

# MANAGING HEALTH AND SAFETY RISKS IN NEW ZEALAND MORTUARIES

Guidelines to promote  
safe working conditions

Published by the Occupational Safety and Health Service  
of the Department of Labour  
Wellington  
New Zealand

November 2000

Guidelines towards compliance with the Health and Safety in Employment Act 1992, developed by the  
New Zealand Committee of the Royal Australasian College of Pathologists with the assistance of OSH.

ISBN 0-477-03633-3

### **Acknowledgement**

This document was written by Dr Chris Walls and Dr Jeff Brownless (OSH Departmental Medical Practitioners) with advice and input from Dr Alison Cluroe (Forensic Pathologist, Auckland Healthcare) and a Committee of Pathologists from the RACPA.

## **Foreword**

---

Autopsies, tissue harvesting and the environment that they occur in, are a specialised part of New Zealand's medical and forensic services. It is clear historically that pathologists and mortuary attendants are at an increased health risk from this aspect of their occupation.

The New Zealand Committee of the Royal Australasian College of Pathologists, with assistance from OSH, has developed these guidelines to address the risks posed by autopsies to people working in this environment.

The principles developed in this document apply to all autopsies. We are confident that the guidelines will increase the awareness of safety among all those employed in the industry.

We would like to thank all professionals who have contributed to this document.

Dr A B M Tie  
*President*  
*New Zealand Council, RACPA*

R J M Hill  
*General Manager*  
*Occupational Safety and Health Service*

# Contents

Executive summary	6
Introduction	7
Scope of these guidelines	8
<hr/>	
A summary of the Health and Safety in Employment Act 1992 and Regulations (1995)	
<hr/>	
<i>Regulations</i>	9
<i>Guidelines</i>	9
<i>Employers' duties</i>	9
<i>Hazard management</i>	10
<i>Information for employees</i>	11
<i>Employers to involve employees in the development of health and safety procedures</i>	11
<i>Training of employees</i>	11
<i>Safety of people who are not employees</i>	12
<i>Employees' and self-employed persons' duties</i>	12
<i>Accidents and serious harm (recording and notification)</i>	12
<hr/>	
Philosophy of these guidelines	
<hr/>	
<i>Identifying hazards</i>	13
<i>Risk assessment — the division between “standard” and “high-risk” cases</i>	14
<hr/>	
Hazard control	
<hr/>	
<i>Preparation of a written plan</i>	17
<i>Planning priorities for control</i>	17
1. <i>Elimination of risk</i>	18
2. <i>Isolation</i>	18
3. <i>Minimisation</i>	19
<i>Engineering controls</i>	19
<i>Work practices</i>	23
<i>Personal protective equipment (PPE)</i>	24
<i>Education, training and supervision</i>	25
<i>Monitoring</i>	26

<b>Other relevant legislation</b>	
<i>Environmental discharges</i>	28
<b>Appendix 1: Autopsy risk assessment</b>	29
<b>Appendix 2: Facilities and work practices for high-risk procedures</b>	
<i>Transportation of the body</i>	30
<i>Reception and storage of the body</i>	30
<b>Appendix 3: Procedures for undertaking a post-mortem examination on a high-risk case</b>	
<b>Appendix 4: Handling of tissues retained from a suspected high-risk autopsy (tuberculosis, HIV and hepatitis)</b>	
<i>Histology</i>	35
<b>Appendix 5: Procedures for post-mortem examination of known or suspected CJD/spongiform encephalopathy</b>	
<i>Consideration for tissue handling in laboratories: specific for CJD/spongiform encephalopathies</i>	36
<b>Appendix 6: Work practices for both standard and high-risk autopsy cases</b>	
<i>RACS Recommendations (Document appendix 4, 33 - 46)</i>	38
<b>Appendix 7: Materials copied directly from the Creutzfeldt-Jacob Disease Surveillance Unit, Edinburgh</b>	
<i>Chemicals used for deactivating CJD</i>	47
<i>Protocols for laboratory management for human spongiform encephalopathies</i>	48
<i>References and guidelines</i>	54

## **Executive summary**

- Elimination of all the risks to the health and safety of staff performing autopsies is the ideal, but not possible.
- All cases coming to autopsy shall undergo risk assessment so as to identify, where possible, those cases fitting a high-risk category.
- Control of the risks encountered at autopsy is a mixture of environmental controls, workplace practices and the use of appropriate personal protection.
- Risk assessment does not invalidate nor render unnecessary the practice of universal precautions.
- These guidelines recommend that, where recognised before commencement, the autopsy of high-risk cases shall be confined to specifically designed mortuaries.

### ***Minimum standards recommended for standard autopsies***

**Standard autopsies** should occur in institutions that have the following minimum standards of engineering controls and work practice procedures in place:

1. Ventilation of the autopsy suite that achieves at least 6 room air changes per hour (vented to the exterior) with the air flow moving away from the operators' breathing zone.
2. Local exhaust ventilation is provided over bone cutting saws or bandsaws used for sectioning of tissue.
3. *All personnel who are in contact with the body or any specimens* must use personal protective equipment (PPE) of an adequate standard. These should include:
  - Impervious aprons and footwear;
  - Surgical gloves of latex or a similar synthetic material;
  - Eye splash protection; and
  - Respiratory protection.
4. Procedures are in place to deal with autopsy "surprises" that may cause the case to be re-evaluated in mid-procedure, and reclassified in the high-risk category.
5. Clean-up and decontamination procedures are adhered to.
6. Regular monitoring of the effectiveness of staff and environmental control measures is conducted, and recorded.

***Minimum standards required for high-risk autopsies***

**High-risk autopsies** shall only be carried out in institutions with appropriate environmental controls and impeccable work practices. In addition to standard measures, the facility should have:

1. Ventilation of the autopsy suite that achieves at least 12 room air changes per hour. The autopsy suite should be a negative pressure area with respect to the surrounding environment.
2. Ventilation that is vented directly to the exterior (at a suitable height, and clear of other buildings) or recirculated within the building only after adequate HEPA filtration.
3. Ventilation should be directed away from the operators' breathing zone, usually achieved by downdraught ventilation systems (ceiling entry, floor exit directional flow).
4. Movement in and out of the high-risk autopsy area should be controlled and restricted to the bare minimum of personnel. Such movement shall occur via a decontamination area where clothing worn during the autopsy can be removed and isolated for disposal.
5. Observers of high-risk autopsies should be confined to a viewing area which is physically separate and with a separate source of ventilation from the high-risk suite.
6. Personal protection of an adequate standard must be used by *all personnel present in the high-risk suite*, irrespective of their duties.
7. Clean-up and decontamination procedures must be adhered to.
8. Monitoring of staff and of environmental control measures is essential.

## **Introduction**

---

This document has been published in response to the concerns of pathologists and mortuary staff about their health and safety at work. Many mortuaries were designed and built to earlier standards that are no longer adequate. Work practices and adherence to “best practice” for health and safety has, at best, been patchy.

Mortuaries now need to have standards that are stringent enough to cope with the advent of the new or re-emerging infections which pathologists are increasingly confronted with. Of particular concern is the development of the antibiotic-resistant strains of tuberculosis, and the recognition of the major transmissible viral illnesses.

In addition, 20 years ago there was minimal harvesting of tissue for research, teaching and transplantation purposes. The amount of tissue retrieved from cadavers for all of these purposes has increased, providing further reason for the separation of high-risk from standard cases, from which tissue is harvested on a daily basis.

Standards are being set in international publications for dealing with high-risk cases. There is consensus among the Royal Australasian College of Pathologists, the Ministry of Health, and the Occupational Safety and Health Service of the Department of Labour (OSH) that the development of these guidelines, based on international standards and recommendations, will provide a benchmark for institutions throughout New Zealand.

This document does not discuss in detail the environmental aspects of disposal of fluid/tissue wastes from standard and high-risk autopsies. Some ideas about disposal are discussed.

### **Scope of these guidelines**

Compliance with these guidelines is voluntary. Although the document sets out a means of achieving minimum standards of facilities and work practices in New Zealand mortuaries, employers are not obliged to follow the procedures and recommendations contained within. However, where they vary from the guidelines, they must achieve the same standard of health and safety established by the recommended procedures and practices.

Because the guidelines have been compiled with the advice and input of the New Zealand Committee of the Royal Australasian College of Pathologists, deviance from the guidelines is as much a matter of professional standard setting and quality control as an OSH compliance issue.



## **A Summary of the Health and Safety in Employment Act 1992 and Regulations (1995)**

The principal object of the Health and Safety in Employment Act is to prevent harm to employees at work. To do this, it imposes duties on employers, employees, principals and others, and promotes excellence in health and safety management by employers. It also provides for the issuing of regulations, codes of practice approved by the Minister of Labour, and industry guidelines.

### **Regulations**

Regulations are promulgated from time to time under the Act. Regulations may impose duties on employers, employees, designers, manufacturers and others relating to health and safety. These regulations may apply with respect to places of work, plant, processes or substances and may have been made to deal with particular problems that may have arisen.

### **Approved codes of practice**

“Approved codes of practice” are provided for in section 20 of the Act. They are statements of preferred work practice or arrangements, approved by the Minister of Labour, and may include procedures that could be taken into account when deciding on the practicable steps to be taken to ensure health and safety in a place of work. Compliance with approved codes of practice is not mandatory. However, a code may be used in court as evidence of good practice .

### **Guidelines**

Guidelines are statements of preferred work practice formulated after discussion with employers, employees and OSH. They have not undergone the process of consultation and endorsement necessary for the Minister of Labour to “approve” them. Guidelines may include procedures that could be taken into account when deciding on the practicable steps to be undertaken. Compliance with guidelines is not mandatory. However they also may be used in court as evidence of good practice.

### **Employers’ duties**

Employers have the most duties to perform to ensure the health and safety of employees at work.

Employers have general duties to take all practicable steps to ensure the safety of employees. In particular, they are required to take all practicable steps to:

- Provide and maintain a safe working environment;
- Provide and maintain facilities for the safety and health of employees at work;

- Ensure that machinery and equipment is safe for employees;
- Ensure that working arrangements are not hazardous to employees; and
- Provide procedures to deal with emergencies that may arise while employees are at work.

Taking “all practicable steps” means doing what is reasonably able to achieve the result in the circumstances, taking into account:

- The severity of any injury or harm to health that may occur;
- The degree of risk or probability of that injury or harm occurring;
- How much is known about the hazard and the ways of eliminating, reducing or controlling it (i.e. the current state of knowledge); and
- The availability, effectiveness, and cost of the possible safeguards.

Where there are different parties owning a building and providing professional services from that building, the design, maintenance and upgrading of facilities is a contractual matter between these parties.

### **Hazard management**

Employers must have an effective method to systematically identify and regularly review hazards in the place of work (existing, new and potential). They must determine whether the identified hazards are significant hazards and require further action.

If an accident or harm occurs that requires particulars to be recorded, employers are required to investigate it to determine whether it was caused by, or arose from, a significant hazard.

“Significant hazard” means an hazard that is an actual or potential source of:

- Serious harm; or
- Harm (being more than trivial) where the severity of effects on a person depends (entirely or among other things) on the extent or frequency of the person’s exposure to the hazard; or
- Harm that does not usually occur, or usually is not easily detectable, until a significant time after exposure to the hazard.

Where the hazard is significant, the HSE Act sets out the steps that employers must take:

- Where practicable, the hazard must be eliminated;
- If elimination is not practicable, the hazard must be isolated; and
- If it is impracticable to eliminate or isolate the hazard, the employer must minimise the likelihood that employees will be harmed by the hazard.

Where the hazard has not been eliminated or isolated, employers must:

- Ensure that protective equipment is provided, accessible and used;
- Monitor employees' exposure to the hazard; and
- Seek the consent of employees to monitor their health and, with their informed consent, monitor employees' health.

### **Information for employees**

Before employees begin work, they must be informed by their employer of:

- Hazards employees may be exposed to while at work;
- Hazards employees may create which could harm people;
- How to minimise the likelihood of these hazards becoming a source of harm to themselves and others;
- The location of safety equipment; and
- Emergency procedures.

Employees shall be provided with the results of any health and safety monitoring. In doing so, the privacy of individual employees must be protected.

### **Employers to involve employees in the development of health and safety procedures**

Employers need to ensure that all employees have the opportunity to be fully involved in the development of procedures for the purpose of identifying and controlling significant hazards, or dealing with or reacting to emergencies and imminent dangers.

### **Training of employees**

Employers must ensure employees are either sufficiently experienced to do their work safely or are supervised by an experienced person. In addition, employees must be adequately trained in the safe use of all plant, objects, substances and protective clothing and protective equipment that the employee may be required to use or handle.

### **Safety of people who are not employees**

Employers also have duties towards people who are not employees (e.g. visitors to a mortuary). Employers must take all practicable steps to ensure that employees do not harm any other person while at work, including members of the public or visitors to the place of work. Employers must also take all practicable steps to ensure that hazards arising in the place of work do not harm any other person in the vicinity.

### **Employees and self-employed persons' duties**

Employees and self-employed persons have a responsibility for their own health and safety while at work. They must also ensure that their own actions do not harm anyone else.

However, these responsibilities do not detract from the employer's responsibilities.

### **Accidents and serious harm (recording and notification)**

The Act requires employers to keep a register of work-related accidents and serious harm. This includes every accident that harmed (or might have harmed):

- Any employee at work; and
- Any person in a place of work under the employer's control.

Employers are also required to investigate all accidents and near misses to determine whether they were caused by or arose from a significant hazard.

Employers are required to notify all accidents and occurrences involving serious harm to employees while at work to the Secretary of Labour (in practice the nearest OSH office), as soon as possible after the occurrence. In addition, within 7 days the circumstances of the accident must be reported in the form prescribed. (Pre-printed registers and suitable forms for notification are available from OSH offices and selected stationers.)

## **Philosophy of these guidelines**

---

This document approaches the health and safety issues surrounding pathology from a different perspective than is common in medicine, as the proposed control measures rely on the application of risk control principles incorporated in the Health and Safety in Employment (HSE) Act.

Traditionally, risk assessment in medicine has been concerned with improving the well-being of patients. The history of medicine reflects that necessary bias, but records the demise of many prominent physicians in the pre-antibiotic era from infections contracted at autopsy.

Risk control, as practised in industry at large, requires:

- Hazard identification (the potential for harm);
- Risk assessment (the probability of harm);
- Risk control by means of eliminating the risk, isolating the risk to special situations, or minimising the risk to those exposed;
- Monitoring the chosen measures to ensure the risk is controlled; and
- Adapting the control plans as necessary.

### **Identifying hazards**

The HSE Act requires employers to have a systematic method of identifying hazards in the workplace in an ongoing manner. The methods used must identify all hazards, including new ones, before they pose a risk of harm. Some general methods to identify hazards are outlined in OSH publications, they include:

- Carrying out physical inspections;
- Analysing accident records;
- Observing and analysing tasks and processes;
- Talking with employees;
- Analysing tasks with particular methods;
- Using consultants; and
- Consulting texts or safety journals.

Hazards can be classified according to their nature, and these classifications are used to make sure hazards are not overlooked.

Performing an autopsy means that the pathologist, the mortuary technician and any observers are exposed to a number of potential hazards, which may include:

**1. Infection:**

- a) Aerosols from bone saws and sectioning of tissues, especially lungs e.g. tuberculosis<sup>1</sup>, including multi-drug-resistant (MDR) tuberculosis; or
- b) Direct transfer of blood or body fluids by needlesticks, bone puncture accidents or direct splashes, e.g. all forms of viral and sub-viral hepatitis, human immunodeficiency virus (HIV).

**2. Manual handling risks incurred while transporting bodies (ergonomics)**

**3. Chemical hazards:**

- a) From material ingested by the case; or
- b) From materials used in the autopsy process or subsequent processing of tissue or cleaning of the environment.

**4. Physical hazards:**

- a) Thermal stress in some situations.
- b) Noise and possibly radiation from autopsy procedures or investigations.

**5. Social hazards:**

- a) “Stress” and “burnout” from the constant dealing with emotionally fraught situations; or
- b) Unsociable hours (at times).

Accompanying these risks is the potential for the transmission of diseases for which the occupational risks are unclear (viral haemorrhagic fevers, Creutzfeldt-Jakob disease and other human transmissible spongiform encephalopathies) or those diseases that are not currently recognised by medical science.

As yet there is epidemiological uncertainty as to whether CJD and the other human transmissible spongiform encephalopathies place pathologists and mortuary technicians at increased occupational risk of acquiring these infections. OSH has recommended the adoption of the principle of “prudent avoidance” for this and the other diseases where statistical certainty is lacking.

**Risk assessment — The division between “standard” and “high-risk” cases**

The Advisory Committee on Dangerous Pathogens<sup>2</sup> has defined infectious hazards into groups as below:

**Hazard Group 1**

An organism that is most unlikely to cause human disease.

1. Lunn J, Mayo V Incidence of pulmonary tuberculosis by occupation of hospital employees in the National Health Service in England and Wales 1980 - 84 *J Soc Occup Med* 1989; 39: 30-2

2. *Safe working and the prevention of infection in the mortuary and post-mortem room* Health Services Advisory Committee, Safety in Health Service Laboratories HSE Library and Information Services UK 1991

### **Hazard Group 2**

An organism that may cause human disease and which might be a hazard to laboratory workers but is unlikely to spread to the community. Laboratory exposure rarely produces infection and effective prophylaxis or effective treatment is usually available.

### **Hazard Group 3**

An organism that may cause severe human disease and present a serious hazard to laboratory workers. It may present a risk of spread to the community but there is usually effective prophylaxis or treatment available.

### **Hazard Group 4**

An organism that may cause severe human disease and is a serious hazard to laboratory workers. It may present a high risk of spread to the community and there is usually no effective prophylaxis or treatment.

For the purposes of these guidelines, known or suspected cases fitting into Hazard groups 1, 2 and 3 are considered standard-risk autopsies. For example the risks associated with a case of infectious hepatitis B can be virtually eliminated by ensuring staff are immune to hepatitis B.

For the purposes of these guidelines, known or suspected cases fitting into Hazard group 4 are considered high-risk autopsies

***Risk assessment of each case on its entry into the mortuary complex is essential.***

To aid risk assessment some services test cases with an inadequate clinical history for HBV, HCV and HIV before commencing the autopsy<sup>3</sup>. This practice is usually carried out in communities where there is a significant community rate of these diseases.

Pathologists should have a brief risk-assessment procedure that identifies any of the cases outlined above. Such a procedure does not detract from nor invalidate the doctrine of standard precautions that applies in all procedures in medicine. A sample risk assessment is included in appendix 1 of these guidelines for evaluation and adaptation.

Risk assessment is never perfect but will go some way to identify the more obvious cases. The New Zealand Public Health Report<sup>4</sup> published recommendations for risk assessment according to diagnosed disease. Table 1, overleaf, is reproduced in a modified manner for consideration by each facility.

3 It is accepted that there is an increasing false positive rate as time from death increases. The pathologist should make a decision in each case as to whether this procedure is appropriate and timely.

4 New Zealand Public Health Report 2 (8) August 1995, 67-8

**Table 1: Recommendations for risk assessment according to diagnosed disease**

<i>Infection and degree of risk</i>	<i>Bagging required</i>	<i>Viewing safe</i>	<i>Embalming safe</i>	<i>Autopsy risk</i>
<b>Health Department's Low Risk Group for infectious spread to community</b>				
Chickenpox/shingles	no	yes	yes	STANDARD
Legionellosis	no	yes	yes	STANDARD
Leprosy	no	yes	yes	STANDARD
Measles	no	yes	yes	STANDARD
Meningitis (except meningococcal)	no	yes	yes	STANDARD
Methicillin-resistant <i>Staph aureus</i>	no	yes	yes	STANDARD
Mumps	no	yes	yes	STANDARD
Psittacosis	no	yes	yes	STANDARD
Rubella	no	yes	yes	STANDARD
Tetanus	no	yes	yes	STANDARD
Whooping cough	no	yes	yes	STANDARD
<b>Health Department's Medium Risk Group for infectious spread to community</b>				
Food poisoning	no	yes	yes	STANDARD
Hepatitis A	no	yes	yes	STANDARD
HIV/AIDS	advisable	yes	no	<b>HIGH RISK</b>
Diphtheria	advisable	yes	yes	STANDARD
Leptospirosis	no	yes	yes	STANDARD
Malaria	no	yes	yes	STANDARD
Meningococcal Disease	advisable	yes	yes	STANDARD
Cholera	no	yes	yes	STANDARD
Scarlet fever	advisable	yes	yes	STANDARD
Tuberculosis (known sensitivities)	advisable	yes	yes	STANDARD
Tuberculosis (multidrug resistant or unknown sensitivities)	advisable	yes	yes	<b>HIGH RISK</b>
Typhoid fever	advisable	yes	yes	STANDARD
<b>Health Department's High-risk Group for infectious spread to community</b>				
Hepatitis B (providing staff have HBV antibodies)	yes	yes	yes	STANDARD
Hepatitis C	yes	yes	no	<b>HIGH RISK</b>
Invasive Group A Streptococcal disease	yes	yes	no	<b>HIGH RISK</b>
Creutzfeldt-Jakob disease and other transmissible spongiform encephalopathies	yes	yes	no	<b>HIGH RISK</b>



## **Hazard control**

---

The HSE Act establishes a hierarchy of hazard control measures. Where elimination of the risk is not technically feasible because of the nature of the facilities or the hazards faced, exposure must be reduced by other mechanisms. Isolating the risk to suitably trained (appropriate work practices) and equipped personnel (personal protective equipment) in premises where the engineering controls minimise the risk to those exposed is the next logical method of control.

### **Preparation of a written plan**

The preparation of a written plan of the control measures, in consultation with employees, provides the basis for planning and audit of the service. Because the factors surrounding the autopsy service may change (e.g. new technology may permit easier solutions) the practicability of a planned action may change. Accordingly, a plan must be kept under review, and where a different control strategy becomes more appropriate, the plan will then need to be amended to reflect the changed circumstances.

The plan should include:

- A summary of temporary measures to be implemented immediately to control risks and to protect employees until more long-term solutions are implemented.
- A description summarising the engineering measures proposed.
- The reduction in risk estimated to result.
- Agreed times by which the measures proposed will be implemented.
- Name of management representatives responsible for performing and overseeing the development and implementation of agreed control measures.
- A follow-up phase to assess the effectiveness of implemented controls which should, where necessary, include checks of the risks to ensure that hidden problems are still not creating risk.
- Appropriate procedures for preventive maintenance for existing plant and workplaces.
- Appropriate procedures for monitoring the application of work practices, PPE and staff health status.

### **Planning priorities for control**

The HSE Act requires control of each significant hazard. If the employer is not able to deal with all of them immediately, a priority list should be constructed and the most worrying hazards dealt with first.

A good knowledge of the industry (such as is present amongst pathologists) and common sense are the best tools to judge a priority list.

The matrix below is one way of working through the probabilities. It asks the questions:

*How severe is the harm that this hazard may cause ?*

1. Minor injury or illness.
2. Severe harm — e.g. a broken arm.
3. Very severe injury — a permanent disability.
4. Death.

*How frequently is a person exposed to this hazard?*

1. It could happen but is unlikely.
2. It has happened in the past.
3. It is quite likely to happen.
4. It has happened a few times.
5. It happens all the time.

Severity and frequency can be combined using the table:

		<i>Severity of the possible harm</i>			
		4	3	2	1
<i>Likely frequency of the harm</i>	5	20	15	10	5
	4	16	12	8	4
	3	12	9	6	3
	2	8	6	4	2
	1	4	3	2	1

The score for the hazard will give an indication (only) of how severe a risk it poses in comparison with other hazards.

### 1. Elimination of risk

Elimination of the risk posed by autopsies, both standard and high-risk, is not possible.

Staff can refuse to undertake “high-risk” autopsies if they consider the personal risks too great. This is obviously not a desirable long-term solution but is a practical option for staff faced with performing a high-risk autopsy in inadequate facilities and, indeed, the right to refuse dangerous work is recognised in New Zealand common law.

### 2. Isolation

Isolation of the risk refers to:

- a) Isolation of identified high-risk cases to facilities identified as having appropriate engineering and work practice controls; and

b) Isolation of certain procedures within each autopsy (both standard and high-risk) to areas that have effective environmental engineering controls.

Given the expense of establishing and maintaining a facility to the standard required to perform high-risk autopsies safely, OSH and the College of Pathologists recommend concentrating high-risk facilities in three or four institutions throughout the country. Other facilities, having assessed a case as being potentially high-risk would transfer the case to one of these facilities.

There are obvious cultural and logistic issues that need to be addressed. They are not part of this document and resolution of these issues lie with the service provider, their funder and the community that both agencies serve.

### 3. Minimisation

Minimisation can be achieved by means of:

- Of appropriate engineering controls;
- A strict adherence to work practice procedures; and
- The use of personal protection.

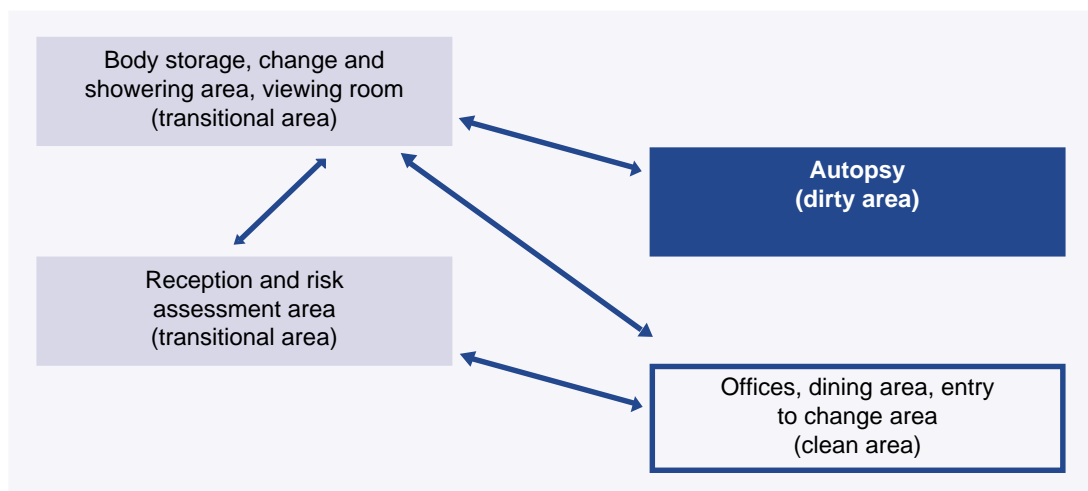
This document lays out a “best practice” approach and gives institutions a basis upon which to formulate their own policies. Such a policy needs to be accompanied by appropriate ongoing training of staff, visitors and contractors.

### Engineering controls

#### Facility design

The mortuary shall be designed so as to allow a proper separation of clean and dirty areas by transitional zones. These areas shall be clearly marked and so arranged that the transfer of all personnel to and from dirty areas shall be through a transitional zone.

1. Movement of the case should be from the reception (transitional area) where a risk assessment occurs into either storage (transitional) or the autopsy (dirty area).
2. Visitors to the mortuary (other staff, students, relatives, undertakers, etc.) are confined to a recognised clean area without potential for contamination.



### **Facility construction**

A brief description of minimum standards for each area follows.

#### ***Clean areas***

This category includes areas such as the viewing room, offices, chapel and receptions areas.

Clean areas shall have adequate ambient climate control. This needs to control any potential for nuisance odours and vapours from preserving or cleaning fluids.

There needs to be provision of adequate hand washing and toileting areas.

Clean areas should conform to the standards set by the Health and Safety in Employment Regulations 1995, and relevant approved codes of practice.

#### ***Clean storage***

Storage of clean equipment needs to be provided in the clean areas, with no risk of soiling from dirty areas.

#### ***Transitional areas***

The control of mortuary staff movements needs to follow the principles of controlled transition from clean to dirty areas. Access to the dirty areas must only be allowed via the transition areas, and clear demarcation of the transition needs to be achieved either by physical barriers or by appropriate signage.

It is important that all workers and visitors to dirty areas move through the transition areas, and are provided with adequate information about personal protection, safety issues and emergency evacuation procedures prior to their entry.

These transition areas need to provide adequate cleaning, showering, hand washing and toileting facilities. There is a need for provision and storage of clean linen and protective equipment supply. Separate storage needs to be provided for contaminated clothing and equipment, with adequate control of their cleaning, bagging and labelling.

Transitional areas include such areas as:

***Vehicle bay*** — large enough to allow the manoeuvring of large cars and vans, preferably at a discrete location.

***Body store*** — needs to be a chiller maintained at 4° C. Integrity of the power source needs to be provided in case of reticulated power failure. The store needs to be of adequate capacity to cope with peak demands over public holidays. It needs to provide non-porous surfaces that are easy to clean and provide ergonomic solutions to the problems of manual handling of heavy bodies. There needs to be a system of containment of leaking body fluids and control of nuisance odours.

### ***Dirty areas***

#### ***1) Post-mortem room***

- International standards suggest a minimum of 2 dissecting tables be provided, no matter how small the unit<sup>5</sup>, to allow for efficient work practices of the pathologist.
- If, however, the newer concept of the tray system of body containment for storage transport and dissection is used, one dissecting station may be all that is required in a smaller unit.
- Post-mortem rooms need to have adequate flooring, lighting, electrical fittings, surface finishes, water supply, drainage control, ventilation, work surfaces, and communication equipment.

#### ***2) Dirty storage***

- Dirty storage needs to be provided for the sorting and discard of any dirty disposable materials (medical waste, disposable instruments and equipment, etc.) and the cleaning and preparation for reuse of reusable equipment (e.g. non-disposable dissection tools and instruments, gum boots and overshoes, face-shields, etc.).

#### ***3) Ventilation***

- Ventilation of the facility is necessary to control the exposure to *M Tb*, other airborne pathogens, chemicals and fumes. Ventilation also helps to maintain a comfortable and appropriate thermal environment for the autopsy. The recommendations below are developed from the CDC Guidelines<sup>6</sup> and equate to the standards<sup>7</sup> required for the internal ventilation of buildings in New Zealand. Ventilation has the effect of capturing, diluting and removing air-borne contaminants or pathogens in a far more effective manner than can be achieved by careful work practices or the use of PPE.
- Dirty areas need to have negative-pressure ventilation relative to the rest of the building, to prevent loss of harmful vapours and nuisance odours.
- Extraction exhaust should be of a laminar flow nature and not produce turbulence across work surfaces.
- Exhausted air should be vented directly to the outside or through HEPA filters, ensuring no entrainment by other air intakes.

5 Health Building Note 20: *Mortuary and post-mortem room*. NHS Estates HMSO ISBN 0 11 321400 6 1991

6 *Guidelines for Preventing the Transmission of Mycobacterium Tuberculosis in Health Care Facilities, 1994* US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention (CDC) 1994 Oct; 43 RR-13

7 NZS 4303:1990 *Ventilation for acceptable indoor air quality*, also AS 1668.2:1991 part 2 *Mechanical ventilation for acceptable indoor air quality*

- Airflow should be from ceiling entry to floor exit, so as to remove potential pathogens from the operator's breathing zone.
- A minimum standard of 6 room air changes per hour should be provided in the post-mortem room.
- Separate "capture" ventilation should be provide for mechanical bone saws and for dissection benches via local exhaust ventilation via a portable HEPA filter similar to those units used in orthopaedic clinics.
- There should be no chance of an interchange between ventilation intakes and exhausts.
- High-risk facilities should follow the CDC recommendations and achieve ventilation standards of 12 air changes per hour.

#### *4) Flooring*

Flooring should be:

- Impervious, non-slip, easily cleaned, resistant to cleaning agents and be gravity drained via a waste trap.
- Wall/floor joins should be formed in a curved manner and be waterproof.

#### *5) Lighting*

- Lighting needs to be provided that complies with NZ/Australian standards<sup>8</sup>. These describe a minimum standard, and special advice may be sought to ensure spot lighting for specific tasks (examining forensic cases), and adequate general lighting for work areas. Particular care needs to be taken to prevent glare from stainless steel work surfaces and local heating effects.

#### *6) Electrical fittings*

- Electrical fittings need to comply with NZ standards for hazardous areas. Care needs to be taken to ensure safety working in a wet environment and potentially combustible vapours.

#### *7) Surface finishes*

- Wall surfaces need to be impervious easily cleaned, not damaged by cleaning agents, with an awareness of the acoustic properties of these surfaces.

#### *8) The mortuary "slab"*

- This may be porcelain or stainless steel. It needs to have a gravity drain system to a waste trap, a supply of low pressure water to provide continuous running water to its surface as well as a directional flow hose for use as required. Preferably this unit should be adjustable for height.

<sup>8</sup> NZS 6703: *Code of practice for interior lighting design*  
AS/NZS 1680 *Interior lighting*, part 2.4: Industrial tasks and processes  
AS/NZS 1680 *Interior lighting*, part 2.5: Hospital and medical tasks

9) *Instrument tray*

- An instrument tray needs to be handy to the pathologist for storage of clean and dirty instruments while not in immediate use during dissection. This tray needs to be stainless steel with rolled edges to ensure equipment does not roll off to the floor.

10) *The dissection table or bench*

- The dissection table or bench needs to be in close proximity to the “slab”. It needs to be either stainless steel or porcelain with an upstand behind. It needs a deep sink with low-pressure water supply for washing specimens and to provide a facility for safely cleaning the gut. Drainage of this should be to the sewer. A facility is required for weighing specimens. The dissection table should have its own ventilation to control aerosols generated in preparation of histology samples and to control vapours of preserving fluids.

11) *Water supply*

- The water supply needs to be of low pressure, both hot and cold, with back-flow protection.

12) *Drainage*

- Drainage of dirty areas needs to be free flowing by gravity. All wastes must include solid traps, and tubing diameters must be sufficient to prevent blocking. General water waste may be to storm water.
- Potentially infective wastes, or wastes from a high-risk autopsy should be collected and discharged to be treated via the sewage system. For autopsies of high-risk cases, body fluids such as blood and central spinal fluid need to be isolated and treated as infective waste by appropriate methods.

14) *Communication equipment*

- Communication aids in the mortuary should have hands-free capabilities. This should be monitored by the mortuary circulator to avoid distraction of the pathologist during the autopsy. Similarly systems and equipment needs to be available to allow note taking by “dirty” members of the autopsy team without their handling office type equipment.

15) *Emergency showers and eyewashes*

- Emergency showers and eyewashes should be available within easy reach to allow decontamination in the event of a blood/body fluid splash.

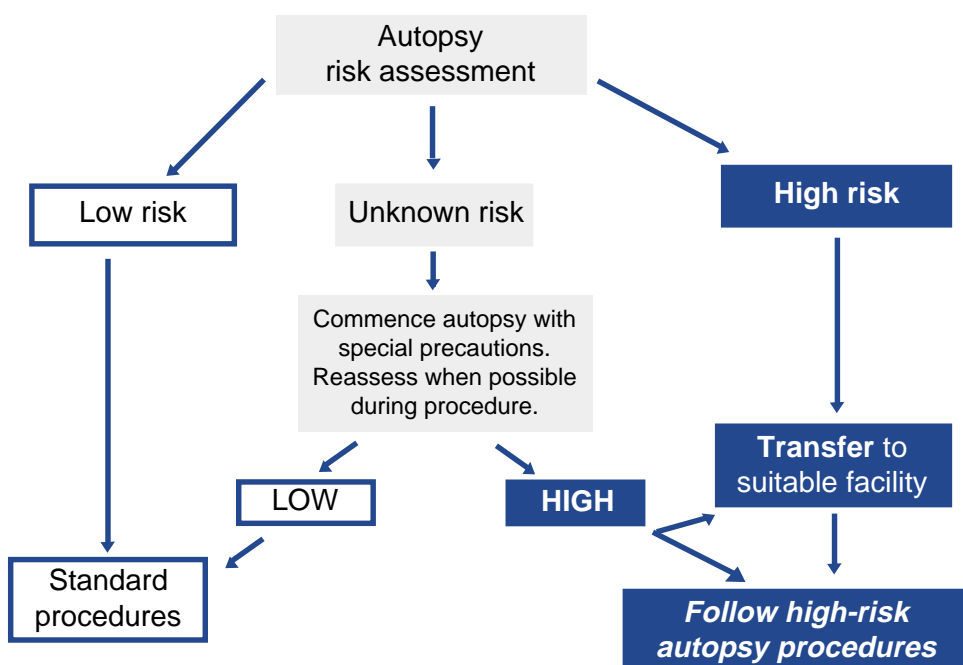
## Work practices

Appropriate work practice behaviours are best achieved by achieving consensus that these measures are necessary, by ongoing training, and by all those present at the autopsy monitoring each other's standards.

Many institutions have found success by appointing a “procedure captain” whose task it is to set the appropriate standards, including the use of personal protection, and who has authority to persuade compliance with these standards.

A suitable standard of work practice behaviours is outlined in the Royal Australasian College of Surgeons publication<sup>9</sup>. The relevant sections of this document have been modified to this environment and are published with permission as appendix 6.

Essential to the safe conduct of autopsies is some degree of risk assessment at the outset of the procedure. A sample procedure is set out in appendix 1. This document recommends that the following sequence of events occurs:



### Personal protective equipment (PPE)

The concept of universal precautions is well known to all workers in the health arena. Evidence exists of inconsistent observance of the doctrine by healthcare workers<sup>10</sup>.

PPE is the final barrier to prevent hazards, known or unknown, from causing personal injury. As such, it is the least satisfactory method, involves user discomfort, compromises worker activity, and is often discarded in practice.

This document, and the HSE Act, places PPE as the last step in the sequence of minimising the hazard as a consequence.

The level of PPE ideally should always be based on the premise that, even in low risk cases as predicted by the risk assessment protocol, high-risk “surprises” may occur.

9 *Policy Document: Infection Control in Surgery*, Royal Australasian College of Surgeons Council Advisory Committee on Infection Control in Surgery, July 1998.

10 Jeffe DB, Mutha S, L’Ecuyer PB et al. Healthcare Workers’ Attitudes and Compliance with Universal Precautions: Gender, Occupational, and Speciality Differences – Concise Communication *Infection Control and Hospital Epidemiology* 1997 18 (10) 710 -712

Kim LE, Evnaoff BA, Parks RL. Compliance with Universal Precautions among emergency department personnel: Implications for prevention programs *American Journal of Infection Control* 1999 27(5) 453 -455



A minimum standard of PPE is set out in table 3, below.

**Table 3: Minimum standards of PPE**

<b>Pathologist and mortuary technician</b>	
<i>Respiratory protection</i>	These should be adequate by design to prevent inhalation of any aerosols produced during bone sawing and any airborne spores, bacteria or viral particles. Consideration can be given to masks that absorb nuisance odours and the respiratory irritants used in the mortuary room, such as formaldehyde (e.g. 3M 1860, Moldex 2200, Gerson G1920).
<i>Impervious aprons</i>	To cover the trunk and extend below the boot line.
<i>Gowns</i>	These similarly can be impervious and cover from neck and wrist to bootline.
<i>Latex gloves</i>	Double gloving is the standard presently accepted although single gloving and the use of chain mail to index and thumb of the non-dominant hand may be acceptable.
<i>Eye protection</i>	Usually in the form of a visor, although splash-proof spectacles are acceptable.
<i>Head gear</i>	As in operating theatre standards.
<i>Rubber boots</i>	As in operating theatre standards.
<b>Mortuary captain and all visitors</b>	
<i>Respiratory protection</i>	Need for visitors at high-risk autopsies must be questioned. Any people present during an high-risk autopsy should use the same level of respiratory protection as the pathologist.
<i>Gowns</i>	Over gowns to bootline.
<i>Eye protection</i>	Only during the potentially splash-producing procedures. Standard safety glasses should be sufficient unless the captain or visitor is in close proximity to the case whereupon they should wear the same level of protection as the pathologist.
<i>Head gear</i>	Optional.
<i>Rubber boots</i>	Optional. Should have separate footwear to street wear or utilise overshoes.

## Education, training and supervision

*Education* means informing employees about hazards and control measures, while *training* means making sure that employees act safely (when there are hazards).

### Education

Employees must be informed of the following:

- What to do in emergencies;
- *All* identified hazards (*not only significant hazards*) that the employee is likely to encounter or create;
- The steps the employer is taking to minimise the hazards; and
- Where personal protective equipment and other safety equipment is kept.

The education needs to be given in a form that employees can understand and, if complex, then there should be a written record of it.

### **Training and supervision**

All employees (including part-time pathologists and locums) shall have an “induction” into the mortuary facilities and work practices. This is a brief introduction into how the facility works — where the tea room is, where the toilets are, who to ask for help, and what the health and safety rules for the facility are.

Employees must be trained in every aspect of the safe use of equipment. Until this is done, and until the employer or manager is sure that employees are acting safely, supervision must occur by someone who has been trained in the safe use of the equipment and facilities at the mortuary.

Training is complete, and has been effective when:

1. The employee uses the best possible techniques to do the work;
2. The employee knows the hazards of the job and applies the correct methods to control them; and
3. The employee follows all the relevant safety standards.

Until they meet these three tests, each employee should be supervised (directly) by a person who does meet the tests. A record should be maintained of information sessions and training that is given to all employees.

## **Monitoring**

### **Protection of staff by means of vaccination**

It is the view of these guidelines that where an immunisation exists that provides substantial protection against infection by a potential biological hazard then it is mandatory that mortuary staff are vaccinated before commencing work.

Mortuary facilities must have in place a programme which ensures that staff are vaccinated, and that these vaccinations are maintained according to current clinical recommendations.

This applies, at this stage, to Hepatitis B Virus (HBV) where almost complete protection can be offered.

It is OSH's view that other control mechanisms cannot offer the same degree of protection as is achieved by HBV immunisation:

- OSH has offered the opinion (as yet untested in the courts) that a failure to ensure the presence of HBV surface antibodies before exposure in the mortuary environment would be a failure by the employer to take “all practicable steps”, as required by the HSE Act.
- It is OSH's opinion that in the case of an employee, having had a course of HBV immunisation but having failed to acquire HBV surface

antibodies, the employer would have taken “all practicable steps” (provided they operated the facility according to these guidelines).

- In the advent of a significant exposure to blood and body fluids, the employer would be expected to carry out post-incident evaluation of exposures and offer appropriate prophylaxis (e.g. HBV or HIV) if clinically recommended in these people.

The use of the BCG vaccination, which offers some partial immunity against the tuberculosis, is recommended for mortuary staff.

### **Personal monitoring**

In the event of a significant exposure by an employee to blood and body fluids or to respiratory pathogens, the employer would be expected to carry out post incident evaluation of exposures and offer appropriate health surveillance treatment or prophylaxis if clinically recommended to staff. Staff need to be informed of the results of this monitoring in a confidential manner.

Employers may use aggregated group data in such a manner that preserves medical confidentiality.

### **Environmental monitoring**

Mortuary facilities should ensure that facilities undergo regular maintenance and the efficacy of such equipment as ventilation systems, local exhaust systems, fume cabinets and some personal protective equipment is regularly measured.

## **Other relevant legislation**

### **Environmental discharges**

Discharges from mortuaries are governed by the Resource Management Act 1991.

Discharges of contaminants or water into sewers are covered by section 15(1), which only allows discharges if they comply with a regulation, a rule or a resource consent.

Similarly, discharges of contaminants to air is covered by section 15(2), which ensures that any discharges comply with the regional (or proposed regional) plan. However, in this part most mortuaries will be allowed to continue under the “grandparenting” provision of section 20(2).

Mortuaries must comply with regional council rules concerning environmental discharges:

- a) There must be no visible discharge of any contaminant beyond the boundary of the subject property .....
- b) The discharge must not result in objectionable or offensive odour or particulates beyond the boundary ....
- c) There must be no harmful concentrations of contaminants beyond the boundary of the subject property or into water.

Mortuary facilities must also comply with territorial authority requirements.

It is the view of these guidelines that all mortuaries should work gradually towards the controlled disposal of waste material in an environmentally safe manner.

A number of engineering solutions are available, including:

1. Storage and treatment in a holding tank prior to pumping out and ultimate disposal. Sumps and storage/treatment tanks need to be designed so that treatment chemicals can be added automatically and maintenance throughout the life of the facility does not pose risks to maintenance workers.
2. Storage into absorbent waste in containers that can be removed and disposed of off site in an environmentally acceptable manner. Such containers must not pose a health and safety risk to waste control staff.

## Appendix 1: Autopsy risk assessment

### AUTOPSY RISK ASSESSMENT TOOL

CASE NAME	Case identifier (hospital number, coroner's number etc.)
Case age/DOB	Pathologist
Place of death	Suspected mode of death

Risk assessment questions		YES	NO	Not known
1.	Evidence or history of illicit IV drug use?			
2.	Evidence or history of a hepatitis?			
3.	Evidence of more than occasional tattooing?			
4.	Evidence of Immune Deficiency Disease (wasting illness with atypical infections, positive serology, full blown AIDS)?			
5.	Evidence of occupational risk (e.g. - psychiatric or institutional care, known or suspected sex worker)?			
6.	History or diagnosis of unexplained dementia?			
7.	History or evidence of pulmonary tuberculosis?			
8.	Evidence of recent travel through a highly endemic area for infectious disease?			
9.	Evidence of chronic blood product exposure prior to effective HCV testing?			
10.	Recipient of cadaveric products?			

<b>SUMMARY OF ASSESSMENT</b>	SAFE <input type="checkbox"/>	UNSAFE <input type="checkbox"/>
------------------------------	-------------------------------	---------------------------------

Potential high-risk autopsies will often be recognised in advance because of a combination of clinical and historical factors and preparations can be made in advance.

More difficult decisions will occur when some risk factors are present in an unknown case (e.g. heavily tattooed, rather disreputable looking, unknown mva) and may require special precautions until the infectivity or otherwise of the case is established.

“There is no such thing as an emergency autopsy”

## **Appendix 2: Facilities and work practices for high-risk procedures**

---

### **Transportation of the body**

- The body must be covered with a sheet and enclosed in a strong body bag with the head at the end where the zip closes. There must be no leakage of body fluids.
- Correct identity tags or bracelets must be attached to the patient's wrist and a second label attached to the outside of the body bag.
- Infectious hazard labels should be attached to the body bag.
- The undertakers must be informed that the body is possibly infectious so that they are able to take whatever precautions are required according to their protocol. (e.g. impervious clothing, gloves, etc.)
- It is the responsibility of the undertaker to arrange a suitable time for delivery with the mortuary .

### **Reception and storage of the body**

- The body should be received by authorised personnel only, i.e. the duty technician or the deputy, and placed on a tray that contains all body fluids.
- The identity tag or label must be checked against the documentation of the patient, and all relevant details entered into the official post-mortem register kept in the mortuary office.
- If for any reason the body was not packed into a body bag, check the identity of the body and put it into a body bag, so that the head is at the end where the zip closes.
- Ensure that there is an identity tag and an infectious hazard tag on the outside of the body bag.
- The body can now be stored in the refrigerator in the section designated for the storage of infectious cases.

## Appendix 3: Procedures for undertaking a post-mortem examination on a high-risk case

---

*This information **INCLUDES** HIV, HEPATITIS, TUBERCULOSIS but **EXCLUDES** CJD and OTHER SPONGIFORM ENCEPHALOPATHIES*

- If suspicion of a high-risk infection exists, the body should already be in a sealed body bag. After checking the ID, details of the body should be entered into the mortuary register.
  - If it is not bagged, it should be done so immediately and placed in the refrigerator.
- The pathologist should then be notified that the body is in the main mortuary and a time should be arranged when the post-mortem can be carried out in an infection isolation room.
- The technician should prep the post-mortem room before the post-mortem is done by:

*1) Putting out the instrument kit comprising of:*

- Hand saw for removing the skull cap;
- T-shaped chisel;
- Post-mortem 40 knife;
- Disposable scalpel;
- Hammer;
- PR's spencer wells;
- Large scissors;
- Small scissors;
- Surgical staple guns (disposable);
- Plastic bowls;
- Wadding;
- Body bag;
- Sponge; and
- Neck block.

*2) Making up a solution of the appropriate disinfectant in one of the bowls, (about 4 or 5 litres is usually sufficient).*

- Relevant safety precautions must be observed.
- The agent used will vary depending on the organism.

*3) Placing out 3 separate kits of clothing for the pathologist, the technician and the circulator. The kit should comprise:*

- Disposable barrier gown;
- Disposable apron;
- Disposable face mask (industrial quality dust/mist respirator such as the 3M 1860);

- Disposable theatre hood;
- Disposable latex gloves;
- Full face protective visor; and
- Gumboots.

All of the above should be worn over the normal post-mortem room clothes i.e. a sleeved surgical shirt and trousers.

- 10 minutes before the pathologist arrives to do the post-mortem the technician should change into the above clothing and move the body, still in the body bag, into the post-mortem room and place it onto the post-mortem table.
- The pathologist, on arriving at the mortuary, should change into the above clothing and the outer mortuary door should be locked.
  - There should be no observers within the autopsy room for a high-risk case. (An exception may need to be made for a homicide/suspicious death.)
- On entering the post-mortem room, the pathologist who is to do the post-mortem should open up the body bag as far as is necessary to complete the post-mortem and place the neck block under the deceased's neck and the body bag.
  - The name tag should be checked, and then the post-mortem can start. (Any clothing can be removed or cut off, but should remain in the body bag.)
  - One technician will be solely responsible for the opening and removal of organs.
  - The pathologist will handle incised material. The pathologist and technician will not handle sharp tools or instruments at the same time.
  - Where possible, disposable instruments and tools will be used.
  - The circulator will remain uncontaminated and the pathologist and technician will not work in the absence of the circulator.
- The circulator present is to perform duties such as:
  - Photography;
  - Removal of contaminated specimens;
  - Communication;
  - Recording of notes, etc.
- The circulator will also be on the lookout for any risks associated with the presence of sharp tools and splashing. Any warnings issued by the circulator or pathologist must be instantly obeyed by all three persons present.
- The post-mortem should be carried out in the body bag so all spillage is contained. Wadding can be used to soak up spillage (which is then packed into the body bag cavities when the post-mortem is complete).



- When the post-mortem is complete, the body is reconstructed using surgical staples (to prevent needle stick injury).
- Once the incisions have been stapled, the body bag is sealed containing the body, clothes/shroud and any wadding that was used at post-mortem.
  - The outside of the body bag should be washed over with the appropriate disinfectant and left for 1 hour.
  - Those instruments that can not be disposed of are swilled with water to remove heavy contamination and are then placed in the appropriate disinfectant for 1 hour.
- All disposable clothing and boots are removed by the pathologists at the post-mortem room door or decontamination lock and discarded as infectious waste. The technician then places the boots into the appropriate disinfectant to soak.
- After the appropriate time the body bag can be swilled off with water and then placed into another clean body bag, which is sealed, and over-sealed with bio-hazard tape.
  - The name of the deceased is then written on to the body bag in marker pen (and any jewellery, if present).
  - The post-mortem table is wiped down with the appropriate disinfectant (there should be no body fluid spillage onto the table if the post-mortem was carried out in the body bag) and swilled with water. Boots are swilled in water and dried.
  - The yellow bags are re-bagged into another yellow bag, and with the sharps bin, are sealed with bio-hazard tape and taken to the clinical waste collection point.
- Surgical tops and bottoms are placed into the relevant contaminated laundry bags and the pathologist and technician shower before changing into outside clothes and leaving the mortuary.
- The undertakers who will carry out the funeral should be notified that the body is infected and that when they come to collect the body the proper coffin should be brought (not a stretcher or shell).
  - When they come for the body, the body bag will not be opened but placed directly into the coffin.
  - The undertakers will be told of the potential risks of contamination and that:
    - The body bag should not be opened;
    - The body should not be embalmed; and
    - That relatives should be discouraged from viewing the body. If the relatives insist they may see the face only, and must not touch or kiss it.

- The undertakers should then sign for the body in the mortuary register through the words “INFECTED BODY”, written in red ink so they are aware that the body they have collected is infected.
- The fridge tray that the body was on should then be wiped over with the appropriate disinfectant, left for 1 hour and swilled with water.

## **Appendix 4: Handling of tissues retained from suspected high-risk autopsies (tuberculosis, HIV and hepatitis)**

---

### **Histology**

Tissue specimens for histology should be placed in appropriately sized containers that will allow them to be totally submerged in at least 10 times their volume of fixative solution. Great care should be taken to ensure that the outside of these containers is properly decontaminated before placing them into a plastic bag which is labelled with hazard warning labels, prior to transportation to the laboratory.

Large specimens should be retained in the mortuary until fixation is considered to be complete.

Routine fixatives for histopathology, based on formaldehyde, rapidly inactivate tuberculosis, hepatitis and HIV organisms and hence, once adequately fixed, no hazard arises from trimming or cutting of paraffin embedded tissue blocks.

### **Other laboratory samples**

When fresh tissue/body fluids are to be sent to laboratories (i.e. for microbiological or toxicological analysis) they should be placed in a sealed leak-proof container and then placed inside a transport bag and biohazard or similar warning labels should be fixed to the specimen taken from high-risk cases.

## **Appendix 5: Procedure for post-mortem examination of known or suspected CJD/Spongiform encephalopathy**

The procedure for the examination of other high-risk cases, including HIV, hepatitis and tuberculosis, can be used for examination of cases with known or suspected spongiform encephalopathy and is in fact used by the Neurosciences Unit at the Queen Elizabeth Hospital in Birmingham<sup>1</sup>.

At the time of the isolation facility being made available, then the same procedure as has been described for other high-risk cases could be implemented within the isolation area. The only differences that will be required being:

- 1) That a dedicated set of equipment used *only* for CJD cases must be used to avoid contaminating all other sets; and
- 2) A category I or II type safety cabinet needs to be available for storage and handling of retained tissue specimens.

### **Considerations for tissue handling in laboratories — specific for CJD/ spongiform encephalopathies**

- 1) The brain should be fixed in 10% formal saline (or equivalent) without phenol or any other chemicals and dissected, if possible, in a Class 1 microbiological safety cabinet, or on a disposable surface using hand, eye and face protection. Dissection in a shallow tray will limit dispersal of contaminated fluids onto work surfaces, which must be decontaminated afterwards and any residual material incinerated. It is advisable to use disposable instruments wherever possible for dissection.
- 2) All tissues for histological examination should be fixed in formalin without the addition of phenol which reacts deleteriously with formic acid. Unfixed frozen tissues should be clearly labelled “Risk of Infection” and handled accordingly. Exposure of brain tissue blocks to 96% formic acid for 1 hour after formalin fixation has been shown to be effective in substantially reducing CJD infectivity, although it may make large blocks of tissue brittle and difficult to cut. If tissues are to be processed by machine, they should be washed again in formalin, since formic acid may damage plastic containers.
- 3) Tissue processing fluids, xylene and other laboratory waste should be disposed of by incineration after absorption with sawdust. Disposable microtome blades should be used to cut brain sections from CJD cases, and should be incinerated after use. Histological sections are not regarded as being of significant infectivity and can be additionally decontaminated after coverslipping by wiping with 96% formic acid.
- 4) Storage of post-mortem tissue after examination:
  - a) Remaining tissue unprocessed for histology should be placed back into its container which will be re-sealed and should remain inside the category 3 safety cabinet until its ultimate disposal by incineration.

<sup>1</sup> The ‘High Risk’ Neuropathological Autopsy in AIDS and Creutzfeldt-Jakob Disease: Principles and Practice. JW Ironside and JE Bell. *Neuropathology and Applied Neurobiology*, 1996, 22, 388-393.

## **Appendix 6: Work practices for both standard and high-risk autopsy cases**

---

*Adapted from RACS recommendations (Document appendix 4, 33 - 46)*

(The RACS “Infection Control in Surgery” document is reproduced here in a modified format omitting those sections dealing with preventing the transmission of infection from surgeon to patient.)

### **Infection control protocols**

These protocols assume that the blood and body substances of every patient must be considered to be potentially infective.

The aim of the protocols is to protect HCWs from exposure to patients’ infections with blood-borne and non-blood-borne pathogens.

### **Surgical techniques**

*It is strongly recommended that surgical practices be examined specifically to minimise the risk of injuries from sharps and other surgical equipment.*

### **Health care workers**

All HCWs involved in invasive procedures should be aware of their HIV and Hepatitis B and C status and if susceptible to HBV should be immunised against HBV.

### **Hygiene**

Consistently high hygiene standards should apply for all staff involved. Work areas must be cleaned regularly, hands must be washed frequently, uniforms should be clean, and hair should be tied back or covered (and beards covered) when performing aseptic or sterile procedures.

### **Hand washing**

*Hand washing is generally considered the single most important procedure for preventing nosocomial infection.*

Whenever HCWs fail to learn from Semmelweis and do not comply with recommendations about handwashing, hand case to pathologist-transmissions are likely to occur.

*Hands should be washed before any significant case contact and after activities likely to cause contamination.*

*Gloves should be used as an adjunct to hand washing when contamination of hands with blood or body fluids is anticipated.*

In emergencies where there may be insufficient time for routine or surgical hand wash, an alcoholic chlorhexidine preparation may be used.

Hand care is also important, as skin that is intact is a natural defence against infection. Cuts and abrasions should be covered by water-resistant occlusive dressings which should be changed as necessary or when the dressing becomes soiled.

HCWs who have skin problems such as exudative lesions or weeping dermatitis must seek medical advice and must be removed from direct patient care until the condition resolves.

Repeated hand washing and the wearing of gloves can cause irritation or sensitivity, leading to dermatitis or allergic reactions. This can be minimised by the use of suitable hand creams.

**Table 1: Hand washing techniques**

Type	Technique (how)	Duration	Drying	Example (when)
Routine hand wash	Wet hands thoroughly and lather vigorously using neutral pH soap. Rinse under running water. Do not touch taps with clean hands if elbow or foot controls are not available, use towel to turn off taps.	10-15 seconds	Pat dry using a paper towel.	Before eating and smoking. After going to the toilet. Before significant contact with patients e.g. physical examination. Before injection or venipuncture. Before and after routine use of gloves. After handling any instruments or equipment soiled with blood or body substances.
Hand wash prior to aseptic procedures (non-surgical) examination.	Wash hands thoroughly using an anti-microbial soap or skin cleanser. Do not touch taps with clean hands. If elbow or foot controls are not available, use paper towel to turn taps off.	1 minute	Pat dry using paper towel	Before any non-surgical procedures which require aseptic techniques (such as inserting intravenous catheters).
Surgical scrub	Wash hands, nails, forearms thoroughly and apply an anti-microbial skin cleanser (containing) 4% w/v chlorhexidine 53 or detergent-based povidone iodine containing 0.75% available iodine. Rinse carefully, keeping hands above the elbows. No-touch techniques apply.	First wash of the day 5 minutes and subsequent washes 3 minutes	Dry with sterile towel	Before any invasive surgical procedure (operating room procedures).

### **Barrier protection**

The type of protective barrier chosen by the health care worker depends upon the clinical situation and the assessment of risk, with consideration given to:

1. The probability of exposure to body substances;
2. The nature of exposure;
3. The amount of body substance to be encountered; and
4. The probable route of transmission.

### **Personal protective clothing and equipment**

#### **Gloves**

Gloves should be worn when there is a risk of exposure to blood or body substances.

**Hands should be washed before and after the use of gloves.**

Types of gloves should be appropriate to the task:

- *Sterile gloves* — for procedures involving a sterile field, involving normally sterile areas in the body double gloving in the operating theatre;
- *Non-sterile gloves* — for procedures other than above;
- *General purpose utility gloves* — for housekeeping chores.

Gloves should be changed and discarded:

- As soon as damaged;
- After contact with each patient; and
- Before performing separate procedures on the same patient.

#### **Protective eye wear or face shields**

Protective eye wear or face shields must be worn during procedures where splashing or spraying of blood or body substances may occur.

#### **Masks**

It is important that masks protect the operating team from aerosolised fluids. Researchers have shown that for ideal protection, a mask should be fluid-capture efficient and air resistant.

At present the wearing of face masks is recommended mainly to protect the surgeon from blood splatter and aerosolised fluids. This function may be better served by a face shield; however this possibility has not yet been tested.

Masks must always be worn in the operating theatre when there is a likelihood of splashing or splattering of blood, other body substances or where

airborne infection may occur.

A fluid-repellent deflector mask should be used when aerosolation or splashing of blood is probable.

A particulate mask capable of best possible fit capable of filtering micron particles should be worn when attending patients with pulmonary TB.

Masks must:

- Not be touched by the hand when worn;
- Be removed after 20 minutes continuous exposure to aerosols or as soon as possible after they become moist or visibly soiled;
- Be removed by touching the strings and loops only; and
- Not be worn loosely around the neck, but removed and discarded as soon as possible after use.

### **Gowns and plastic aprons**

Gowns and plastic aprons must be worn to protect the wearer's clothing and skin from contamination with blood or body substances.

Gowns should be impervious or fluid resistant.

Sterile prepacked gowns must be worn in all aseptic procedures requiring a sterile field.

### **Techniques for prevention of injury**

All HCWs should take precautions to prevent injuries caused by needles, scalpels, and other sharp instruments or devices during procedures, when cleaning used instruments, during disposal of used needles, and when handling sharp instruments after procedures.

To prevent needlestick injuries, needles should not be recapped, purposely bent or broken by hand, removed from disposable syringes, or otherwise manipulated by hand.

### **Disposal of sharps**

After use disposable syringes and needles, scalpel blades and other sharp items should be placed in puncture-resistant leak-proof containers that are colour coded yellow and labelled with a biohazard label for disposal. The puncture-resistant containers should be located as close as practical to the area of use.

### **Instrument and equipment design**

Equipment design, systems of operating and instrument handling should minimise the chances of a penetrating injury.

Manufacturers should be encouraged to develop equipment which reduces the risk of sharps injuries and allows safer re-use. Manufacturers should also be encouraged to develop low-cost equipment for single use.



Equipment intended for re-use should be designed to facilitate cleaning and sterilisation or disinfection.

Safety features of equipment should be considered prior to selection and purchase of that equipment.

### **Organisation and scheduling**

All staff in the surgical team should be vaccinated for Hepatitis B.

The surgeon in charge of the patient, the anaesthetist, and the scrub nurse should be responsible for ensuring that all members of the operating team know the operating room procedures and current infection control precautions that are to be taken, including any additional precautions that may be required.

Staff involved in cleaning and sterilising instruments and equipment used in the operating theatre should also be informed of the need for any additional precautions.

Each health care establishment undertaking surgery should have a specific protocol for operating room procedures.

This should include specific requirements for surgical hand washing routines.

Discretion and case confidentiality must be maintained in all circumstances.

Autopsy lists should be scheduled on the basis of clinical urgency, and in such a way as to allow ample time for adequate infection control procedures to take place.

The patient's infectious or immune status should be considered in determining the order of the operating list to allow appropriate clinical management, which may include the need for the additional precautions described below.

### **Additional precautions for high-risk autopsies**

#### **Personnel**

Personnel with skin abrasions, dermatitis or wounds of the skin should be excluded from the operating team.

Where a procedure requires an assistant or assistants, such assistants must be appropriately qualified medical or trained personnel.

The team should be limited to essential members, but with sufficient support staff to tend to the patient's needs without cross-contaminating the operating team. The roles of circulating nurses and theatre personnel should be clarified to prevent contact between potentially contaminated items and the surgical team.

#### **Barrier protection**

Outside clothing must be changed for clean laundered theatre attire of closely woven material.

An impermeable, cuffed wrist, sterile gown should be worn by scrub staff. Theatre gowns should be made of waterproofed fabric with ability to “breathe” and should be comfortable to wear.

Open footwear must never be worn in the operating room.

Shoe covers should cover the shoes and protect shoes from spills.

Calf-length, waterproof over boots should be worn where gross contamination is likely.

**Double sterile gloving**, i.e. a double glove with the larger size glove on the inside, is recommended for all surgeons involved in operating room procedures. A prospective, randomised study in which the hands and fingers of surgeons and first assistants were closely observed after surgical procedures found that when a single layer of gloves was worn, blood penetration of the skin occurred in 51% of cases but when a double layer was worn, the rate of penetration was reduced to 7%.

If a glove is torn or a needlestick or other injury occurs, the gloves should be removed and hands washed when safety permits and new gloves put on promptly.

The needle or instrument involved in the incident must also be removed from the sterile field. Needlestick and mucous membrane exposures are to be attended to immediately safety permits, and reported to appropriate authorities.

**Caps** should cover the hair completely.

**Masks.** A fluid repellent deflector mask should be worn. It should be tied securely to cover the nose and mouth, and it should be changed frequently.

**Eye protection** is essential to avoid blood splashes to the conjunctiva. Glasses, protective goggles, full-face shield or surgical helmet system should always be worn during operations.

Fully ventilated total **body suits** (stretcher suits) may be used where there is a high level of risk of exposure to infectious aerosols.

In the event of any strike through theatre clothing by body fluids, the surgeon or nurse concerned should remove the contaminated clothing, shower and re-dress. The clothing should then be disposed of as described for contaminated linen.

Personnel who attend the patient should not leave the operating room until their outer gown, gloves, masks, and protective face shields are removed.

Theatre clothing should not be worn outside the operating theatre environs.

**Drapes.** Sterile drapes used in the operating theatre should be impervious. Drapes should incorporate systems for the containment of blood and irrigation fluids.

Surgical hand washing routines should be specified.

### Surgical techniques

Prior to any surgical or operating procedure, the pathologist and assistant should decide on the routine for passage of sharp instruments during the procedure. This may entail the designation of a “neutral” zone.

The surgeon must avoid placing his/her less dextrous hand in potential danger.

The diathermy and suction should be placed on the opposite side of the table to the surgeon, thereby ensuring the assistant does not reach across the table between the surgeon and nurse.

Sharp instruments should not be passed by hand. A specified puncture resistant sharps tray must be used for the transfer of all sharp instruments. Only one sharp must be in the tray at one time. If two surgeons are operating simultaneously, for example, varicose veins operation on both legs, each surgeon needs his/her own sharps tray.

All theatre staff, including surgeons, must be responsible for safe handling of sharp instruments.

Hand-held straight needles should not be used.

Needles must never be picked up with the fingers, nor the fingers used to expose and increase access for the passage of a suture in deep tissues. When suturing, forceps or a needle holder should be used to pick up the needle and draw it through the tissue.

Surgeons may wear a sterile thimble on the index finger of the less dextrous hand for protection when suturing.

Where practical, suture needles should be cut off before knots are tied to prevent needlestick injury. The sharp point of the needle should be sheaved in the jaws of the needle holder prior to being cut off.

Hands of assisting staff must not be used to retract the wound or viscera during surgery. Self-retaining retractors should be used or a swab on a stick instead of fingers.

Certain instruments should be avoided unless essential to the procedure, for example, sharp wound retractors such as rake retractors and skin hooks.

Wire sutures should be avoided where possible because of the high injury rate to the surgeon.

Following a surgical procedure the skin should be closed with staples whenever possible.

Where practical, blunt needles should be used to close the abdomen.

### Additional operating room precautions

**ADDITIONAL PRECAUTIONS** may be required where the transmission of infection might not be contained by **STANDARD PRECAUTIONS**, for example:

- n Where CJD, pulmonary tuberculosis, MRSA; or
- n Any aerosolised pathogens are involved); or
- n Where there is an established risk of transmission regardless of the nature of the procedure being undertaken; or
- n Where the procedure itself carries an established risk of blood accident or staff/patient injury.

The nature of additional precautions that are implemented will also depend upon the mode of transmission such as aerosols, the type of micro-organism (for example CJD compared to staphylococcus), and the procedure itself (for example where this carries an established risk of accidental injury).

An indication that the patient is infectious/biohazardous should be made on the routine operation list.

Adequate safeguards to protect a patient from unauthorised disclosures must be adopted. Discretion and case confidentiality must be maintained always. However, the staff involved in the operation will need to know of the infectious nature of the patient.

The infectious/biohazardous nature of the patient must be taken into account when organising the order of an operating list.

In order to minimise the risk of spread of infection to other patients adequate time must be allowed at the end of the case for the terminal cleaning of the operating theatre and the appropriate disposal of contaminated waste.

Generally, this will mean that the patient is placed last on the operating list.

Pre-operative shaving should be eliminated.

Patients should be anaesthetised in the operating room rather than the anaesthetic room.

Unnecessary equipment should be removed from the theatre.

The pathologist in charge of the case should be responsible for seeing that all members of the team know of the infection hazards and the precautions to be taken.

Only experienced surgeons and assistants should perform the surgery.

Special protective equipment, for example full face visors should be used.

Where additional precautions are required, and where it is possible, single-use equipment should be used.

### **Cleaning of the autopsy room and instruments**

In order to minimise the risk of spread of infection to other patients, adequate time must be allowed at the end of each case to allow for thorough cleaning of the operating theatre and the appropriate disposal of clinical waste.

As soon as possible after use, instruments for re-use should be immersed in warm water and detergent to prevent congealing or solidifying of blood and fatty materials, and must be thoroughly cleaned in the designated clean-up area prior to sterilisation. Where practical, used instruments should be washed mechanically rather than by hand.

Scalpel blades and needles and all other non-reusable sharps should be placed in a designated puncture proof sharps container (disposable containers must comply with AS 4031, whilst reusable containers must comply with AS/NZS 4261). The container should be sealed and removed from the operating room for appropriate disposal.

Clinical waste, infectious waste excluding sharps, should be placed in a yellow infectious waste plastic bag, sealed and removed from the operating room. Disposal of infectious waste must comply with regulations.

Linen should be handled in accordance with the linen service policy, with State and Territory Health Department guidelines and with Standards Australia guidelines for correct laundry practice (AS 4146).

Blood and other body fluid spills should be cleaned up immediately using absorbent material such as paper toweling, which should then be discarded into the infectious waste bag. Gloves must be worn. The area should then be cleaned with warm water and detergent. The area may be treated with sodium hypochlorite (1 per cent or 10000 ppm available chlorine) or other appropriate disinfectant in accordance with the institution's spills management protocol. Disinfectant solutions should not be allowed to pool or remain on surfaces for longer than is required to effect disinfection, usually 10 minutes.

Operating table, instrument table, equipment used and the floor should be carefully cleaned using warm water and detergent. Disinfectant such as sodium hypochlorite.

(0.1 per cent or 1000 ppm available chlorine) may be used after removal of gross soil.

Surfaces should be cleaned and dried after applying disinfectants.

At the end of the day after spot cleaning with sodium hypochlorite solution, the operating lights, all the furniture and equipment, including diathermy, suction, anaesthetic equipment and the operating table should be cleaned with warm water and detergent and dried thoroughly. The floor should be mopped with warm water and detergent after spot cleaning with 0.1 per cent sodium hypochlorite solution.

**From RACS appendix IX Creutzfeldt-Jacob Disease (page 59 RACS “Infection Control in Surgery”**

**Occupational risk of transmission**

The occupational risk of CJD transmission of health workers, according to current knowledge, is considered to be low. Twenty-four highly suspect cases of health workers who have contracted the disease have been reported: in six of these (table 1) valid data for supposing professional transmission has been revealed.

Table 1

Age	Sex	Profession	Time of onset (years)	Bibliographical references
54	M	Neurosurgeon	7	Schoene 1981
62	F	Histopathology technician	11 or 16	Miller 1988
74	M	Histopathology technician	19	Stirwell 1988
70	M	Neuropathologist	?	Gorman 1992
58	M	Pathologist	31	Berger 1993
55	M	Orthopaedic surgeon	20 or 24	Weber 1993

## Appendix 7: Material copied directly from the Creutzfeldt-Jacob Disease Surveillance Unit, Edinburgh

### Chemicals used for deactivating CJD

#### 1. Sodium hypochlorite

- Requires a dilution yielding 20,000 ppm available chlorine [i.e. 1:4].
- Must not be used on surfaces — pungent fumes.
- Corrodes metal and steel — do not use on Envair cabinet [max only 5,000 ppm].
- Incompatible with formaldehyde, alcohols and acids — explosive.
- Can be used for disinfecting glassware in container in Wenvair cabinet.
- Concentrated stock dilutions last for only 2-3 weeks approx.
- Diluted solutions very unstable and should be made up daily.

#### 2. Sodium hydroxide

- Use as 2M sodium hydroxide [80g in 1 litre].
- Must not be used on aluminium or zinc.
- Suitable on all forms of steel and can be used in Envair hood [4% for max 4 hours].
- Will not cause fumes but corrosive to body tissue. Irritant and harmful as dust.

#### *To make solution*

Exothermic reaction — make up with caution in the Envair cabinet wearing protective clothing and cool the glass container in cold water.

#### 3. Formic acid

- L — 90% solution required — 1 hour.
- Used for deactivating tissue.
- Pungent and irritating vapour – use in fume cupboard.
- Can be disposed of down stainless steel sink with plenty of running water.

#### COSHH ASSESSMENT (*Equivalent of NZ MOSHH approved code of practice*)

*Sodium hypochlorite* Caustic, irritating, pungent fumes.

*Sodium hydroxide* Short exposure represents minimum risk.

*Formic acid* Short duration of exposure unlikely to represent hazard.

L. McCardle  
Chief MLSO  
May 1998

### **Protocol for laboratory management of human spongiform encephalopathies**

1. Experience suggests that the Creutzfeldt-Jakob disease (CJD) agent is transmitted to humans only by ingestion, inoculation or transplantation, and that infection by the usual route of aerosol or surface contact is not a serious risk.

2. CJD is currently in Hazard Group 3\* (ACDP Guidelines). Eye protection and gloves are specified in the code that required a high standard of safe working.

3. It is known that infectivity of the agent is reduced, but not abolished, by:

- Boiling water
- 10% formalin
- 70% alcohol
- 100% ethanol
- 15% phenol in formalin
- 12% gluteraldehyde
- Hydrogen peroxide
- Ionising radiation
- Ultraviolet radiation
- Nucleases
- Proteases
- Dry heat up to 360°C

4. Formalin fixed tissue is not rendered safe by autoclaving

5. Agents thought to be effective:-

- Porous load steam autoclave –
  - 134°C (+41°C) for 18 mins.
- Gravity displacement steam autoclave –
  - 134°C (+41°C) for 1 hour incineration
- Sodium hypochlorite (20,000 ppm available chlorine) –
  - Highly corrosive to metal, unstable and irritant 96% formic acid –
  - Pungent and irritant vapour, use in fume cupboard
- 2M sodium hydroxide –
  - Caustic and exothermic on making up

6) All fresh and fixed CJD tissues, including brain, are handled in a dedicated laboratory.

a) If previously undiagnosed case of CJD is discovered amongst routine neuropathology cases, all material relevant to the case is immediately transferred to the dedicated laboratory, and an attempt is made as far as possible to disinfect the equipment used in processing that case (see below).

b) All tissues are transported to the laboratory in suitable containers,



double wrapped, and labelled “Risk of Infection”. No material should leave the laboratory or the unit until it is rendered safe.

7) The dedicated laboratory includes -

- Security entrance and alarm system
- Double door entry
- Class B1 cabinet
  - With secondary HEPA filters. Used filters to be incinerated.
  - Gravity displacement autoclave (capable of maintaining steam at 136°C).
  - Enclosed tissue processor.
- Cryostat
- Embedding station
- Centrifuge
- Cytospin
- Macro Photographic set up
- Wash-hand basin and first aid station
- Intercom and phone

### **Work practice protocols**

#### **1) Entry**

a) Entry to the laboratory is restricted to authorised personnel who wear appropriate protective clothing. This includes:

- i) Disposable gown;
- ii) Gloves; and
- iii) Eye protection.

b) Staff visiting to undertake maintenance and repair work should be similarly protected and only admitted with permit-to-work authorisation.

#### **2) Handling of fixed brain and tissues**

a) Fixed brain and tissues should be sliced or trimmed in Class 1 cabinet using chain mail gloves and disposable instruments when possible.

b) The cutting board should be on a non-permeable but disposable protective sheet.

c) Blocks selected in Class 1 cabinet (according to CJD tissue selection protocol)

d) Blocks decontaminated in 96% formic acid for one hour.

e) Blocks loaded into enclosed tissue processor.

- f) Blocks embedded at embedding station.
- g) Sections cut on Microtome using a disposable blade (hands to be protected with chain mail gloves when cutting blocks that have not been decontaminated with formic acid).
- h) Sections stained and mounted.
- i) Sections not decontaminated with formic acid will be de-waxed (in staining jars not part of routine set-up) and immersed in 96% formic acid for 5 minutes before using staining set-up (to prevent contamination of staining fluids).
- j) Prepared slides leave the containment laboratory through a hatch to histology room where microscopy, microphotography and slide storage take place.
- k) Residue of fixed brains and tissues (in formalin) and paraffin blocks (in boxes) are stored in a dedicated room without the laboratory (because of formalin fumes) but within the laboratory unit.

**3) Frozen tissue samples**

- a) Tissues stored in dedicated -70°C freezer (labelled “Risk of Infection”).
- b) Cryostat sections stained in coplin jars used exclusively for frozen sections, in Class 1 cabinet.

**4) Fluid samples (blood, CSF)**

- a) Centrifugation and cytospin preparations in dedicated laboratory (in Class 1 cabinet when possible).
- b) Slide preparations stained in Class 1 cabinet as above.
- c) Frozen samples stored in dedicated -70°C freezer.

**5) Decontamination**

- a) Both Class 1 cabinets to be wiped down with 2M sodium hydroxide for 1 hour.
- b) Do not use 20,000 ppm sodium hypochlorite in cabinets.
- c) Work surfaces to be wiped down with 2M sodium hydroxide for 1 hour. NB: do not use on aluminium or zinc.
- d) All tissue to be immersed in 96% formic acid for 1 hour (unless it has been exposed to phenol).
- e) Paraffin sections from blocks not previously decontaminated to be immersed in 96% formic acid for 5 minutes after de-waxing (except those that have been phenolised).
- f) Glassware can be decontaminated by immersion in sodium hypochlorite (20,000 ppm free chlorine).

g) Most non-disposable items are autoclaved (gravity displacement 136°C for two consecutive cycles of 36 minutes each).

**6) Disposal of waste by incineration**

a) Contaminated fluids: (to be absorbed in sawdust and contained in bin and double bagged).

i) Formalin that the tissue was received in.

ii) Xylene and alcohol used for de-waxing sections that required immersion in formic acid.

iii) Stains used for cryostat and fluid samples.

b) Contaminated instruments and other disposable items e.g. clothing, specimen jars.

c) Contaminated sharps: (Enclose in appropriated sealable container).

d) Outer bag to be closed with hospital tag and taken by designated member of staff to locked container within the hospital grounds.

**7) Disposal of non-contaminated fluids**

a) Remaining non-contaminated fluids to be disposed to general drainage. Fluids to be flushed with plentiful running tap water.

i) **NB: Wax, xylene and chloroform cannot go down drain — to be incinerated.**

**8) Accidents**

a) Careful practice must be maintained to avoid accidents, including use of chain mail gloves when cutting sections. All injuries should be thoroughly washed and cleansed using the first aid facilities.

b) All accidents recorded in a book maintained for this purpose and reported to the head of the department or the laboratory manager.

**References and guidelines**

1. Advisory Committee on Dangerous Pathogens. *Categorisation of pathogens according to hazard and categories of containment*. HMSO. Second edition 1990.
2. *Advisory group on the management of patients with spongiform encephalopathy* (Creutzfeldt-Jakob Disease, CJD) HMSO 1981.
3. Brown et al. 1986. Newer data on the inactivation of scrapie virus or Creutzfeldt-Jakob disease virus in brain tissue. *Journal of Infectious Diseases*, 153:1145-1148.
4. Taylor DM 1989. Phenolised formalin may not inactivate Creutzfeldt-Jakob disease infectivity. *Neuropath. Applied Neurobiol.* 1989; 15: 585-586.

5. Brown P et al. A simple and effective method for inactivating virus infectivity in formalin fixed tissue samples from patients with Creutzfeldt-Jakob disease. *Neurology* 1990; 40: 887-890.

6. *Safe working and the prevention of infection in the mortuary and post-mortem room.* HSAC 1991 HMSO.

Dr Jeanne E. Bell

Dr James Ironside

Mrs L. McCardle

1997