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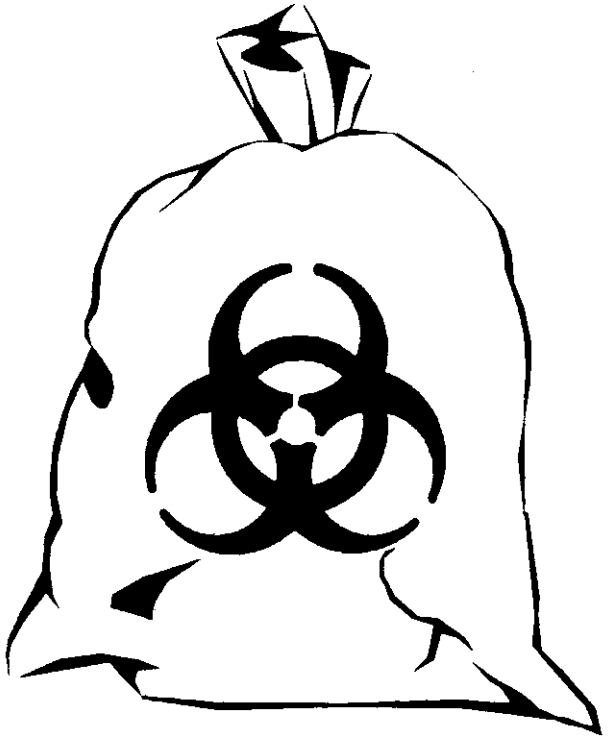
Guidelines for the Management of Biomedical Waste in Canada



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Guidelines for the Management of Biomedical Waste in Canada

Prepared by the
Canadian Standards Association

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for the

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Environmental Protection
Conservation and Protection
Environment Canada

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Readers' Comments

Readers who wish to comment on the contents of this report should address their comments to:

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Ce rapport est aussi disponible en français sous le titre "Lignes directrices sur la gestion des déchets biomédicaux au Canada", à l'adresse ci-dessous.

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Preface

The Canadian Council of Ministers of the Environment (CCME) has worked on developing minimum national standards for handling, treating and disposing of wastes. As well as producing guidelines for incinerators and landfills, CCME is also targeting important waste types, such as used oil and biomedical waste.

In 1989, CCME set out to address the significant differences in regulating and managing biomedical waste across Canada through the development of these national guidelines. At present, many different definitions for biomedical waste or infectious waste are used across Canada. This has resulted in different waste management practices among and within the provinces and territories, and different recommended practices for waste treatment and disposal.

Most Canadian jurisdictions have prepared or are considering preparing guidelines or regulations dealing with the management of biomedical waste. These activities are briefly summarized in Appendix A. The diversity of these activities clearly indicates a need to seek consistent national solutions to the same problems. While some regional differences may be justified, a single uniform approach to the problem would considerably benefit the Canadian health care system, both practically and in terms of regulations.

In order to achieve a consensus on minimum national standards for managing biomedical waste in Canada, CCME formed a working group consisting of members from New Brunswick, Quebec, Ontario, Saskatchewan, Alberta, British Columbia, and Environment Canada. This working group commissioned CSA to complete a draft guideline that was circulated for input to members of CCME and to the major stakeholders in the health care industry. The revised guidelines were then approved by all members of CCME as minimum national standards.

These guidelines will be the basis from which some provinces will create biomedical waste regulations. Other provinces have comparable or more stringent standards already in place. The intent of the guidelines is to promote uniform practices and set minimum national standards for managing biomedical waste in Canada.

Avant-propos

Le Conseil canadien des ministres de l'environnement (CCME) a travaillé à l'élaboration de normes nationales minimales concernant la manutention, le traitement et l'élimination des déchets. En plus de préparer des lignes directrices concernant les incinérateurs et les décharges, le CCME prévoit également s'attaquer à des catégories importantes de déchets, comme les huiles usées et les déchets biomédicaux.

En 1989, le CCME a résolu d'éliminer les différences significatives dans la réglementation et la gestion des déchets biomédicaux au Canada en élaborant les présentes lignes directrices nationales. À l'heure actuelle, il y a de nombreuses définitions différentes des déchets biomédicaux et des déchets infectieux au Canada. Les pratiques en matière de gestion des déchets sont donc différentes dans les différentes provinces et territoires, tout comme le sont les pratiques recommandées en matières de traitement et d'élimination des déchets.

La plupart de provinces et territoires canadiens ont préparé ou envisagent de préparer des lignes directrices ou une réglementation concernant la gestion des déchets biomédicaux. L'annexe A résume brièvement ces activités. La diversité de ces activités indique clairement qu'il faut rechercher des solutions nationales uniformes à des problèmes identiques. On peut justifier certaines différences à l'échelle régionale, mais le système canadien de soins de santé tirerait des avantages indéniables d'une approche uniforme à ce problème, tant sur le plan pratique que sur le plan de la réglementation.

Dans le but d'obtenir un consensus sur des normes nationales minimales en matière de gestion des déchets biomédicaux au Canada, le CCME a mis sur pied un groupe de travail formé de membres du Nouveau-Brunswick, du Québec, de l'Ontario, de la Saskatchewan, de l'Alberta, de la Colombie-Britannique et d'Environnement Canada. Le groupe de travail a chargé la CSA de préparer des lignes directrices préliminaires qui ont été distribuées auprès des membres du CCME et des principaux intervenants dans l'industrie des soins de santé afin qu'ils y apportent leurs commentaires. Tous les membres du CCME ont alors adopté les lignes directrices révisées comme normes nationales minimales.

Ces lignes directrices serviront de document de base à certaines provinces pour élaborer leur propre réglementation en matière de gestion des déchets biomédicaux. D'autres provinces disposent déjà de normes comparables ou plus sévères. Les présentes lignes directrices ont pour objectif de promouvoir l'adoption de pratiques uniformes et d'établir des normes nationales minimales en matière de gestion des déchets biomédicaux au Canada.

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Glossary

The following are definitions of terms used in these guidelines.

Biomedical waste - See Section 2

Decontamination - This is a process that removes microorganisms from an object, rendering it safe for handling.

Disinfection - This is a process that kills most microorganisms but rarely kills all spores. The three levels of disinfection are: low level; intermediate level, and high level. Disinfectants are substances used to disinfect inanimate objects.

Field operations - These are sites or services that generate small quantities of biomedical waste. Their main activity is not waste management, but transporting biomedical waste to a local waste transfer facility could be required. Field operations occur at a location that is not: a local waste transfer facility; the primary place of business of the person undertaking the operations; or a human or animal health care facility.

Generator (Consignor) - This refers to the facility that produces the waste or serves as a local waste transfer facility.

Local waste transfer facility - This is a facility that is owned or controlled by a person undertaking field operations or a person on whose behalf field operations are being undertaken. Only waste from field operations is received at such a facility. Such waste is received, bulked, stored temporarily and transferred. This facility is used primarily for functions other than waste management.

Operator (Carrier) - This is a company or person responsible for transporting waste.

Receiver (Consignee) - This is the waste disposal site or transfer station to which waste is transported.

Sanitization - This is a process that substantially reduces bacterial count without eliminating all microbial forms.

Sterilization - This is a process that kills all microorganisms, including bacteria, viruses, spores, and fungi.

Waste Sharps - These are clinical and laboratory materials consisting of needles, syringes, blades or laboratory glass capable of causing punctures or cuts.

Section 1

Scope

These guidelines make reference in several sections to requirements that are properly part of the *Transportation of Dangerous Goods (TDG) Act and Regulations.* Amendments to the TDG Regulations involving biomedical waste have not yet been completed at the time these guidelines were printed. Users of the guidelines should consult with their provincial or territorial regulatory authorities for any updates of the TDG Regulations respecting biomedical waste (see Appendix F).

In some provinces and territories, biomedical waste is already classified as hazardous waste. In general, this classification can have important implications on how such waste is managed and particularly on how it is transported.

These guidelines recommend minimum practices to be followed in the management of biomedical waste. Provincial and territorial regulatory agencies may specify more stringent requirements. Health care facilities are strongly encouraged to use these guidelines when formulating their biomedical waste management policies.

In the context of these guidelines, "must" indicates an important requirement, and "should" indicates a recommendation. Notes in italics throughout this publication contain explanatory or informative material that is not actually part of the guidelines.

These guidelines apply to, but are not limited to, the following facilities:

- hospitals;
- nursing homes and extended care facilities;
- public health units;
- physicians' offices/clinics;
- dentists' offices/clinics;
- veterinarians' offices/clinics;
- veterinary research, teaching and health care facilities;
- medical research and teaching establishments;
- health care teaching establishments;
- clinical testing or research laboratories;
- facilities involved in the production or testing of vaccines;
- mortuaries and funeral homes;
- coroner's offices;
- nursing offices; and
- blood banks and blood collection centres.

Note: *Although not specifically listed here, other generators and handlers of biomedical waste, such as mobile health care providers, pharmacies and pharmaceutical suppliers, and police, fire, and ambulance services, are encouraged to use these guidelines in formulating their biomedical waste management policies.*

These guidelines relate to the following aspects of biomedical waste management: waste reduction; segregation; collection; containment; in-house movement; storage; transportation; disposal (both on- and off-site); and occupational health and safety issues.

These guidelines do not apply to: waste from animal husbandry; waste controlled in accordance with the *Health of Animals Act (Canada)*, formerly the *Animal Disease Protection Act (Canada)*; waste generated in the food production, general building maintenance, and office administration activities of all facilities to which these guidelines refer; and wastes arriving in Canada on international aircraft or at Canada Customs points on international shipping routes. (Agriculture Canada should be consulted in such cases.)

While these guidelines do not apply to household wastes, such wastes are referred to in the guidelines within the context of home health care of both humans and animals. See Appendix B for additional information.

In many locations within Canada, the treatment and disposal methods described in these guidelines may be limited or unavailable. Local regulatory authorities should be consulted in such situations to determine practices based upon the principles presented in these guidelines.

Section 2

Defining Biomedical Waste

2.1 General

Biomedical waste represents a small proportion (typically 10 to 15%) of the total volume of waste generated by health care facilities. Such waste requires proper handling and disposal because of environmental, aesthetic, and occupational concerns, as well as risks to human health.

While any item that has had contact with blood exudates or secretions may pose a hazard, it is not usually considered practical or necessary to treat all such waste as biomedical waste. Thus, the following items should be considered general waste: soiled dressings; sponges; surgery drapes; lavage tubes; casts; catheters; disposable pads; disposable gloves; specimen containers; lab coats and aprons; and dialysis wastes, such as tubing, filters, towels, and disposable sheets.

2.2 Definition

Reflecting the need to have a single, national definition for biomedical waste, the following definition should be used by those facilities listed in Section 1. This definition does not apply to microbiology laboratory waste, human blood and body fluid waste or waste sharps after these wastes have been disinfected or decontaminated.

Biomedical waste refers to waste that is generated by:

- human or animal health care facilities;
- medical or veterinary research and teaching establishments;
- health care teaching establishments;
- clinical testing or research laboratories; and,
- facilities involved in the production or testing of vaccines.

The following are the types of biomedical waste.

(a) Human Anatomical Waste

This consists of human tissues, organs, and body parts, but does not include teeth, hair, and nails.

(b) Animal Waste

This consists of all animal tissues, organs, body parts, carcasses, bedding, fluid blood and blood products, items saturated or dripping with blood, body fluids contaminated with blood, and body fluids removed for diagnosis or removed during surgery, treatment or autopsy, unless a trained person has certified that the waste does not contain the viruses and agents listed in Risk Group 4 (see Table 1). This excludes teeth, hair, nails, hooves, and feathers.

(c) Microbiology Laboratory Waste

This consists of laboratory cultures, stocks or specimens of microorganisms, live or attenuated vaccines, human or animal cell cultures used in research, and laboratory

material that has come into contact with any of these.

(d) Human Blood and Body Fluid Waste

This consists of human fluid blood and blood products, items saturated or dripping with blood, body fluids contaminated with blood, and body fluids removed for diagnosis during surgery, treatment or autopsy. This does not include urine or feces.

(e) Waste Sharps

Waste sharps are clinical and laboratory materials consisting of needles, syringes, blades, or laboratory glass capable of causing punctures or cuts.

Biomedical waste does not include waste that is:

- from animal husbandry;
- household in origin;
- controlled in accordance with the *Health of Animals Act (Canada)*, formerly the *Animal Disease Protection Act (Canada)*; or,
- generated in the food production, general building maintenance, and office administration activities of those facilities to which this definition applies.

Table 1 "Risk Group 4" Agents*

Bacteria	Fungi	Parasites	Viruses
None	None	None	Arenaviridae Lassa fever, Junin, Machupo viruses Bunyaviridae Genus Nairovirus Crimean-Congo hemorrhagic fever Filoviridae Marburg virus Ebola virus Flaviviridae Tickborne encephalitis complex, including - Russian Spring-Summer Encephalitis Kyasanur forest disease virus Omsk hemorrhagic fever virus Herpesviridae Alphaherpesvirinae Genus Simplexvirus: Herpes B virus (Monkey B virus) Poxviridae Genus Orthopoxvirinae Variola Monkeypox

* Risk Group 4 (high individual risk, high *community* risk)
A pathogen that usually produces very serious human or animal disease, which is often untreatable and may be readily transmitted from one individual to another, or from animal to human or vice-versa, either directly or indirectly, or by casual contact. (Health and Welfare Canada, 1990).

Section 3

Biomedical Waste Management Program

3.1 General

A written biomedical waste management program must be included in a health care facility's policy and procedure manuals. It must also be included in the facility's in-house education, occupational health and safety, and orientation programs for all employees. This program must be regularly reviewed and updated by an appropriate review committee, which includes waste handlers as members.

Note: ***The programs of individual health care facilities will vary depending on such factors as: the nature and quantity of the waste generated; the availability of equipment for treatment, on-site or off-site; the regulatory requirements applicable to the particular facility; and, the costs of waste handling and disposal.***

The health care facility must appoint a person or persons to be responsible for the biomedical waste management program. This person or persons must have suitable training and experience, relating to waste management, occupational health and safety, infection control, etc., and be aware of the hazards associated with managing biomedical waste.

Policies and procedures should be available in English and French and include the following:

(a) strategies for minimizing the quantities of biomedical waste generated and disposed of;

(b) methods of segregating, packaging, labelling, moving, storing, treating, and transporting the various waste types (both on- and off-site, as appropriate);

(c) methods for keeping records of the quantities of biomedical waste generated, treated, and disposed of;

(d) a list of all regulations and legislation concerning biomedical waste that are applicable in the facility's jurisdiction;

(e) a list of those responsible for managing biomedical waste in the event of an accident or spill; and

(f) provision for regular, ongoing staff instruction about proper handling and potential hazards of biomedical waste.

Certain basic elements must be embodied in any biomedical waste management program to ensure that biomedical waste is handled and disposed of safely and efficiently.

Health care facilities must prepare contingency plans for dealing with: the storage of refrigerated or frozen biomedical waste, if excess waste is produced; disposal facilities or equipment becoming inoperative; refrigeration or freezing facilities or equipment becoming inoperative; and the disposal of biomedical waste if disposal services are disrupted.

The effectiveness of waste disposal policies and procedures should be assessed regularly.

The assessment process should be described in the policy and procedure manuals and should reflect the quality assurance requirements used in other areas of facility management.

3.2 Reduction

The recommendations in this subsection go beyond biomedical waste and touch on other aspects of waste management in health care facilities. The principles stated herein should be applied as broadly as possible to all aspects of waste reduction.

Comprehensive waste reduction principles must be reflected in the health care facility's biomedical waste management program.

Note: *(1) Implementing waste reduction strategies leads to a source-reduction approach to waste management whereby the creation of waste is avoided and its by-products are recycled as much as possible.*

(2) In order to operate efficiently, source separation and other innovations in waste handling may require designated and appropriately designed spaces. These needs should be considered when health care facilities are being designed or renovated.

Waste management needs must be considered when planning to purchase new products or to change operational procedures, e.g., quantity and type of waste produced, disposal costs, disposal method, etc.

Waste audits should be conducted regularly to identify sources and types of waste that the health care facility generates, with a view to determining options for waste reduction.

Note: *(1) Waste audits serve to: define sources, quantities, and types of waste generated; highlight efficiencies and inefficiencies in waste management; identify aspects of waste management requiring improvement or alteration; help set targets for waste reduction; and increase employee knowledge of, and concern for, waste management.*

(2) Factors to be considered when undertaking a waste audit include identifying: those waste generators to be included in the audit; the services they provide; the types of medical and surgical supplies used, including the amount of disposable products being used; the types and volumes of waste generated; the potential for source reduction and product substitution; and the waste treatment and disposal practices followed.

Recently, the reduction of waste from health care facilities has focused on the potential replacement of medical and surgical supplies with reusable supplies. Where possible, and consistent with patient safety, replacing single-use/disposable items with reusable products should be considered. While this may be one component of a waste reduction program, product substitution, reduced product packaging, and recovering materials that can be reused or recycled should also be considered. For example, scrap dental amalgam should be recovered in dental offices and made available for re-smeltering. Silver from radiographs and mercury should also be recovered for reuse.

When products are being assessed, preference should be given to those products that are reusable, contain recycled material, or are themselves recyclable. Consideration should be given to the costs associated with product disposal and to minimizing the

amount of packaging associated with the product.

Note: *While product packaging is not a biomedical waste, if not properly segregated, it may require special handling and disposal.*

If possible, products purchased by health care facilities should bear the "EcoLogo" symbol shown in Figure 1. This is the symbol of the Environmental Choice Program, administered by Environment Canada. This program helps consumers to identify products that maximize energy efficiency and the use of recycled or recyclable materials, and minimize the use of environmentally hazardous substances. After independent third-party testing, products found to comply with the product-specific guidelines are considered environmentally responsible and can display the EcoLogo.

For further information regarding the program and approved products, contact:

Environmental Choice Program
107 Sparks Street, 2nd Floor
Ottawa, Ontario
K1A 0H3.

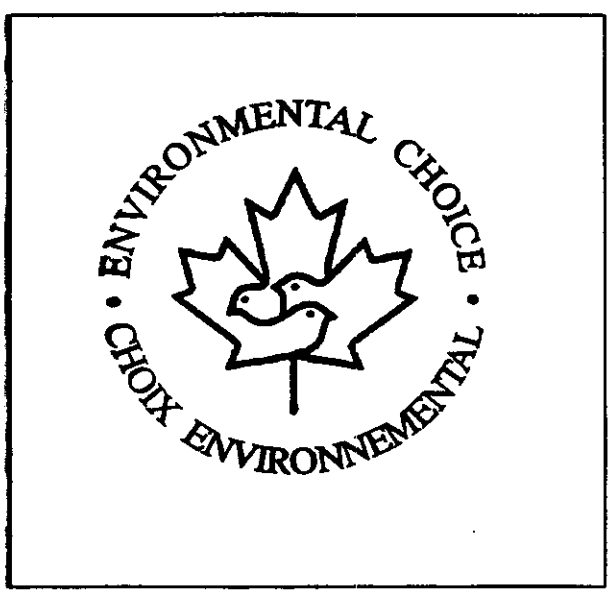

Figure 1 The Environmental Choice Program's EcoLogo

3.3 *Segregation*

Whether the method of disposal is on-site or off-site, biomedical waste must be segregated from the general wastestream. If biomedical waste is mixed with general refuse, the total wastestream would require special treatment and handling. Waste segregation relies on the waste being segregated at its point of generation and placed into appropriate waste containers. Segregation permits facilities to effectively divert those materials that are recyclable.

Biomedical waste must be segregated at the point of generation into the following waste categories: human anatomical waste; animal waste; microbiology laboratory waste; human blood and body fluid waste; and waste sharps. These types of waste are defined in Subsection 2.2.

Although not considered a biomedical waste, cytotoxic wastes and pharmaceutical wastes must also be segregated from the remainder of the wastestream. (See Appendix D for further information about cytotoxic waste.)

3.4 *Packaging*

Waste must be safely contained during handling and to the point of its disposal. The packaging must remain intact throughout handling, storage, transportation, and treatment.

When selecting packaging, the following factors should be considered: the type of

waste being contained; appropriate colour-coding and labelling (see Subsection 3.5); special transportation requirements; the method of disposal; local regulatory requirements; and requirements of the disposal facility.

To simplify their selection and use, waste containers should be classified as reusable or single-use/disposable.

3.4.1 Reusable Containers

Reusable waste containers must be made of metal or rigid plastic and able to withstand exposure to common cleaning agents. They must be colour-coded according to the type of waste for which they are intended (see Subsection 3.5); and labelled with the biohazard symbol (Figure 2).

Reusable waste containers should be inspected for holes or leaks each time they are emptied and their colour-coding and labelling renewed if necessary. Holes or leaks must be repaired or the waste container replaced.

Reusable waste containers must be cleaned regularly to prevent odours and as soon as possible if waste materials leak or spill within the containers.

The facility's infection control committee, biosafety officer, or other appointed person(s) should be consulted about the frequency of cleaning and the type of cleaning agent to be used.

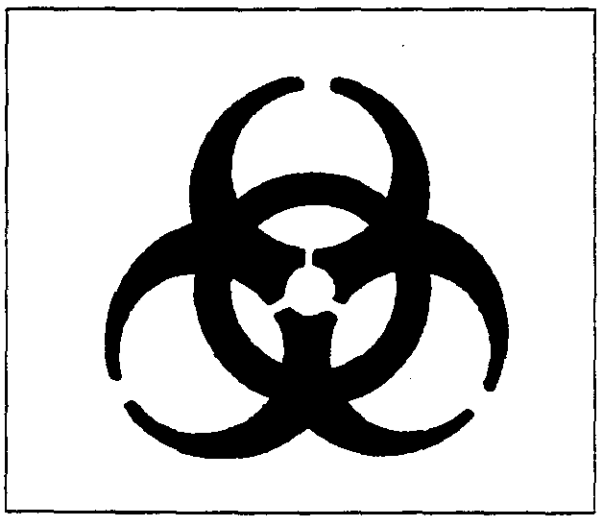

Figure 2 Biohazard Symbol

3.4.2 Single-use Containers

Single-use waste containers should be classified as one of the following types: sharps container; waste-holding plastic bag; or cardboard container.

Sharps Containers - The critical characteristic of any sharps container is that it be sturdy enough to resist puncture under conditions of use and to the point of disposal. Until a method is devised to determine this objectively, sharps containers should be tested and evaluated under actual conditions of use.

Sharps containers must also be colour-coded yellow and labelled with the biohazard symbol (see Subsection 3.5 and Figure 2); have lids that can be tightly secured; and if used for containing cytotoxic wastes, the cytotoxic hazard symbol (Figure 3) must be displayed clearly and visibly (see Appendix D).

It may also be useful to users if sharps containers have: a fill line; features permitting simplified movement and handling of filled containers before disposal; means by which unauthorized individuals are prevented from removing items from the container or from removing the container itself; a design that allows stacking, to decrease storage space; and features that allow the sharps container to be attached to medication and/or treatment carts.

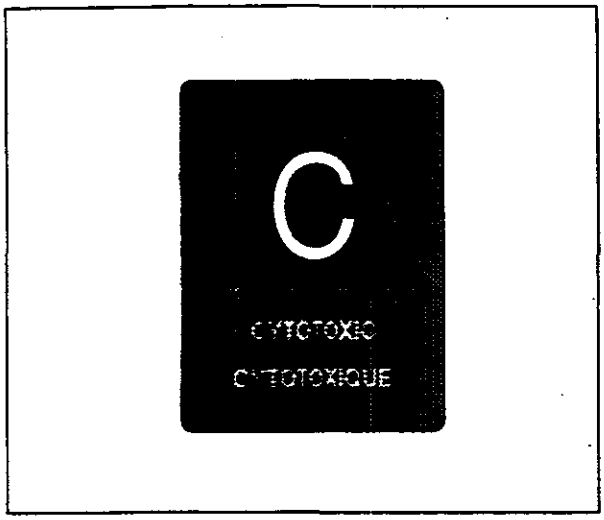

Figure 3 Cytotoxic Hazard Symbol

Note: ***If sharps containers are to be autoclaved before disposal, they must remain functionally intact at high autoclaving temperatures.***

Sharps containers should be conveniently located close to the point of disposal to reduce the likelihood of injury from sharps being carried significant distances for the purpose of disposal. Sharps containers should not be filled to more than three-quarters of their usable volume in order to prevent injuries due to overfilling. Sharps should never be forcibly pushed into the container.

Staff responsible for collecting and replacing sharps containers should be trained in proper handling methods.

During use, sharps containers should not be filled or partially filled with liquid disinfectant solution.

Note: ***Although this practice is intended to decontaminate sharps as they are placed into the container, it has the following problems:***

- *the solution rarely has the required contact with all items placed within the container, resulting in a failure to achieve the degree of decontamination intended;*
- *the liquid in the container presents a spill hazard if the container is knocked over; and,*
- *before disposal, the liquid is usually decanted, presenting an unnecessary opportunity for staff contact with aerosols.*

The use of secondhand containers, e.g., bleach and germicide bottles, for containing sharps must be formally approved by the person(s) responsible for the facility's biomedical waste management program. Such containers are only acceptable if they meet the requirements outlined in this subsection. The random, unsupervised use of secondhand sharps containers is unacceptable.

Plastic Waste-holding Bags - The critical characteristic of any plastic waste-holding bag is that it be sturdy enough to resist puncture under conditions of use and to the point of disposal. Each facility should fully test and evaluate their bags under actual conditions of use. While this may be the most appropriate method of determining the suitability of plastic waste-holding bags, if local authorities specify a minimum bag thickness, bags of that specified thickness must be used.

Note: *For the purposes of in-house collection and movement of waste, it is inappropriate to specify a minimum thickness of plastic bags or plastic sharps containers as plastic materials vary extensively in their physical and mechanical properties. A 25.4 µm thick film of one plastic material may be more resistant to puncture, impact, and abrasion than a 50.8 µm thick film*

of a different plastic material. These properties can be further affected by the manufacturing process, i.e., extrusion versus injection molding.

Plastic waste-holding bags must also be colour-coded (see Subsection 3.5) and comply with any other regulatory performance standards.

Cardboard Containers - Cardboard containers must be: colour-coded and labelled with the biohazard symbol (see Subsection 3.5 and Figure 2); rigid; closeable; leak-resistant; and capable of being sealed.

Notes: *(1) The use of cardboard containers that contain recycled fibres is encouraged.*

(2) If cardboard containers are to be shipped off-site and are not to be supplemented with an additional outer packaging meeting the requirements of the Transportation of Dangerous Goods Regulations, then the cardboard container itself must meet the requirements of the Regulations.

3.5 Colour-coding and Labelling

Containers for biomedical waste must be colour-coded as shown in Table 2 and labelled with the biohazard symbol (Figure 2). This must be implemented as part of each health care facility's biomedical waste management program.

Note: *Segregation and colour-coding of the various types of waste is vital to ensure that the wastes are handled and disposed of properly.*

Containers for biomedical waste must be colour-coded by: dyeing the entire container in the appropriate colour; encircling the outer surface of the container with a band of colour not less than 50 mm wide; or other methods acceptable to the regulatory authority.

If a sharps container is mounted in a cabinet or some other type of holder, only the actual sharps container must be colour-coded and labelled with the biohazard and cytotoxic symbols, as appropriate. The outer cabinet or holder must, however, be labelled as containing sharps, using the words "CAUTION: WASTE SHARPS", or an equivalent.

Note: *For animal waste, the requirements of the Health of Animals Act (Canada), formerly the Canada Animal Disease Protection Act (Canada), as well as any relevant provincial or territorial regulations and legislation, must be followed. Under the Act, which is administered by Agriculture Canada, communicable disease is defined as any disease that is infectious or contagious. This Act gives a veterinary inspector the power to order persons having possession, care or custody of an animal that dies and is suspected of having died of a communicable disease or is destroyed because of infection by such disease, to dispose of the carcass in such a manner as the veterinary inspector specifies.*

3.6 In-house Movement of Wastes

The handling and transport of waste containers should be minimized to reduce the likelihood of exposure to the waste.

Note: *From their point of generation, wastes are moved within the facility to storage areas to await disposal. Wastes should be moved through the facility in such a manner as to prevent unnecessary exposure to staff and others.*

Table 2 Colour-coding of Waste Containers by Waste Type

Waste Type	Colour-coding
Human Anatomical	RED
Animal Waste	ORANGE
Microbiology Laboratory Waste	YELLOW
Human Blood and Body Fluid Waste (if applicable)	YELLOW
Waste Sharps	YELLOW

Careful selection of waste containers greatly reduces the likelihood of breakage and leakage during use. In anticipation of such accidents occurring, however, a material-handling system should be devised to minimize the possibility of inadvertent exposure by limiting the amount of handling. Specific routes must be planned through the facility to minimize the passage of loaded carts through patient care and other clean areas.

To minimize the possibility of waste handlers incurring injuries while handling filled waste containers, the facility's health and safety committee or other appointed person(s) should establish size and weight criteria for the waste loads.

Carts used for moving biomedical waste through the health care facility should be designed to prevent spills, and made of materials able to withstand exposure to common cleaning agents. The biohazard symbol should be clearly displayed on these carts (Figure 2).

These carts must be thoroughly cleaned before any maintenance work is performed on them. They should be cleaned regularly to prevent odours and as soon as possible if waste materials leak or spill in the carts.

The facility's infection control committee, biosafety officer, or other appointed person(s) should be consulted about the frequency of cleaning and the type of cleaning agent to be used.

3.7 Storage

After biomedical waste has been collected and moved from its point of generation, it may be held in storage areas to await disposal. These storage areas must be totally enclosed, and separate from supply rooms or food preparation areas. They must be lockable and access must be restricted to authorized personnel. Storage areas must be identified as containing biomedical waste, with the biohazard symbol clearly displayed. It is unacceptable for materials other than waste to be placed in the same storage area as biomedical waste.

Floors, walls, and ceilings of storage areas must be thoroughly cleaned in accordance with the facility's established procedures. These procedures should be prepared in consultation with the facility's infection control committee, biosafety officer, or other appointed person(s).

Anatomical wastes must be stored at 4°C or lower. All biomedical waste must be refrigerated at 4°C or lower if stored for more than four days. Provincial or territorial regulatory authorities should be consulted for specific time requirements, as the recommended four-day limit may vary among jurisdictions. Health care facilities should determine the maximum storage time of refrigerated or frozen biomedical waste based upon its storage capacity, rate of waste generation, and any applicable provincial or territorial regulatory requirements.

Facilities refrigerating or freezing stored waste should use a lockable, closed cold storage facility or a lockable, domestic type freezer unit. Either type must be used only for storing biomedical waste, visibly display the biohazard symbol, and be identified as containing biomedical waste.

It the health care facility generates only waste sharps, waste storage areas need not be refrigerated.

Note: *While both refrigeration and freezing serve to reduce the rate of microbial growth and putrefaction, caution should be exercised when freezing waste containing glass or plastic items that may contain infectious agents, e.g., culture tubes. Such glass or plastic items may fracture at lowered temperatures.*

Contingency plans must be prepared for storing refrigerated biomedical waste if excess waste is produced, or if either refrigeration or disposal facilities or equipment become inoperative.

The compaction of untreated biomedical waste destined for off-site disposal is not permitted.

Note: *The compaction of biomedical waste is potentially hazardous to staff as containers could burst or leak and sharps could protrude through containers. Furthermore, compaction of untreated biomedical waste may also aerosolize infectious agents.*

Section 4

Treatment Options for Biomedical Waste

The appropriate treatment options for the different types of biomedical waste are summarized in Table 3.

Note: *The treatment options described in these guidelines may vary among provinces and territories. Local environmental regulatory authorities should be consulted for acceptable practices based upon the principles presented in these guidelines.*

4.1 Steam Autoclaving

Steam autoclaving is an appropriate method for treating microbiology laboratory waste, human blood and body fluid waste (if applicable), waste sharps, and non-anatomical animal wastes. It must not be used for treating either human or animal anatomical waste.

Table 3 Summary of Treatment Options for Biomedical Waste

Waste Type		Steam Autoclaving	Chemical Decontamination	New Technology
Human Anatomical Waste		No	No	Regulatory Approval Required
Animal Waste	Anatomical	No	No	Regulatory Approval Required
	Non-anatomical	Yes*	No	Regulatory Approval Required
Microbiology Laboratory Waste		Yes	Regulatory Approval Required	Regulatory Approval Required
Human Blood and Body Fluid Waste		Yes	Yes	Regulatory Approval Required
Waste Sharps		Yes	Yes**	Regulatory Approval Required

* Only if followed by incineration under strict control.

** Chemical treatment alone does not render sharps safe for additional handling. This treatment option applies to filled sharps containers that may undergo further treatment after chemical decontamination, as part of a process, e.g., chemical decontamination coupled with mechanical shredding.

Personnel who operate steam autoclaves must be thoroughly trained in the use of the equipment. Specific guidelines and regulated requirements for operating and using autoclaves already exist in some provinces and territories. (Ontario Ministry of Health, 1984; CSA, 1984a; CSA, 1984b; CSA, 1987).

The effectiveness of decontamination of biomedical waste is dependent upon the temperature to which the waste is subjected as well as the length of time it is exposed to steam. Because the waste is heated by both steam penetration and heat conduction, all air must be displaced and containers holding the waste must have good steam permeability.

Note: *(1) Typical operating conditions for decontamination are a temperature of at least 121°C at a pressure of 105 kPa (15 lbs/in^2) for more than 60 minutes.*

(2) Laboratory wastes, such as Petri dishes and syringes that are liable to melt and trap air or liquids, may require longer sterilization times.

The penetration of steam into the waste is crucial to the effectiveness of the autoclaving process. For this reason, particular attention must be given to packaging to ensure effective steam penetration.

Special consideration must be given to the type of plastic bags used within the autoclave. Some bags impede steam penetration while others may melt during the autoclave cycle. Plastic bags should therefore be assessed under actual working conditions to assure their effectiveness and integrity throughout the autoclave cycle.

The effectiveness of decontamination is also affected by the volume and size of the waste load in the autoclave. For small-capacity laboratory autoclaves, two separate small loads may be more effective for treatment than a single larger load. Also, since there is no "standard load" for an autoclave, the operator may need to adjust to the autoclaving parameters. As with other treatment technologies, proper operation of the autoclave is essential to its effectiveness.

To monitor the effectiveness of the autoclaving cycle, either chemical indicators or biological indicators are typically used. Chemical indicators are not recommended, however, as they indicate only the attainment of a temperature, not its duration. Biological indicators, such as the presence of *Bacillus stearothermophilus*, are typically found to be more reliable. The effectiveness of the autoclave should be verified regularly, based on its frequency of use.

The facility should keep records of the time, temperature, and pressure to which each load of decontaminated waste is subjected as evidence that the load has been treated. Such records may be useful if landfill operators require a certificate, signed by an official of the waste generator, stating that the waste has been treated in a steam autoclave. Records must also be kept of routine preventative maintenance and problem maintenance for the steam autoclave. These records must be available at all times.

Wastes containing cytotoxic agents, such as chemotherapy drugs and other chemical wastes, must not be subjected to autoclaving. Such wastes are not degraded at normal autoclave temperatures. (See Appendix D for more information.)

4.2 *Chemical Decontamination*

Chemical decontamination may be appropriate for treating microbiology laboratory waste, (regulatory approval required), human blood and body fluid waste (if applicable), and waste sharps. It must not be used for treating anatomical waste.

Note: *(1) Chemical decontamination is most often applied to liquid wastes before disposal. It may be useful in decontaminating spills when they occur.*

(2) Chemical treatment alone does not render sharps safe for additional handling. This treatment option applies to filled sharps containers that may undergo further treatment after chemical decontamination as part of a process, e.g., chemical decontamination coupled with mechanical shredding.

If chemical decontamination is used, the following factors should be considered: type of microorganism; degree of contamination; type of disinfectant used; and concentration and quantity of disinfectant. Other relevant factors include temperature, pH, degree of mixing, and the length of time the disinfectant is in contact with the contaminated waste.

Sodium hypochlorite (household bleach) is often used as an intermediate-level disinfectant, with the undiluted commercial product normally being a 5.25% solution of sodium hypochlorite (50 000 mg/L of free available chlorine). If a diluted hypochlorite solution is used, it should be made up daily to prevent loss of germicidal action.

Note: *A 5000 mg/L (5000 ppm) sodium hypochlorite solution (1:10 dilution) is recommended for disinfecting blood spills and soiled equipment.*

Records of the chemical decontamination protocol to which each load of waste was subjected should be kept by the facility as evidence that the load has been treated. Such records may be useful if landfill operators require a certificate, signed by an official of the waste generating facility, stating that the waste has been appropriately treated.

The disposal of chemically treated waste must comply with applicable federal, provincial or territorial, and municipal regulations.

4.3 *New Technology*

Innovative, new techniques may be used for treating biomedical waste, subject to the approval of provincial or territorial regulatory authorities. Health care facilities should consult these authorities before purchasing products or implementing new approaches to waste treatment.

Section 5

Disposal of Biomedical Waste

5.1 Disposal Options

Disposal options for the different types of untreated biomedical waste are summarized in Table 4.

Note: *In many locations in Canada, the treatment and disposal methods described in these guidelines may be limited or unavailable. Local environmental regulatory authorities should be consulted in such situations on appropriate practices based upon the principles presented in these guidelines.*

5.1.1 Landfill

It is technically acceptable to dispose of some types of decontaminated biomedical waste in a landfill.

The following are recommended protocols for the handling of decontaminated biomedical wastes at landfill sites. In some locations in Canada, local regulatory authorities or landfill operators may specify more stringent standards.

(a) The generator should prearrange with the landfill site operator such specific details

Table 4 Summary of Disposal Options for Untreated Biomedical Waste

Waste Type	Landfill	Sanitary Sewer	Incinerator	New Technology
Human Anatomical Waste	No	No	Yes	Regulatory Approval Required
Animal Waste	No	No	Yes	Regulatory Approval Required
Microbiology Laboratory Waste	No*	No*	Yes	Regulatory Approval Required
Human Blood and Body Fluids	No	If Permitted by Regulatory Authorities	Yes	Regulatory Approval Required
Waste Sharps	No*	No	Yes	Regulatory Approval Required

* Microbiology laboratory waste and waste sharps can be disposed of in this way if they are first decontaminated by a treatment process deemed to be acceptable by the local authority.

as time of delivery, volume of waste, evidence of treatment, etc.

(b) Decontaminated microbiology laboratory waste, or decontaminated waste sharps should be buried immediately upon receipt or following a schedule designated by the authority with jurisdiction.

(c) To prevent direct contact with compaction equipment or other equipment operating at the surface, the wastes should be covered with either earth or other waste at the site.

If requested, the generator should provide information to the landfill operator and other staff, about the nature and handling of decontaminated microbiology laboratory waste or decontaminated waste sharps. Such information may include where the waste was generated, what treatment it has undergone, and the quantities of waste generated. Human anatomical waste and animal waste must not be disposed of in a sanitary landfill.

5.1.2 Sanitary Sewer

The sanitary sewer system is an acceptable method of disposal for untreated fluid blood, suctioned fluids, excretions and secretions. Due to variations in provincial, territorial, and municipal guidelines and regulations, however, the appropriate regulatory authorities should be contacted to ensure that this practice is acceptable.

Fluids associated with the six exotic communicable diseases (ECDs) listed by Health and Welfare Canada require special handling. These diseases are: Lassa fever; Marburg virus disease; Ebola virus disease; the two South American hemorrhagic fevers - Junin and Machupo; and the Crimean-Congo hemorrhagic fever. Because of the potential infectivity of the agents causing these diseases, and their relatively high case-fatality rates, wastes contaminated by these diseases should be managed in consultation with the Laboratory Centre for Disease Control, Health and Welfare Canada (Health and Welfare, 1988 to 1991).

Microbiology laboratory waste consisting of: laboratory cultures; stocks or specimens of microorganisms; live or attenuated vaccines; human or animal cell cultures used in research; and laboratory material that has come into contact with the above, must be autoclaved or subjected to other treatment technologies considered acceptable to the regulatory authority before disposal to the sanitary sewer system.

Solid wastes must not be ground and then flushed into the sanitary sewer as aerosols can be produced and sewer lines may become clogged.

Liquid wastes, if they are not being disposed to a sanitary sewer after appropriate treatment (if applicable), should be placed in leak-proof containers before treatment and/or disposal. Liquid wastes contained in this way must not be disposed to landfill as sanitary landfills are not designed to accept waste liquids.

5.1.3 Incineration

In Table 5, stack discharge limits are given for new incinerators with a charging capacity of less than 200 kg/hr or existing incinerators, regardless of capacity, that are used to process biomedical waste. In Table 6, stack discharge limits are given for new incinerators with a charging capacity of more than 200 kg/hr that are used to destroy biomedical waste. It has been shown that maintaining emission concentrations within these limits for the selected contaminants

Table 5 CCME Stack Discharge Limits (@ 11% O_2) For New Incinerators With a Charging Capacity of Less Than or Equal to 200 kg/h or Existing Incinerators Regardless of Capacity

Contaminant	Limit	Monitoring Method/ Averaging Time
Particulate Matter	50 mg/Rm^3	As specified by the regulatory agency
Hydrogen Chloride (HCl)	75 mg/Rm^3 (50 ppmdv)	As specified by the regulatory agency

Rm^3: Reference cubic metre, i.e., the volume of gas at 25°C and 101.3 kPa
ppmdv: parts per million dry volume

(Table adapted from CCREM, 1988)

should result in low emissions for a number of other contaminants.

Provincial or territorial regulatory authorities issue requirements for many aspects of incinerator operation and emissions. These authorities should be consulted for any additional requirements.

Note: *(1) Incineration is a process whereby combustible materials are converted into non-combustible residue or ash, achieving a reduction of 90% by volume or 75% by weight when the incinerator is properly operated. Incineration has traditionally been the principal method used by health care facilities to process their anatomical and non-anatomical biomedical wastes. To date, incineration is the only disposal technology proven to be capable of handling all components of the biomedical wastestream.*

(2) To meet the stack discharge limits presented in Tables 5 and 6, scrubber systems are required.

If crematoria incinerators are used to destroy biomedical waste, they can be used only to dispose of anatomical wastes. Crematoria incinerators are not required to meet the stack discharge limits stated in Tables 5 and 6. Provincial or territorial regulatory authorities should be consulted for the appropriate operating criteria.

To ensure the proper functioning and operation of an incinerator for biomedical waste, staff responsible for the incinerator should be trained in all aspects of incinerator operation. The appropriate incinerator should be selected, i.e., proper design, construction, controls, and instrumentation, and the incinerator should undergo regular maintenance.

The charging capacity of the incinerator should not be exceeded, and when incinerating wastes with a high moisture content, supplementary fuel may be required to assure that necessary temperatures are attained and destruction is efficient.

Residues of incinerator ash normally discarded to sanitary landfill must pass the leachate extraction test as described in CGSB (1987), or its equivalent, (e.g., Ontario Regulation 309, Leachate Extraction

Table 6 CCME Stack Discharge Limits (@ 11% O_2) For New Incinerators With a Charging Capacity Exceeding 200 kg/h

Contaminant	Limit	Monitoring Method/ Averaging Time
Particulate Matter	20 mg/Rm^3	As specified by the regulatory agency
Hydrogen Chloride (HCl)	75 mg/Rm^3 (50 ppmdv)	Continuous Emission Monitor - 24 hour Rolling Average
Carbon Monoxide (CO)	57 mg/Rm^3 (50 ppmdv)	Continuous Emission Monitor - 4 hour Rolling Average
Total polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans	0.5 ng/Rm^3* (Toxic Equivalency Factor New International Method)	As specified by the regulatory agency

* Based upon congener-specific analytical test data; however, if only homologue test data are available, then the most conservative (largest) equivalency factor should be applied.

Rm^3: Reference cubic metre, i.e., the volume of gas at 25°C and 101.3 kPa
ppmdv: parts per million dry volume

(Table adapted from CCREM, 1988)

Procedure), as prescribed in the *Transportation of Dangerous Goods Regulations* or provincial or territorial regulatory requirements. Fly ash and bottom ash must be tested independently and must not be mixed before testing. Ash residues that fail the leachate extraction test must be managed as hazardous waste.

5.2 *Disposal According to Type of Waste*

5.2.1 Human Anatomical Waste

Human anatomical waste, consisting of human tissues, organs, and body parts, but excluding teeth, hair, and nails, must be incinerated in a biomedical waste incinerator meeting the stack discharge limits shown in Table 5 or 6 as appropriate; or destroyed in a crematorium incinerator.

Note: *For religious or ethical reasons, human anatomical waste consisting of organs or body parts may in some cases be buried with human remains in a cemetery.*

5.2.2 Animal Waste

Most animal waste, with the exception of teeth, hair, nails, hooves, and feathers, should be incinerated in a biomedical waste incinerator that meets the stack discharge limits shown in Table 5 or 6, as appropriate. This includes all animal tissues, organs, body parts, carcasses, bedding, fluid blood and blood products, items saturated or dripping with blood, body fluids

contaminated with blood, and body fluids removed for diagnosis or removed during surgery, treatment or autopsy, unless a trained person certifies that the waste does not contain the viruses and agents listed in Table 1.

Note: *When animal waste is managed under the Health of Animals Act (Canada), formerly the Animal Disease Protection Act (Canada), the attending inspector designated under the Act has the authority to require disposal by a means other than incineration.*

5.2.3 Microbiology Laboratory Waste

Microbiology laboratory waste consisting of laboratory cultures, stocks or specimens of microorganisms; live or attenuated vaccines; human or animal cell cultures used in research; and laboratory material that has come into contact with the above, must be incinerated, autoclaved, or subjected to other treatment technologies considered acceptable to the regulatory authority.

5.2.4 Human Blood and Body Fluid Waste

Except for those wastes associated with the exotic communicable diseases, fluid human blood and blood products, body fluids contaminated with blood, and body fluids removed for diagnosis or removed during surgery, treatment or autopsy, but excluding urine or feces, if allowed to be disposed to the sanitary sewer, should be carefully poured down a drain connected to the sewer. These wastes need not undergo special treatment before disposal unless required by local regulatory authorities. These authorities should be contacted to ensure that this practice is acceptable.

When handling these fluids, care must be taken to eliminate spills and the formation of aerosols. At no time should these fluids be disposed of to the storm sewer.

Fluids associated with the six exotic communicable diseases (ECDs) listed by Health and Welfare Canada require special handling. These diseases are: Lassa fever; Marburg virus disease; Ebola virus disease; the two South American hemorrhagic fevers - Junin and Machupo; and the Crimean-Congo hemorrhagic fever. Because of the potential infectivity of the agents causing these diseases, and their relatively high case-fatality rates, wastes contaminated by these diseases should be managed in consultation with the Laboratory Centre for Disease Control, Health and Welfare Canada (Health and Welfare Canada, 1988 to 1991).

Waste materials saturated or dripping with blood must be incinerated, autoclaved, or subjected to other treatment technologies considered acceptable to the regulatory authority.

Notes: *(1) Typical items to which this requirement may apply include disposable surgical drapes and surgical gowns, sponges, dressings, etc. that are saturated or dripping with blood.*

(2) Materials saturated with blood but intended for reuse may be laundered or reprocessed; they should not be considered waste.

If human blood and body fluid waste is incinerated, it must be contained such that the outer packaging is colour-coded yellow and bears the biohazard symbol. Liquid wastes contained in this way must not be disposed to landfill as sanitary landfills are not designed to accept waste liquids.

5.2.5 *Waste Sharps*

Clinical and laboratory materials consisting of needles, syringes, blades, or laboratory glass capable of causing punctures or cuts (referred to as waste sharps), must be incinerated, autoclaved, or subjected to other treatment technologies considered acceptable to the regulatory authority. When autoclaved, sharps containers must remain functionally intact at high autoclaving temperatures.

Section 6

Transportation of Biomedical Waste

6.1 General

The handling, offering for transport, and transport of biomedical waste must comply with the requirements of the *Transportation of Dangerous Goods Act and Regulations* and applicable provincial or territorial waste transportation legislation.

6.2 Driver Training

Note: *Driver training requirements may vary among the provinces and territories. Local regulatory authorities should be consulted for any different or additional requirements.*

Drivers of vehicles transporting biomedical waste must be trained by their employers, and the training updated periodically. This training must cover the following areas:

(a) operation and basic maintenance of all vehicles and equipment the driver may use;

(b) proper loading, unloading, and cleaning procedures;

(c) relevant legislation, such as requirements for packaging, safety markings, documentation, vehicle requirements, and the classification of the waste;

(d) the nature and characteristics of the waste, including personal and community health risks;

(e) emergency response procedures, including what to do in the event of an accident or spill, reporting requirements, and the operation and purpose of any emergency equipment on the vehicle;

(f) relevant provincial or territorial legislation concerning waste transportation and spills; and,

(g) other considerations specific to the type of biomedical waste being transported.

The driver must be issued a certificate of training when training has been completed. Anyone who has not received a certificate of training must not operate a biomedical waste transportation vehicle unless under the direct supervision of a trained driver.

Note: *In some provinces or territories, an untrained person is not permitted to operate a biomedical waste transportation vehicle even under the direct supervision of a trained driver.*

6.3 Generator Registration

Generators of biomedical waste must meet the applicable provincial or territorial registration requirements.

Note: *The facility can use waste generation information to keep track of its waste production and thus the cost of waste handling and disposal. Regulatory officials can use this information to determine the quantity of waste generated and appropriate strategies to deal with the waste.*

6.4 *Carrier Types*

Biomedical waste carriers should be classified into three different categories:

- the professional carrier whose main business is transporting biomedical waste;
- the health care facility carrier whose main business is not transporting waste, but who transports the waste from its own facility to a local disposal site or transfer station; and
- field operations carriers acting on behalf of facilities that generate biomedical waste, such as mobile health care providers, blood banks, blood transfusion centres, police and fire services, etc., who transport biomedical waste to a local waste transfer facility but whose main business is not transporting waste.

Note: *In the case of field operations carriers, local waste transfer facilities are usually used. A local waste transfer facility is defined as a facility:*

(a) at which waste from field operations is received, bulked, temporarily stored and transferred;

(b) at which only waste from field operations is received;

(c) that is owned or controlled by a person undertaking field operations or a person on whose behalf field operations are being undertaken; and,

(d) that is used primarily for functions other than waste management.

6.5 *Vehicle Requirements*

Note: *Provincial or territorial regulatory authorities should be consulted for particular vehicle and licensing requirements. The following requirements may or may not apply to one of the specific carriers described in subsection 6.4.*

Vehicles used by professional carriers to transport biomedical waste must not be used to transport mixed cargoes of wastes and other goods, including food or other goods for human consumption. The biohazard symbol must be permanently affixed to the vehicle.

All vehicles used to transport biomedical waste must have storage compartments designed to efficiently maintain a protective barrier between the contained waste and the driver and general public. The storage compartment should be constructed of materials with a suitable surface finish to enable cleaning; it should have a sealed, leak-proof floor with a liquid-retaining lip at the doorway, no windows or ventilation openings, only one lockable door, and an interior light.

The storage compartment should be locked at all times that the biomedical waste transportation vehicle is being operated or contains any waste.

The storage compartment must be refrigerated if the period of time between generation and disposal of the biomedical waste exceeds four days. This applies when biomedical waste must be transported over long distances. If refrigerated, the storage compartment should be insulated and maintained at 4°C or less while it contains waste or the vehicle is being operated.

Note: Some provincial or territorial regulatory authorities may specify refrigeration requirements differing from the above. Local regulatory authorities should be consulted.

Professional carriers must clean the storage compartment after each day's use.

Health care facility and field operations' carriers should clean the storage compartment regularly to prevent odours and must clean the storage compartment as soon as possible if waste materials leak or spill within the compartment.

To prevent breakdowns and accidents, the vehicle must be maintained regularly and records should be kept of all maintenance performed on the vehicle.

6.6 Contractual Concerns for Off-site Transportation and Disposal

Before disposing of any biomedical waste, the generator of the waste should consider the contractual obligations that must be made if the waste is destined for off-site disposal. The generator of the waste must ensure that the firm or organization handling the waste is appropriately authorized.

Note: *This can be verified by contacting the provincial or territorial government agency responsible for environmental concerns (see Appendix F).*

Contractual relationships should exist between the waste generator, carrier, disposal facility, and any other party involved in the management of the waste.

6.7 Preparation for Transport

Before transferring a shipment of biomedical waste to the carrier, the health care facility (consignor) must ensure that, if required by provincial or territorial regulations, the carrier has a valid licence to transport this type of waste and that the intended consignee is authorized to dispose of biomedical waste.

When waste is prepared for transport, it must be packaged appropriately to prevent crushing during transportation. All biomedical waste packaging and labelling must comply with the applicable packaging requirements of the *Transportation of Dangerous Goods Regulations* as well as any additional provincial or territorial packaging and labelling requirements.

All outer containers for biomedical waste must be colour-coded according to the type of waste contained (see Subsection 3.5). The biohazard symbol must be affixed to the outer surface of the container in such a way that it is clearly visible and legible. The biohazard symbol must not be placed on the side upon which the container is intended to rest.

During the packaging process, outer containers must not be damaged in any way that might allow the release of contents.

6.8 Manifests

Generators of biomedical waste using the services of professional or health care facility carriers must meet the manifest requirements of the *Transportation of Dangerous Goods Regulations.* In addition, generators of biomedical waste should consult provincial and territorial regulatory

authorities for any additional specific manifest requirements.

When a shipment of biomedical waste arrives at the disposal site, the consignee must inspect it to ensure that there are no discrepancies in the manifest.

6.9 Rejected Shipments

When a shipment arrives at the consignee facility and something is found to be wrong with it, such as a manifest discrepancy or damaged or unsafe packaging, the consignee may refuse the shipment. In this case, the carrier should immediately contact the provincial or territorial authorities and the consignor of the shipment and attempt to settle the discrepancy.

6.10 Emergency Reporting

Note: *Emergency reporting requirements may vary among provinces and territories. Local environmental regulatory authorities should be consulted for any different or additional requirements.*

If an accident or spill occurs during the transportation of biomedical waste, the person responsible for the waste at that time must contact: the appropriate provincial or territorial authority (see Appendix E); the local environmental regulatory authority; and the local medical officer of health.

The accident report must include:

(a) the time and place of the accident or spill;

(b) the name and phone number of the person reporting the incident;

(c) the type and amount of material spilled;

(d) a brief description of what happened and the status of the situation at the time of the report;

(e) what has been done by the person reporting to correct the situation; and

(f) the name of the consignor.

The carrier must submit a written report detailing all aspects of the incident if requested by the provincial or territorial authority or by Transport Canada.

Section 7

Occupational Health and Safety

7.1 General

Under the Canada Labour Code, employers must provide safe working conditions and inform employees about occupational hazards associated with their duties. Employees also have the right to leave the workplace if faced with unsafe conditions.

Other federal legislation, the Workplace Hazardous Materials Information System (WHMIS), makes it mandatory that all hazardous substances, including microorganisms, e.g., those used in research or other pursuits, be labelled in a specified manner and that a Material Safety Data Sheet (MSDS) be available to accompany each hazardous substance. Currently, the requirements of WHMIS do not apply to waste materials. Employers must provide all training necessary to work with hazardous substances and must keep a written record of their employee education program. More information about WHMIS can be obtained from Labour Canada.

Each province and territory has enacted Occupational Health and Safety Acts related to worker health and safety in the workplace. All such Acts require the employer to provide information, instruction, and supervision to workers to protect their health and safety, and take every reasonable precaution in the circumstances to protect the worker.

7.2 Policies and Procedures

Workers handling and disposing of biomedical waste are at potential risk of exposure to infection from sharps-related accidents or when containers of waste burst open and leak, or spills of certain waste materials occur. Facilities and organizations responsible for waste handling and disposal should take reasonable steps to reduce the risk of exposure to infection by establishing written policies and procedures based upon the most currently accepted clinical and occupational health and safety information. Workers handling and disposing of biomedical waste should participate in the preparation of these policies and procedures.

Policies and procedures should be reviewed and updated regularly, with compliance to their requirements verified as necessary.

Employee training programs must emphasize the following:

- personal hygiene, especially washing hands;
- the facility's procedures for the reduction, segregation, collection, packaging, colour-coding, labelling, storage, and in-house movement of waste;
- methods for preventing the transmission of infections related to waste-handling procedures;
- the hazards of those materials to which workers may be exposed; and
- the actions to be taken and which supervisory staff should be notified in the event of an accident.

Employee training programs should be continually assessed and reinforced, and their content periodically reviewed and updated as necessary. Consideration should be given to adapting the training programs to suit personnel who may not be fluent in the official language of predominant use or who may not be fully literate.

To minimize the occupational health risks associated with the handling and disposal of biomedical waste, occupational health care programs should:

- include a regular assessment of waste management procedures to assure compliance with applicable standards and all applicable federal, provincial or territorial, and municipal regulations and legislation;
- provide appropriate personal protective equipment and handwashing facilities for workers involved in various stages of waste handling and disposal;
- include a written procedure to handle and report needlestick injuries and other waste-handling incidents. Injuries caused by needlesticks and sharp instruments should be documented, reviewed, and changes implemented to prevent similar incidents in the future;
- emphasize the need for point of generation segregation so that waste is placed within an appropriate waste container;
- review the type and quality of waste containers used and, if necessary, have them upgraded to containers considered to be more suitable;
- review handling practices to determine if problems are the result of excessive or inappropriate handling. If so, modify the handling techniques; and
- consult with employees being affected by inappropriate handling techniques and invite their participation in determining effective solutions.

Waste haulers and handlers should always be appropriately clothed and wear personal protective equipment so that harmful agents, whether physical, chemical, or infectious, are prevented from gaining access to open wounds, cuts, or by absorption through the skin. Personal protective equipment may include gloves, gowns, safety glasses, protective footwear, etc.

7.3 Immunization

A course of Hepatitis B (HBV) vaccine should be offered to all employees responsible for handling and disposing of biomedical waste who are at risk of exposure to human blood, blood products, or body secretions. These employees should also be up-to-date for tetanus, diphtheria, and polio. While polio boosters may not be necessary, 10-year boosters for tetanus and diphtheria, at least, are recommended. (Health and Welfare, 1989).

In facilities where employees are in contact with animals and their wastes, employees should be offered rabies vaccine if the animals have had a reasonable chance of contacting the rabies virus. For example, rodents kept in a colony situation have no chance of exposure to rabies and thus employees do not require rabies protection in order to safely handle these animals.

7.4 Special Precautions for Sharps

Note: *Exposure to a needle or other sharp object contaminated with the blood of an infectious person presents the greatest potential risk for transmission of HBV, HIV, and other bloodborne pathogens to the health-care worker and waste handler.*

Sharps pose a dual hazard: transmission of infection by inoculation and physical injury. They must be contained and handled properly. Sharps must be contained in puncture-resistant containers meeting the requirements outlined in Subsection 3.4.2.

Two-handed recapping of needles must be avoided. Many safe recapping methods and devices are available. If such devices are used, they must be reliable and readily available, and appropriate education must be provided concerning their use.

Note: *Most needlestick injuries occur during recapping. This recommendation recognizes that, under some circumstances, it is necessary for needles to be recapped, e.g., when medication mixtures are drawn and when multiple injections for the same patient are required. This recommendation also recognizes that devices and methods for safely recapping needles continue to be developed and therefore does not restrict their development and use.*

Needles must not be clipped, bent, or broken before disposal.

Health care facilities must carefully analyze their use of sharps. Despite employee education programs regarding the safe handling and disposal of sharps, needlestick injuries do occur. As a result, health care facilities should establish surveillance programs to identify and analyze needlestick injuries and develop a strategy for preventing such injuries.

Note: *(1) Surveillance programs may lead to the development of more effective safety measures and to better educational strategies. Employees should be encouraged to participate in preparing and promoting these strategies.*

(2) As part of a preventive strategy, sharps containers may be attached to medication carts and placed in convenient locations, particularly in preparation and cleanup areas in wards and laboratories. Point-of-use sharps disposal systems may also be useful, but should be assessed on a case-by-case basis as they may not be appropriate in all situations.

7.5 Special Precautions for Incinerator Operators

Staff responsible for loading and cleaning out incinerators should wear appropriate protective equipment, including dust masks, heavy gloves and safety shoes with puncture-proof toes and soles to avoid injury. Protective eyewear should also be worn, as glass that has melted and stuck to the incineratory refractory may shatter when struck by a shovel being used to remove ash.

Note: *Although the ash from biomedical waste incinerators does not contain viable microorganisms, it may contain a significant quantity of sharps, such as needles and glass which may not be fully destroyed in the burning process, and may thus still pose a hazard to persons who clean out incinerator ash and residues.*

7.6 *Accidental Exposure to Human Blood and Body Fluids*

Health care facilities should develop policies and procedures for following up on employees who sustain a puncture wound from a used sharp. This information must be available in the occupational health service manual and the infection control manual, and be readily accessible to all appropriate staff. It should include procedures to protect and/or follow up with the employee possibly exposed to tetanus, Hepatitis B, Hepatitis C, and HIV.

Health care facilities should ensure that a mechanism exists for following up on employees who suffer a puncture wound when the occupational health nurse is unavailable, or where an occupational health service does not exist. Staff charged with this responsibility must understand and have access to the policies and procedures at all hours.

In preparing these policies and procedures, consideration must be given to incorporating the most current recommendations of sources such as the National Advisory Committee on Immunization, and Health and Welfare Canada.

7.7 *Spills*

7.7.1 *General*

In spite of every possible effort to avoid the escape of waste materials during movement within the health care facility, spills may occur. In most instances, minor spills involving loss or aerosolization of small volumes of material are most likely the result of faulty transfer techniques. Major spills or accidents usually involve container rupture, caused by equipment malfunction or careless handling.

Facilities handling and disposing of biomedical waste should have a documented policy and procedure for managing the spill of such waste. The procedure for managing a spill should include the following.

(a) All staff should be trained and educated in managing biomedical waste and recognizing and managing a spill condition.

(b) A method should be prepared for containing and isolating each type of spill.

(c) Should a spill occur, staff designated for spill cleanup should be notified immediately.

(d) Information about individual substances and their cleanup should be readily available to all staff on a 24-hour basis.

(e) Proper equipment and supplies should be available for cleaning up spills and protecting employees.

(f) The procedures for each type of spill should be documented and made available in areas where spills are likely to occur.

(g) Procedures should be documented for the proper disposal of waste according to the facility's biomedical waste management program.

(h) All incidents should be documented for the purpose of record-keeping.

(i) Any employee exposed to a spill should be treated and monitored by the Occupational Health Services Unit of the facility or their family physician.

(j) If necessary, evacuation and internal contingency plans must be implemented.

In general, spills that cannot be readily contained should be covered with an appropriate absorbent material. This material should be available as part of any spill kit.

In some jurisdictions in Canada, local regulatory authorities may have more stringent spill requirements. Consult the local authority.

7.7.2 Human Blood and Blood-contaminated Fluids

Spills of human blood and blood-contaminated fluids should be promptly cleaned up by the following method *while wearing gloves.*

(a) Visible material should first be removed with disposable towels or other appropriate means that prevent direct contact with blood. If splashing is anticipated, both protective eyewear and clothing should be worn.

(b) The area should then be decontaminated with an appropriate germicide as recommended by the facility's infection control committee, biosafety officer, or other appointed person(s). Chemical germicides that are approved for use as "hospital disinfectants" and are tuberculocidal when used at recommended dilutions can be used.

(c) Hands should be washed after gloves are removed.

(d) Soiled cleaning equipment should be cleaned and decontaminated or placed in an appropriate container and disposed of according to the facility's policy. Plastic waste-holding bags should be available for removing contaminated items from the site of the spill.

(e) Shoes and boots can sometimes become contaminated with blood. If there is massive blood contamination on floors, the use of disposable, impervious shoe coverings should be considered. Protective gloves should be worn to remove contaminated shoe coverings. The coverings and gloves should be placed in plastic waste-holding bags and disposed of in accordance with the facility's policy.

References

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Appendix A

Summary of Provincial and Territorial Initiatives Regarding Biomedical Waste

Most Canadian jurisdictions have prepared, or are considering preparing, guidelines or regulations dealing with the management of biomedical waste. The following is a brief summary of the activities to date.

Newfoundland and Labrador

- No initiatives underway.

Nova Scotia

- Guidelines for the handling and disposal of biomedical waste published in 1988.
- Guidelines for biomedical waste incinerators published in 1988.

Prince Edward Island

- No initiatives underway.

New Brunswick

- Work on guidelines in preparation has been halted pending completion of the CCME Guidelines.

Quebec

- Guidelines for the management of hazardous wastes from hospitals published in 1989.
- The ministries of Environment, and Health and Social Services have prepared a comprehensive policy addressing the biomedical waste issue. It describes a number of goals and initiatives to be enacted before April 1991. The policy was published in 1989.
- A regulation with regard to biomedical waste should be in place soon.

Ontario

- Biomedical waste (pathological waste) is regulated under Regulation 309 of the *Environmental Protection Act.* This regulation is to be amended soon, updating and clarifying requirements for the management of biomedical waste.
- Guidelines for the handling and disposal of biomedical wastes from health care facilities and laboratories were published in 1986. These guidelines are to be revised to reflect the updated Regulation 309.
- Guidelines describing incinerator design and operating criteria were published in 1986.

Manitoba

- Incinerators are regulated under the Incinerators Regulation of the *Environmental Act.*
- A strategy for managing biomedical waste is being developed.

Saskatchewan

- Incinerator guidelines were prepared by the Saskatchewan Department of the Environment and published in 1984.

Alberta

- An amendment is being prepared to address biomedical waste, which is regulated under the Public Health Act, Waste Management Regulation.
- The Hospitals Division of Alberta Health released Waste Management Guidelines and Standards for hospitals and long-term care facilities in April 1991.
- The Calgary Board of Health published its Biomedical Waste Management Policy in May, 1989

Northwest Territories

- No initiatives underway.

Yukon Territory

- No initiatives underway.

British Columbia

- The B.C. Task Force on Biomedical Waste Management published its report "Biomedical Waste in British Columbia" in May, 1989.
- Biomedical Waste System Planning Committee formed in December, 1989.
- "Biomedical Waste Incineration Guidelines" are being prepared.

Appendix B

Disposal of Waste Sharps in the Home Health Care Setting

Increasingly, patients are receiving intravenous solutions and/or medications, blood or blood products, and self-administered parenteral drugs in the home. These activities generate waste often identical to that generated in health care facilities.

In the home health care setting, i.e., the household, patients should be encouraged to dispose of sharps, such as used needles, syringes, and lancets, in a safe manner. Such objects pose a potential hazard to family members, friends and neighbours, and sanitation workers. These objects must not be disposed of in the sewer system.

Home health care providers, and in some cases the pharmacist or health care practitioner dispensing needles, syringes, lancets, etc., should encourage patients to place their sharps within a tightly closed, hard plastic or metal container before disposal. An antifreeze container or bleach bottle can also be used for this purpose. If a container with a snap-on lid is used, the lid should be secured with heavy-duty tape. Unlike in the health care facilities to which these guidelines apply, secondhand sharps containers (see Subsection 3.4.2) used in the home need not be colour-coded yellow or labelled with the biohazard symbol.

Some public health departments or municipal agencies may operate sharps collection programs or may have recommended handling requirements for domestically generated sharps. The local municipality or public health unit should be contacted before disposal.

Note: *Some hospitals encourage home-care patients to return containers with such waste to the hospital.*

Appendix C

Principles of Disease Transmission

To understand and appreciate issues concerning the handling and disposing of biomedical waste, the principles of disease transmission must be understood. The segregation of potentially infectious waste from the bulk of the solid wastestream - all of which could theoretically be considered "potentially infectious material" - is a difficult task. Thus a working knowledge of the way in which infectious agents grow, multiply, and actually induce infection is essential to the development of an effective set of policies.

In order for disease to be transmitted, the following conditions are necessary.

1. Sufficient dose of an infectious agent

For an infectious agent to induce an infection, the infectious agent must be present in quantities sufficient to constitute an infectious dose.

2. Existence of viable infectious agents

With the exception of laboratories or other environments specifically designed for the cultivation of infectious agents, the environment outside the body of humans or animals does not provide conditions suitable for the growth and/or survival of most infectious agents. In general, microbial growth requires very specific temperature, moisture, light, nutrient and pH conditions.

3. A portal of exit

The portal of exit relates primarily to the escape of waste materials during the handling of wastes and can be reduced or eliminated through worker safety programs which include barrier protection and containment procedures.

4. A mode of transmission

Transmission of a disease involves the movement of an infectious agent from a source to the appropriate portal of entry in a susceptible host or individual. The four principal methods of disease transmission are: by physical contact with an infected person (including their secretions, excretions, body fluids, or tissues); through the air; through food and water; and by indirect contact through vectors or other objects. Handwashing is the single most important procedure for preventing nosocomial infections in patients and staff. The ideal frequency of handwashing is unknown, but personnel should wash their hands after handling items contaminated or likely to be contaminated with blood, body fluids, excretions, or secretions; after removing gloves; and in other cases, in accordance with departmental policies.

5. A portal of entry

Barrier protection is an infection control practice that attempts to eliminate routes of infection through the use of gloves, gowns, masks, and other types of personal protective equipment. The use of such equipment minimizes an individual's risk of exposure to hazardous agents, whether they are physical, chemical, or infectious.

6. A susceptible host

In the context of biomedical waste disposal, assuming proper waste disposal practices, the susceptible host population consists primarily of the waste haulers and handlers. Under normal waste disposal conditions, the general population is not exposed to biomedical waste.

Generally speaking, given current sanitation practices, solid waste disposal does not constitute a significant method of disease transmission. With the advent of sanitary landfills where waste is covered with soil at the end of the day, the health risks once posed by waste disposal have been greatly reduced. Sanitary landfill operations, as well as other current solid waste disposal operations, tend to reduce access to disease vectors, such as rodents, that can potentially transmit waste-derived disease to human populations. To date, the scientific and epidemiological literature does not suggest a direct causal association between waste disposal and disease transmission in the absence of rodent and insect vectors.

Most waste, whether from a health care facility or the residential setting, simply does not provide either an environment conducive to the growth and survival of infectious agents or the means by which the agent can escape from its source via an infectious mode of transmission.

Appendix D

Cytotoxic Waste

General

Although not specifically considered to be biomedical waste, cytotoxic waste must be handled and disposed of carefully. It is therefore included in these guidelines as an appendix.

Cytotoxic agents are considered to be hazardous materials with a toxic effect upon cells. The term is commonly used to refer to pharmaceuticals used in treating cancer, e.g., antineoplastics or chemotherapy agents. Cytotoxics can cause direct irritant or allergic reactions and may present a hazard due to their mutagenic, carcinogenic, and teratogenic properties.

For the purposes of these guidelines, the discussion of cytotoxics is restricted to drugs and other medicinal chemicals used in patient treatment or diagnosis. For additional information, readers should consult the Canadian Society of Hospital Pharmacist's publication entitled "Guidelines for the Handling and Disposal of Hazardous Pharmaceuticals (Including Cytotoxic Agents)" (January 1991).

As with other wastes, segregation from the general wastestream is very important. Cytotoxic waste can range from a few drops on an alcohol swab to 2000 mL of dialysate solution. All items coming in contact with cytotoxic drugs must be treated as cytotoxic waste and handled and disposed of accordingly.

Protective equipment and clothing should be worn to prevent exposure of unprotected skin to the waste materials. While health care workers preparing and administering the agents are already aware of the concerns, special precautions should be taken to alert waste handlers of the type of materials they are handling.

All such waste should be placed within containers bearing the cytotoxic hazard symbol shown in Figure 3 and described in Subsection 3.4.1 of these guidelines.

Sharp objects, such as needles, broken glass, etc, that are contaminated with cytotoxics, must be placed within a sharps containers dedicated to cytotoxic waste, colour-coded yellow and bearing the cytotoxic hazard symbol.

Contaminated liquids should be placed in sealed containers; the original container is acceptable. In some situations, an absorbent material may be placed at the bottom of the waste container to absorb excess fluid.

Several disposal options are available. The one most advocated is incineration using temperatures in excess of 1000°C to completely destroy the cytotoxic agents. Consultation with regulatory authorities is advised for compliance with provincial or territorial regulations.

If incineration is unavailable, chemical deactivation may be used for some agents. Chemical deactivation should be performed in a biological containment cabinet or under a fume hood using appropriate precautions, and protective equipment and clothing. If deactivation procedures are not performed

within a biological containment cabinet or under a fume hood, additional visual and respiratory protective equipment should be worn.

Spills Involving Cytotoxic Agents

Due to the hazardous nature of these agents, personnel cleaning up cytotoxic spills should use full protective equipment and clothing, such as gowns, double gloves, eye protection, and respiratory protection. In addition to the spill accident requirements listed in Subsection 7.7 of these guidelines, the following procedures should be followed when dealing with spills of cytotoxics:

(a) the spill should be contained and wiped up using appropriate absorbent material;

(b) the area should be washed with a detergent, followed by 70% alcohol (for aseptic areas) and then dried; and

(c) all contaminated materials must be discarded into designated cytotoxic waste containers.

Appendix E

Emergency Telephone Numbers

In the event of a spill of biomedical waste or any other transportation-related emergency, report the incident to the local police as well as the appropriate agency listed below. Information about cleanup and/or emergency response procedures may be obtained from these agencies.

Alberta	1-800-272-9600
British Columbia	1-800-663-3456
Manitoba	(204) 944-4888
New Brunswick	1-800-565-1633
Newfoundland and Labrador	(709) 772-2083
Northwest Territories	(403) 920-8130
Nova Scotia	1-800-565-1633
Ontario	1-800-268-6060
Prince Edward Island	1-800-565-1633
Quebec	(418) 643-4595 (514) 873-3454 (Montreal only)
Saskatchewan	1-800-667-7525
Yukon Territory	(403) 667-7244

Additional technical information regarding spilled products and communications can be obtained by calling the Canadian Transport Emergency Centre (CANUTEC).

CANUTEC (Call collect) (613) 996-6666

All emergency numbers operate on a 24-hour basis.

Appendix F

Provincial and Territorial Authorities Responsible for Biomedical Waste

Alberta
Environmental Health Services Branch
Alberta Health
Seventh Street Plaza
10030 - 107 Street
Edmonton, Alberta
T5J 3E4
(403) 427-2643

British Columbia
Municipal Waste Branch
Environmental Protection Division
Parliament Buildings
Victoria, British Columbia
V8V 1X5
(604) 356-9973

Manitoba
Department of Environment
Environmental Management Division
Building 2
139 Tuxedo Avenue
Winnipeg, Manitoba
R3N 0H6
(204) 945-7100

New Brunswick
Department of the Environment
Operations Branch
P.O. Box 6000
Fredericton, New Brunswick
E3B 5H1
(506) 457-4848

Newfoundland and Labrador
Department of Environment and Lands
Environmental Investigation Division
P.O.Box 8700
Confederation Building
St. John's, Newfoundland
A1B 4J6
(709) 729-2565

Northwest Territories
Pollution Control Division
Department of Renewable Resources
Scotia Centre, 7th floor
Box 1320
Yellowknife, N.W.T.
X1A 2L9
(403) 873-7654

Nova Scotia
Department of the Environment
P.O.Box 2107
Halifax, Nova Scotia
B3J 3B7
(902) 424-5300

Ontario
Waste Management Branch
Ontario Ministry of the Environment
2 St. Clair Avenue West, 14th Floor
Toronto, Ontario
M4V 1L5
(416) 323-5200

Prince Edward Island
Department of the Environment
11 Kent Street
Charlottetown, P.E.I.
C1A 7N8
(902) 368-5000

Quebec
Contaminated Sites and Waste
Management Programs Branch
Ministry of the Environment
Box 34, 3900 Marly Street
Ste-Foy, Quebec
G1X 4E4
(418) 644-3402

Saskatchewan
Manager, Waste Management Section
Air and Land Protection Branch
Saskatchewan Environment and
Public Safety
3085 Albert Street
Regina, Saskatchewan
S4S 0B1
(306) 787-6294

Yukon Territory
Transportation Dangerous Goods Inspector
Department of Community and
Transportation Services
Government of Yukon
P.O. Box 2703
Whitehorse, Y.T.
Y1A 2C6
(403) 667-3032