an electrochemical cell as a sensor, is 0.05 to 5 ppm. The New Zealand agents are Watson Victor Ltd.

* The Workplace Exposure Standard[1] represents the highest airborne level of the contaminant that a worker should be exposed to. For glutaraldehyde, a ceiling value is given, indicating that the level of 0.2 ppm should not be exceeded at any time during the working day.

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1. Occupational Safety and Health Service, Department of Labour. *Workplace exposure standards and biological exposure indices for New Zealand*. GP Publications Ltd., Wellington, 1992.
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