

**Hazardous Waste Management
in
Veterinary Practice in Ireland**

by

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ABSTRACT

Hazardous Waste Management in Veterinary Practice in Ireland: A survey of 57 veterinary practices.

This study reports on a survey conducted in February 2006 of the hazardous waste management practices of Irish veterinary practices. Fifty seven veterinary practices responded to the anonymous postal survey which had been sent to a total of one hundred and fifty practices. The survey examined the veterinary practitioner's knowledge of the legislation, and the practice management of veterinary cadavers, municipal waste, clinical waste, and specific hazardous waste streams such as sharps, pharmaceutical and chemical wastes. The results showed that veterinary practitioners were not ignorant of the hazardous status of many of their wastes and were aware of the legislation governing waste management in Ireland. Veterinary practices were successfully managing municipal waste streams with many of them recycling certain waste streams. Veterinary cadavers were disposed of through a pet cremation company, returned to the client for burial or sent for rendering to a rendering plant. However there was considerable non-compliance in relation to hazardous wastes. Many practices consigned infectious clinical wastes to municipal bins. 48% of practices did not dispose of waste medicines via hazardous waste contractors. 53% disposed of photochemical waste from radiographic processing down the sink or the toilet. Only 47% of vets felt that they were fully complying with waste regulations. Additional questionnaires to local authorities and hazard waste contractors showed that local authorities were receiving and acting on public complaints about veterinary waste, and as few as 50-60% of the veterinary practices in Ireland avail of the services of a hazardous waste contractor.

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INTRODUCTION

For the largest part of the twentieth century the service offered by veterinary surgeons in practice in Ireland consisted of an on-farm ambulance type service which was operated largely out of the back of a veterinarian's vehicle. The most hazardous materials generated by a vet's activities were empty/part-empty pharmaceutical bottles, blood soaked cotton wool (usually discarded on farm) and used syringes, needles, and blades. The veterinary practice premises was little more than a clerical office where there was a store for medicines and where there may have been a table on which various procedures were carried out, usually on a shoestring budget.

Ireland's recent economic prosperity has seen major changes in the nature of veterinary practice within a relatively short space of time. The modern-day Irish veterinary practice is very much akin to a small scale human hospital. Many have been purpose-built to accommodate their new (albeit four-legged and feathered) in-patients who benefit from services as diverse as in-house laboratory diagnostic procedures, gaseous anaesthesia, x-ray facilities, advanced surgical procedures, and even chemotherapy. With the advent of these services, have come huge changes in the nature and volume of wastes produced by vets in practice. It may be the case that while veterinary premises and skills have moved on, the veterinary professionals' attitude to waste management has not advanced far beyond the cultured ignorance/indifference of their twentieth century ambulatory predecessor. With few exceptions (Kelly, 2004) veterinary practices seem to have escaped the radar of the regulators and in the apparent absence of regulation vets have no real incentive to become proactive in waste management. The high cost of compliance in a competitive business environment is a much stronger disincentive.

The purpose of this study is to investigate hazardous waste management in veterinary practice in Ireland. This will encompass a survey of the awareness and knowledge of, attitude to, and extent of compliance with the veterinary professional's legislative obligations regarding hazardous waste. The survey will investigate the types of hazardous wastes generated in veterinary practices in Ireland and estimate the volumes of such wastes. The study will also examine the roles of the service providers (partly as a means of validating data obtained from vets), and the regulators; local authorities and the Environmental Protection Agency (EPA).

Chapter 1

LITERATURE REVIEW

1.1 Composition of Waste from Veterinary Practice

Waste produced in veterinary practice in common with other medical disciplines, can be broken down into general waste similar to household waste, clinical waste and hazardous waste. Little information is available relating to quantitative estimates of the composition of veterinary waste in any country. Haskell *et al.*, (2003a) qualitatively estimated the general waste (non-clinical and non-hazardous) proportion of veterinary waste in the USA to be as much as 80%. Quantitative studies do exist for dental practice and human healthcare waste (and will be discussed below). There is a close compositional relationship between veterinary waste and waste produced by the dental and medical profession. The World Health Organisation (WHO) considers it so similar that it should be treated in the same manner (Anon., 1999). Also in the USA veterinary practices are considered sources of biohazardous waste alongside hospitals, medical and dental practices (Cocchiarella, Deitchman and Young, 2000).

As a general rule the majority of the waste produced in dental and medical facilities is non-hazardous. A recent study of the solid waste produced by a school of dentistry in Turkey (Ozbek and Sanin, 2004) found that the majority of the waste was rubber gloves (35%) and paper (30%). Only a small fraction of the waste (~1%) was found to be hazardous. Examination of the character of waste from various human hospital facilities showed that 80% (Anon., 2000b), 82% (Soparajee, 1999) and 85% (Walker, 1990) was found to be similar in character to general domestic waste or that from a hotel. In the case of one Brazilian hospital 50% of the waste generated was found to be food (Mattoso and Schalch, 2001). A recent survey (Yan, Yuan, and Zeng, 2002) of three hospitals in China found that 87% of the waste could be accounted for by glass (55%), plastic (20%) and cotton (12%). These hospitals had a very high recovery rate from their waste (49%, mostly in the form of glass and plastic). They disposed of only 1.34% as medical waste. The rest was mixed with domestic waste and went to landfill. Of the remainder of the waste after the general waste is removed 14 to 22.4% is

considered infectious, 1% is sharps, 3% is chemical and pharmaceutical and 1% is genotoxic (chemotherapy drugs), heavy metal, or radioactive waste (Soparajee, 1999; Anon., 2000b; Mohanty and Tiwari, 2001). The successful segregation of medical waste is an important factor in the quantification of its composition. In Germany as a result of careful waste segregation over 95% of the total medical waste is designated hazardous, whereas in the UK only 10% of medical waste is deemed hazardous (Tickell and Watson, 1992). Thus poor segregation of general waste from medical waste can lead to an overestimation of medical waste.

1.2 Veterinary Clinical “Yellow Bag” Waste

Perhaps the best definition for veterinary clinical waste is given by Gripper (1995):

“A simple rule of thumb for clinical waste is: if something is not obviously household waste then it is clinical”.


Clinical waste thus includes most waste produced in the consulting room, the surgical preparation room and the surgery itself. Included in this type of waste is human and animal body tissues, cadavers, blood and other bodily fluids, excretions, drugs or pharmaceutical products, empty i/v bags and administration sets, swabs, dressings, syringes, needles or other sharp instruments (Gripper, 1995; Gillies, 2001; Haskell *et al.*, 2003a). Some of these wastes such as sharps and pharmaceuticals require special treatment.

There are some international differences in the interpretation of what is and is not clinical waste. In the UK excreta, faeces and urine produced in veterinary practices, quarantine, boarding kennels and catteries are considered clinical waste (Anon., 1993; Gripper, 1995; Gillies, 2001), but may also be regarded as hazardous waste when animals are receiving chemotherapy). Surgically removed tissues including those produced on farms are also regarded as clinical waste in the UK (Anon., 1993). This is on the grounds that there is a potential infectious hazard associated with these materials. Even faeces produced by animals on medication in the owner’s home is regarded as clinical waste in the UK (Anon., 1993) and it is the responsibility of the local authority to deal with it as such. Tissue, faeces and litter and cadavers are not considered clinical waste in the USA unless they are originating from animals known to be infected with a zoonosis (Miller, 2000; Krauss, 2003). In Canada, syringes are not considered “biomedical” waste unless they are attached to a needle (Mc Kelvey, 1997). Also in

Canada urine and faeces, animal tissues, organs, blood and carcasses are not considered biomedical waste unless they come from animals infected from a finite (and not very extensive) list of diseases (Mc Kelvey, 1997). In the UK recent legislation has pushed used syringes into the “special waste” category on grounds of contamination with pharmaceuticals, although the UK Environment Agency (EA) is continuing to allow used syringes to go in with clinical waste (Anon., 1998).

In Ireland and the UK clinical waste should be put into yellow waste bags (Anon., 1993; Gripper, 1995; Kelly, 2004). Such yellow clinical waste bags as are approved for veterinary practice in Ireland are illustrated in **Plate 4, Appendix I**. In the USA these bags are red (Haskell *et al.*, 2003a). Like all clinical and hazardous waste storage containers these need to meet a certain structural standard. This standard has been adopted from United Nations specifications for unspecified clinical waste with which there is an associated infectious hazard (Class 6.2, UN No. 3291: Clinical Waste, Unspecified, N.O.S., United Nations, 1997). Despite their robust construction, care needs to be taken in their storage and presentation for collection. A secure vermin-proof area which can be easily disinfected needs to be set aside for storage (Haskell *et al.*, 2003a). If they are not to be immediately collected they should be chilled or frozen (Gripper, 1995). In the UK some waste contractors provide large cardboard receptacles (UN 3291 standard) for temporary storage of three to four yellow waste bags prior to collection, which reduces the risk of spillage (De Grey, 1990). The contents of the bags need to be recorded and the bags labelled appropriately. The appropriate European Waste Catalogue codes must also be recorded on the labels, as well as the place of origin i.e. the name of the veterinary practice (Mc Killen, 1999). Yellow waste bags can only be collected by an approved waste contractor and it is up to the vet to ensure that the contractor has the appropriate permit (Gripper, 1995; Kelly, 2004). In Ireland a valid C.1 form (**Appendix 1, Figure 1**) must be completed in quintuplicate for each yellow bag shipment (Mc Killen, 1999), and corresponding documentation also applies in the UK (Gripper, 1995; Anon., 1998).


While in theory the primary reason for inclusion of material in yellow bag waste is its potential infectious hazard (with the possible exception of used syringes which have been contaminated by pharmaceuticals), there are conflicting reports in the medical literature as to the extent of the infectious risk associated with human hospital clinical waste. No such information is available for veterinary yellow bag waste. Marrack (1988) found that “red bag” waste in USA was infectious to such a degree that



it would endanger the general public were it to be disposed of as municipal waste. Brenniman and Allen (1993) found that the opening of clinical waste bags for sorting prior to incineration could release pathogens such as *Staphylococcus aureus* as aerosols which could be a source of contamination for elsewhere in the hospital. Studies of clinical waste in the Far East found that only 14 to 22.4% of it was potentially infectious (Soparajee, 1999; Mohanty and Tiwari, 2001). The more recent study by Saini *et al.*, (2004) found that there was little difference in terms of flora and potential for infection between hospital clinical waste and general hospital waste. The need for the rapid removal of clinical waste due to proliferation of microorganisms in the bag over 24 hours was also highlighted. Mohanty and Tiwari's study (2001) had also found that the hospital's kitchen could be almost as dangerous from an infectious point of view as a bag of clinical waste. Biomedical waste from animal and human research laboratories in the USA had levels of bacteria which were lower than those from household waste (Rau *et al.*, 2000). The writers also argued that in any event the pathogens involved would have a short survival time in a landfill environment. It seems likely that the levels of animal pathogens in yellow bag waste if appropriately handled should constitute little risk to humans. It also seems likely that the infectious risk from some clinical waste with a low level of bacterial contamination (e.g. used i/v fluid bags and drip sets) would be very low indeed.

1.3 Disposal of Veterinary Cadavers

According to the literature animal cadavers with the exception of farm animals are regarded as clinical waste in Ireland (Kelly, 2004) and in the UK (Anon., 1993; Tavernor, 1993; Gripper, 1995). As with other animal tissues the clinical waste status given to animal cadavers is on the grounds of the associated potential infectious hazard. There is an exception for farm animals here because farm animal cadavers are governed not by environmental legislation but by Department of Agriculture (Ireland) and DEFRA (UK) regulations due to the associated risks of Transmissible Spongiform Encephalopathies (TSE) (Hirschhorn, 1999). In the UK the strict interpretation of this legislation places great restrictions on what an owner is legally entitled to do with their deceased pet. If a vet visits a client's house to euthanise a family pet they are permitted to remove the cadaver from the owner's home and to transport the carcass to the veterinary practice where it will await collection by an appropriate waste disposal



contractor (Gripper, 1995). However if the owner wishes to bury their pet on their own property they are in breach of the law if they do so since clinical waste cannot be disposed of within the curtilage of a dwelling house. Likewise if a pet dies or is euthanised on a veterinary premises, for a vet to allow the owners to remove the pet for home burial is also an offence since clinical waste can only be removed from a veterinary practice by an approved carrier (Anon., 1993). Unofficially the British Veterinary Association (BVA) has obtained confirmation from the Minister for the Environment that no prosecution will be likely under these regulations (Tavernor, 1993). While it has been reported in the literature that in Ireland animals (of any kind) can neither be buried nor can they be disposed of at a landfill site, rather they have to be collected by a licensed waste collector (Kelly, 2004), recent Irish legislation (European Communities (Animal By-Products) Regulations, 2003; S.I. No. 248/2003) negates the ambiguity created by earlier legislation (European Communities (Disposal, Processing and Placing on the Market of Animal By-products) Regulations, 1994; S.I. No. 257/1994), and clearly states that there is nothing to prohibit an owner from burying a deceased pet on his own property.

Animal carcasses are not regarded as clinical waste in the USA (Miller, 2000) or in Canada (Mc Kelvey, 1997). The only exception is if the animals were known to be suffering from any zoonosis (USA) (Krauss, 2003) or any zoonosis from a finite list of eight zoonoses (Canada) (Mc Kelvey, 1997). Farm animal carcasses are disposed of in the USA by pit burial (under licence from the Department of Agriculture), composting (in selected areas), rendering, and landfill (in selected areas again under licence from the Department of Agriculture) and cremation. Some states do not permit composting of ruminants again because of issues over TSE. A temperature of 130°F achieved by composting is inadequate to destroy TSE (Sanders, Warbington and Myers, 2002). Laboratory animal carcasses in the USA are disposed of by cremation (Rau *et al.*, 2000), and by alkaline tissue hydrolysis (Sanders *et al.*, 2002). If an animal is euthanised with barbiturates, typically a companion animal or a horse, then rendering of the carcass is prohibited. Horses can be buried, composted, or incinerated, but are prohibited from going to landfill because of their size (Haskell and Ormond, 2003). Companion animal carcasses in the USA usually go to landfill, or to incineration or cremation (Sander *et al.*, 2002).

1.4 Veterinary Hazardous Waste

Under the strict interpretation of the term “hazardous waste” at least a proportion of both veterinary clinical and cadaver waste should be deemed hazardous where there is a potential infectious health hazard e.g. where a pet has been suffering from a zoonosis. Recent changes in legislation in the UK by the Environment Agency (EA) have confirmed the hazardous status of yellow bag and cadaver waste in that country (where it is contaminated by infectious material) (Anon., 2005a; Anon., 2005b). In most publications, possibly because of the conditional status of hazardous clinical waste, the term hazardous waste in a veterinary context refers only to sharps, pharmaceutical and chemotherapeutic waste.

A review of the literature failed to identify investigations of any kind into waste treatment (hazardous or otherwise) by veterinary practitioners. Rather publications of a veterinary context deal mainly with descriptions of what constitutes hazardous waste from a legislative point of view and how it should be handled.

Two recent reports have looked at dental professionals and their compliance with waste regulations. Treasure and Treasure (1997) conducted a survey of all the dental practices in New Zealand. They got a 71.3% reply rate following three mailings. The results were quite alarming. Landfill was the destination of bloody swabs from 56.4% of practices and 24.4% also sent their sharps to landfill. Dental practitioners admitted that they were unconcerned about putting clinical waste into landfill and that legislation was not enough of a threat to ensure compliance with guidelines. The high cost of proper disposal and the inconvenience of having to sort waste were cited as the main factors in non-compliance. Many dentists did however make big efforts to salvage waste dental amalgam for scrap metal. Likewise in Israel (Al-Khatib and Darwish, 2004) dental professionals seem to have a rather cavalier attitude to hazardous waste. Of the thirty seven clinics surveyed about what they did with waste dental amalgam most of them admitted to putting it in trash or down drains. The apparent indifference over wastes among members of the dental profession has not escaped the dental organisations in Ireland (Anon., 2003; Anon., 2004a).

As with dental practice, veterinary surgeons produce a diverse range of clinical and hazardous wastes and also in common with dental practice (and unlike most human healthcare waste) veterinarians as individuals must bear the cost of hazardous waste disposal

1.4.1 Sharps

Traditionally sharps which comprise discarded injection needles, scalpel blades, lancets, surgical suture needles, and all other sharp materials of medical origin, have been regarded as hazardous waste across all medical disciplines for obvious reasons. The European Waste Catalogue and Hazardous Waste List (Anon., 2002) lists as hazardous only those sharps associated with a potential infectious hazard, according them a separate code (18 02 02*) from that of non-hazardous sharps (18 02 01).

Estimates of the percentage of total waste made up by sharps in human healthcare place them at 1% of total waste (Anon., 2000*b*). It is reported that veterinary sharps as in other medical disciplines must be disposed of in yellow sharps containers meeting UN 3291 standards, and be handled only by specialist waste contractors in Ireland (Mc Killen, 1999; Kelly, 2004), UK (Anon., 1993; Gripper, 1995), USA (Krauss, 2003) and Canada (Mc Kelvey, 1997). Such a sharps container as is approved for use in veterinary practice in Ireland is illustrated in **Plate 2, Appendix I**. A strict interpretation of UK legislation would mean that sharps contaminated with chemotherapeutic drugs would be considered “special waste” and would require segregation from other sharps with waste chemotherapeutic medication (Anon., 1998). Some experts in veterinary chemotherapy treatments also recommend that contaminated sharps should be disposed of with the rest of chemotherapeutic waste (Lucrey, 2001; Takada, 2003), while another UK expert suggested disposal with other sharps (Dobson, 1998). However the Environment Agency (EA) in the UK has stated that it is satisfied for special waste sharps to be disposed of with other sharps since they all go for incineration anyway (Anon., 1998).

Inappropriate disposal of veterinary sharps has led to personal injury to waste workers and prosecution of polluters in New Zealand (Anon., 2000*a*). Such injuries are common in human healthcare (Branson, 1995), but there is an added risk to human health from sharps of medical origin that extends beyond the physical injury. In theory at least there is a risk of infection with Hepatitis B, Hepatitis C and HIV (Anon., 2000*b*), however recent evidence suggests that such incidences are rare (Tooher, Griffin, Shute and Maddern, 2005).

1.4.2 Pharmaceutical Waste

Pharmaceutical waste (in conjunction with other chemical waste) accounts for about 3% of total waste in human medicine (Soparajee, 1999; Anon., 2000*b*).

The European Waste Catalogue and Hazardous Waste List (Anon., 2002) lists only cytotoxic and cytostatic medicines used in animal treatments as hazardous (waste code: 18 02 07*). All other medicines have the designation 18 02 08. Medicines are regarded as hazardous in the USA (Miller, 2000; Krauss, 2003) and as clinical waste in the UK (Gripper, 1995). In the UK they also come under the category of “special waste”. This means that they require segregation from other clinical waste, which basically makes them analogous to hazardous waste. While many medicines in Ireland are not considered hazardous it has been reported that all pharmaceuticals in both Ireland and the UK must be segregated from clinical waste stored in UN 3291 compatible containers (yellow with a blue lid) (Kelly, 2004) which must be labelled according to contents, waste code and place of origin. Such a container as is approved for storage of waste medicines in veterinary practice in Ireland is illustrated in **Plate 1, Appendix I**. The extensive details of contents, including descriptions of the types of medicines contained therein must also be recorded on the documentation which must be completed on collection by waste disposal contractors (Gripper, 1995; Mc Killen, 1999).

The types of pharmaceutical waste going into these containers should include unwanted and out of date medicines including prescription only medicines (POM), part-full injection bottles and ampoules, and vaccines (Gripper, 1995). There is some ambiguity in the literature over the fate of “empty” injection bottles and ampoules and vials containing drugs and vaccines. Some reports state that if the containers hold less than 1% residue of active ingredient they are considered empty and need not be considered special waste (Gillies, 2001; Kelly, 2004). Neither paper states whether these should still be treated as clinical waste. An earlier UK report (Anon., 1998) stated that all empty medicine bottles should be regarded as special pharmaceutical waste as should syringes containing undischarged injections. It added that while empty syringes that once contained POM should technically be categorised as special waste, the UK Environment Agency were unconcerned if they were disposed of with clinical (yellow bag) waste.

Haskell et al. (2003*b*) highlighted two other aspects of waste pharmaceutical management relevant to vets in the USA which are also relevant to Europe, namely the

vet's responsibility to dispose of unused product dispensed to clients (including farm clients) and the manufacturers responsibility to accept unused or out of date returns of non-hazardous pharmaceuticals from veterinarians, which was also highlighted by another American writer (Miller, 2000). For non-returns in the USA Haskell *et al.* (2003b) suggest consulting the US Material Safety Data Sheet (MSDS) on the drug label for guidelines on disposal. Some of these guidelines as quoted by Meerdink (2000) seem questionable from the point of view of environmental contamination. Some of the MSDS guidelines on the disposal of waste containers from insecticides used topically on farm animals involve the thrice rinsing of containers with household lye, wrapping in newspaper and burial in the ground. Given that occupational exposure to insecticidal organophosphorous compounds (pyrethrin, carbamates and captans) by vets may lead to an increased incidence of brain cancer and Hodgkin's Disease and has been known to cause bladder cancer in dogs (Fritschi, 2000) this does not seem like good advice.

Haskell and co-workers (2003b) reported on the potential hazards of inappropriate disposal of veterinary pharmaceutical waste. Discharge of antibiotics and disinfectants into sewerage can disrupt sewage treatment by killing beneficial bacteria. Likewise uncontrolled combustion of pharmaceuticals can produce toxic chemicals.

This is an area which is attracting much attention currently in relation to human medicine. Pharmaceutical use in humans is contributing to the build up of drugs as contaminants in the environment (Rau *et al.*, 2000). There are a number of reasons for this. Firstly, there is the cavalier attitude with which both professionals and citizens dispose of unused and unwanted waste medications (Kuspis and Krenzelok, 1996; Musson and Townsend, 1998), most ending up in landfill or in wastewater. Even if the medications are used as they are intended, most undergo little change in our bodies and are excreted in potent forms (Rau *et al.*, 2000). Drugs such as antibiotics are very unlikely to be degraded in the environment (degradation in simulated *in vitro* experiments was almost non-existent) and are likely to be effective even when diluted in the environment (Al-Ahmad, Daschner, and Kuemmerer, 1999; Alexy, Kumpel and Kuemmerer, 2004). In particular fluoroquinolone antibiotics (used liberally in veterinary medicine) may be a major source of genotoxicity in hospital waste water (Rau *et al.*, 2000). Drugs are now becoming major environmental contaminants in soil (Xia, Bhandari, Das and Pillar, 2005) and even in our oceans, with particular concern being expressed over chemotherapeutic drugs and associated drugs such as the anti-oestrogen tamoxifen (Rau *et al.*, 2000). Rau and co-workers called for more intensive

monitoring of waste water and drinking water, and for development of new technologies to remove pharmaceuticals from these systems. Some technologies are already in development (Lunn et al., 1994; Emmanuel and co-workers, 2005). Rau et al., called for the public to be more responsible in their disposal of these chemicals and for the onus of management of these drugs in the environment to be put on the companies who make profit from them i.e. the manufacturers. They also expressed concern over the abuse of antibiotic therapy in animals.

1.4.3 Chemotherapeutic Waste

Drugs used in chemotherapeutic treatment of animals and humans could be considered the archetypal hazardous chemicals, expressing multiple hazardous characteristics such as being irritant, harmful, toxic, carcinogenic, teratogenic, mutagenic and ecotoxic. Added to this is the fact that they are excreted almost unchanged in faeces and urine from treated patients, are extremely resistant to degradation (Castegnaro *et al.*, 1997; Hansel *et al.*, 1997; Berek *et al.*, 1998), and are already building up in the environment (Rau *et al.*, 2000).

While the use of chemotherapy drugs in veterinary practice is not widespread it is on the increase especially in the UK (Dobson, 1998). Excellent technical guides on the precautions necessary during preparation and administration of chemotherapy by veterinarians have recently been provided by Lucrey (2001) and Takada (2003). What is immediately apparent from these articles is that it results in the generation of a large amount of waste (all of it considered hazardous) from a relatively simple procedure. Hazardous waste generated by the preparation of just one treatment would include part empty injection bottles or vials, syringes, needles, double sets of gloves, lint-free disposable gowns, masks and goggles, disposable absorbent water-proof bench cover(s), luer-lock intravenous giving set and cannula(e), and plastic transport bag (Lucrey, 2001). The protective apparel must also be worn by the person restraining the animal for injection so the protective clothing must be disposed as hazardous waste in duplicate for each treatment (Takada, 2003). In addition all excreta from the treated animal must be regarded as hazardous waste for 48 hours following treatment and be handled only by a person in full protective garb (Lucrey, 2001). Taking all of this into account it is not hard to see why waste associated with chemotherapy can account for a large portion a human hospital's hazardous waste (Walker, 1990).

Chemotherapy waste must be disposed of in special UN 3291 containers which are yellow in colour with a purple lid. They are similar to those for disposal of pharmaceutical waste but in addition to being puncture proof by sharps they must also be spill proof (Kelly, 2004). As with other hazardous waste, they must be appropriately labelled and accompanied by the relevant completed documentation on collection by a hazardous waste contractor. Chemotherapy waste must currently only be disposed of by high temperature incineration (Dobson, 1998), however degradative chemical treatments for this waste are being developed which may minimise the need for such incineration (Castegnaro *et al.*, 1997; Hansel *et al.*, 1997; Berek *et al.*, 1998).

1.4.4 Hazardous Waste Licences


The new concept of hazardous waste licensing has been introduced to all hazardous waste producers by the relevant environmental governing bodies in the USA and in the UK. Producers are required to audit their own waste production and those who are found to generate more than 50lb per month (USA) (Cocchiarella *et al.*, 2000), or 200kg per year (UK) (Anon., 2005a), have to register as hazardous waste producers with the environmental body, and receive a premises code on registration, and are subject to extra waste tracking scrutiny. It is estimated that over 70% of UK veterinary practices would qualify on production of waste photochemicals from radiograph processing alone. In the UK non-compliance with this legislation will lead to removal of waste collection service since collectors are committing an offence (Anon., 2005b). No such regulations apply in Ireland yet but it is probably only a matter of time.

1.5 Atypical Hazardous Waste

A number of wastes cannot (and should not) be included in the same receptacles with clinical, cadaver, sharps, pharmaceutical or chemotherapy waste but are none the less regarded as hazardous in the eyes of the Environmental Protection Agency. These should responsibly be disposed of through appropriate channels as for other hazardous wastes.

1.5.1 Anaesthetic Gases

This is a slightly unclear area regarding waste as there is no tangible end product which can be packaged and disposed of, since the wastes involved are volatile. Barr (1987)



reported that the halogenated anaesthetic gases and nitrous oxide used in veterinary gaseous anaesthesia are both potentially harmful to veterinary and ancillary staff in close proximity. Nitrous oxide causes abortion in rats and has been reported to cause abortion in anaesthetists in Russia. Halothane (the most widely used anaesthetic agent in veterinary gaseous anaesthesia) and its metabolites may cause liver, kidney and bone marrow disease, immunosuppression, spontaneous abortion, infertility, birth defects, cancer and pruritis (Barr, 1987). Other more recent reports state that there is as yet no conclusive evidence of the health effects of anaesthetic gases and/or nitrous oxide (Anon., 1996a). Veterinary exposure to halothane and nitrous oxide seems to exceed safety limits in surgery rooms in 30-50% and 75% respectively of veterinary surgeries tested (Fritschi, 2000). Violations of safety limits are also reported in medicine (Chang, Kau and Hseu, 1997). The only saving grace for veterinary surgeons may be that as individuals in a multi-person practice they tend to have less overall exposure than other healthcare professionals as they spend less time in the surgery. The ancillary staff e.g. veterinary nurses at the practice may be placed at more risk as they may assist multiple vets in surgery during each week (Barr, 1987). Vets should consider good anaesthetic practice and adequate scavenging systems to minimise occupational exposure to these waste gases as a matter of course. There are excellent guidelines in the literature on best practices (Barr, 1987; Anon., 1996a), and there are also modern anaesthetic techniques and alternatives being explored to help minimise waste gases (Hughes, 1998).

1.5.2 Mercury in Medicine

There is little mention of mercury as a component of hazardous waste in the veterinary literature. Miller (2000) and Kelly (2004) both refer to used fluorescent tubes as a hazard. Miller cited the mercury content of the tubes as the reason for the hazard while Kelly made no reference to the element in the article. Yet to dentists and doctors mercury is a cause for great concern in modern hazardous waste management (Blyth, 1999; Quayle, 2000).

There are many potential sources of mercury in a healthcare (and veterinary practice) situation. Used fluorescent light tubes as mentioned by Miller (2000) contain high quantities of mercury on their inner linings and are even being refused from landfill in the USA at the moment (Rinfret, 1995; Anon., 1996b). Some batteries also contain mercury and in the US physicians are encouraged to segregate batteries as sources of mercury even though they are not strictly hazardous waste (Cocchiarella,

Deitchman and Young, 2000). More obvious sources of mercury include thermometers, sphygmomanometers, laboratory calibrating thermometers, barometers and laboratory chemicals (Rau *et al.*, 2000), but occult sources of mercury have also been found in hospitals attempting to eradicate mercury including sanitary bleach which was found to contain mercury by Shapiro and Stoughton (2001). Waste mercury is lost from hospitals in wastewater. Waste water becomes contaminated by mop water from examination rooms where thermometers had been broken, and possibly also from bleach (Kameyama, 1992). Other hospital wastes containing mercury include solid and liquid clinical and hazardous wastes which ultimately are incinerated. Dental surgeons use of amalgam (high in mercury) to fill teeth means that they have a relatively high output of mercury both as liquid waste (oral rinse water which goes to wastewater) and as solids in the form of contaminated cotton wool and swabs and extracted teeth which may go to landfill (inappropriately) or be incinerated as clinical waste (Chin *et al.*, 2000; Spencer, 2000; Vandeven and Mc Ginnis, 2004). Fillings in dead bodies going for cremation may also be an issue (Spencer, 2000).

Mercury which ends up in wastewater from whatever source ends up in sewage sludge. If this is spread on land it can enter ground and surface waters as well as crops but also if sludge is incinerated the mercury becomes vaporised (it becomes volatile at low temperatures) and can be distributed over much wider areas via atmospheric gases again ultimately to enter water courses (Vandeven and Mc Ginnis, 2004). Similarly solid wastes which are incinerated as clinical waste generate mercury as an aerial contaminant (Chin *et al.*, 2000). While the levels of mercury pollution produced in this manner are not as significant as those of industry or from car exhausts, medical waste incineration is the fourth largest source of mercury pollution in the world, accounting for 10% of total mercury pollution (Shapiro and Stoughton, 2001). Mercury in teeth accounts for 4% of all the mercury on the planet (Chin *et al.*, 2000) and dental surgeons in the USA alone may cause as much as eighteen tonnes of waste mercury to be liberated in a year (Drummond, Cailas and Croke, 2003).

Dentists and doctors are going to great lengths to eliminate mercury pollution from healthcare sources. Dentists in the US use expensive waste water treatment processes to remove mercury at very high cost to themselves (Vandeven and Mc Ginnis, 2004). They also segregated amalgam so that it is not incinerated. Composite resins and glass ionomers are being used as alternatives to amalgam (Spencer, 2000). Hospitals are segregating and treating wastewater to remove mercury, are replacing laboratory

reagents with non-mercury alternatives (Kameyama, 1992), and are replacing diagnostic equipment with digital alternatives (Rau *et al.*, 2000). There are also programmes to educate the public as to disposal of mercury including thermometers (Di Carlo, Ruck and Marcus, 2002).

While amalgam usage in veterinary practice is likely to be very low, mercury thermometers are the most widely used in veterinary medicine, and vets should also take into consideration other potential mercury sources such as batteries and fluorescent tubes.

1.5.3 Laboratory Reagents, Photochemical & Other Chemical Wastes

A small-scale laboratory is now a feature of many veterinary practices in Ireland and even in the absence of such a facility laboratory chemicals will often be present on the premises. Most veterinary practices will have and regularly use formaldehyde and hydrogen peroxide. The average veterinary laboratory will contain formaldehyde or equivalent histological fixatives, cytological stains such as Shorrs, Giemsa or equivalent haematological stains, sodium or potassium hydroxide, solvents such as acetone, and ethanol or methanol or equivalent cytology fixatives. Any veterinary practice with x-ray equipment will have photochemical wet processing and will be producing approximately 20-30kg of photochemical waste alone every month. Such a container as is approved for storage of waste photo chemicals is illustrated in **Plate 3, Appendix I**. Developer usually contains 45% glutaraldehyde and fixer contains hydroquinone (5-10%), potassium hydroxide (1-5%) and silver (less than 1%) (Anon., 1999). Veterinary practices doing advanced dental work may be using phosphoric acid for tooth etching and may be using glass ionomers and composite resins or amalgam in repair work. Solvents and resins are also used in some orthopaedic surgery. Examples include bone cement and resins for some systems of external fixation. The cartridges for wet suture materials such as catgut contain isopropyl alcohol. All of these materials are hazardous (due to their various properties) according to the European Waste Catalogue and Hazardous Waste List (Anon., 2002), and under the definition of hazardous waste in the Waste Management Act, 1996. European waste codes for these chemicals are shown in **Appendix 1, Tables 1(a), 1(b), and 1(c)**. Accordingly, these chemicals cannot be placed with regular waste destined for landfill. There is only passing reference to some of these materials in the veterinary literature (Miller, 2000; Gillies, 2001; Krauss, 2003; Anon., 2005a). There is little or no mention of how these chemicals should be dealt

with in practice except to say that in as far as possible chemicals should be kept in original packaging and containers (Mc Killen, 1999).

1.5.4 Halogenated Organic Compounds

Halogenated organic compounds also known as organic halides are widely used in human diagnostic imaging but are also used infrequently in diagnostic veterinary radiography particularly in referral centres and hospital situations but also with increasing frequency in general veterinary practice. Most are iodised x-ray contrast media. They were not mentioned as a waste issue in any of the veterinary literature but there are increasing concerns over their use in human medicine. These compounds are not metabolised at all in the body and are excreted in urine. They are resistant to metabolic action of all kinds (Tsai, Kuo and Lin, 1999) hence they are a cause of concern because even though they are classed as non-toxic and non-hazardous they accumulate in the environment (Ziegler *et al.*, 1997). The concentration of these chemicals in hospital effluent which can be adsorbed onto activated carbon is known as the AOX load. There are legal limits set for the AOX load in hospital waste water, and these limits are frequently exceeded by hospitals (Ziegler *et al.*, 1997). There are extensive efforts currently being made to develop ways to monitor these products in hospital waste water (Emmanuel *et al.*, 2005), and to develop ways to eliminate them from waste water (Tsai *et al.*, 1999; Sprehe, Giessen, and Vogelpohl, 2001). While the volumes of AOX produced by a veterinary hospital could not approach that produced by human hospitals (800kg per year from five hospitals in Berlin alone) (Ziegler *et al.*, 1997). If vets are to use these products in practice the excreta of treated animals must be considered as a potential hazard to the environment however small.

1.5.5 Pressurised Containers

Pressurised containers should be considered as potential hazardous waste (Anon., 1999). All pressurised containers are potentially explosive regardless of contents and as such must be considered hazardous (according to the Waste Management Act, 1996). While most vets pay rental on their pressurised gas containers with their gas supplier they could potentially end up as waste. Likewise out of date fire extinguishers and used aerosol cans which are ubiquitous in veterinary practice containing everything from pesticides and antibiotics to wound treatments. Most aerosols contain flammable

propellants but many also contain potentially harmful or toxic substances and should be treated as hazardous waste.

1.5.6 Radioactive Waste

Radioactive waste is unlikely to be a problem for the vast majority of veterinary practices as it is really in the domain of hospital, industrial and government research laboratories where its disposal is dealt with extensively and appropriately (Rau *et al.*, 2000). Some very dramatic incidents have been reported in radioactive medical waste management resulting in public injury and substantial loss of life (Anon., 2000*b*). It is not mentioned in the literature in relation to veterinary waste.

1.5.7 Non-medical Hazardous Waste in Veterinary Practice

Various types of non-medical hazardous waste which can be generated in veterinary practice are mentioned in the literature. Fluorescent tubes and batteries as a source of mercury have already been discussed. Also worth considering before they are placed into municipal waste collection are paints and thinners (Miller, 2000; Krauss, 2003, Kelly, 2004), batteries containing lead and cadmium (Cocchiarella *et al.*, 2000; Kelly, 2004), transformers which may contain PCBs (Miller, 2000), used electrical equipment such as fridges, Televisions and computers (Anon., 2005*a*), weed killer and computer ink cartridges (Kelly, 2004).

1.6 Minimisation of Waste

It is a central tenet of waste management that management begins with the avoidance of waste generation through waste minimisation. There are many useful suggestions in the veterinary literature for preventative measures by which veterinarians can minimise waste generation.

Domestic and hazardous waste should be kept separate (Mc Killen, 1999). Only as many pharmaceuticals and chemicals as are needed for the following 2 months should be ordered (Krauss, 2003). Discounts offered by suppliers to secure larger orders should be resisted (Miller, 2000). Expiration dates on medicines should be monitored and good stock control should incorporate a “first in first out policy” (Miller, 2000). Outdated product should be returned to the manufacturer within the time normally allotted by the manufacturer (Miller 2000). Less toxic products should be substituted

wherever possible (Krauss, 2003). Computerised or other accurate methods of recording inventory should be used as an aid to stock control (Miller, 2000). Disposable materials such as gowns and drapes should be avoided where possible (Krauss, 2003). Packaging waste should be recycled including glass, paper, plastic, aluminium, and cardboard as much as possible (Krauss, 2003). The composting of faeces and other biodegradables is also suggested by Krauss but this may not be compatible with the clinical waste status of such waste in the UK and Ireland.

Many of the same points are dealt with by human medical papers advocating waste minimisation but some additional points are worth consideration:

Where possible to avoid use of harmful disinfectants and chemicals, physical methods of cleaning can be used instead of chemical (e.g. steam cleaning and disinfection versus conventional chemical disinfectants), and overuse and wastage of products should be avoided (Anon., 1999). Regarding pharmaceuticals, the expiry date of all products should be checked at the time of delivery, and a conscious effort should be made to use all of the contents of each container (Anon., 1999). There is much concern over the lack of segregation of plastic wastes in particular PVC from hazardous waste. PVC plastics when incinerated lead to the production of toxic chemicals (see incineration below). The avoidance where possible of the purchase of PVC medical products is advocated and pressure should be placed on manufacturers of medical consumables such as drip bags and syringes to make them PVC free (Anon., 2004b). Hospitals in India have even gone back to using glass syringes due to an inability to properly enforce the disposal of plastic syringes (Anon., 2000b). Rau and co-workers (2000) also called for empty i/v infusion packs and used i/v giving sets to be kept out of red bag waste where infectious contamination of these items could be avoided, since the majority of red bag waste goes for incineration. If plastic waste in general in hospitals could be better segregated, then plastic recycling could be improved (Lee, Ellenbecker and Moure-Ersaso, 2002 and 2004).

Common sense dictates that the benefits to a veterinary practice of the application of many of these measures extend beyond mere avoidance of prosecution or the satisfaction of any philanthropic desires to save the planet. There is money to be saved here in the better management of chemicals, drugs, cleaning agents and disinfectants. Expense on disposable items could be reduced or avoided, and a reduction on the expense of hazardous waste disposal could be achieved.

1.7 Fate of Veterinary Hazardous Waste

Currently in Ireland yellow bag wastes are treated usually by autoclaving prior to being shredded and either exported or sent to landfill (Kelly, 2004). In the UK the main method of disposal is via incineration (De Grey, 1990). Irish pharmaceutical, chemotherapeutic and other hazardous chemical waste is currently exported pending the development of a hazardous waste incinerator in Cork (Kelly, 2004). Thus much of veterinary hazardous waste currently is and will in future be incinerated.

1.7.1 Incineration

The potential toxicity of incineration ash produced from veterinary waste has been investigated and demonstrated (Thompson *et al.*, 1995). The potential hazard of every aspect of incineration including the end product has been examined for medical waste and the results of these investigations have caused great concern (Marrack, 1988; Walker, 1990; Coppinger, 1996; Anon., 2000*b*).

There are advantages to incineration of medical waste. It significantly reduces the amount of material, can destroy pathogens and hazardous organic chemicals and renders the waste unrecognisable in the form of ash (Lee, Huffman and Nalesnik, 1991).

However in addition to problems with liberation of mercury and other heavy metals discussed earlier, incineration and combustion of plastics containing PVC especially at low temperatures (<800°C) leads to production of polychlorinated dibenzo-para-dioxins (PCDDs) or dioxins for short, co-planar polychlorinated biphenyls (PCBs), and polychlorinated dibenzofurans (PCDFs) or furans for short (Ferraz and Afonso, 2003; Anon., 2004*b*). Hydrochloric acid, carbon monoxide, and sulphur dioxide are also produced by incineration (Marrack, 1988; Alvim-Ferraz and Afonso, 2003) and levels liberated frequently exceed safe emission limits (Ferraz, Cardoso, and Pontes, 2000; Alvim-Ferraz and Afonso, 2003). Not all dioxins, PCBs and furans are toxic but all are persistent and cumulative in the environment and accumulate in the food chain. Various health problems are attributed to these chemicals from immune impairment, developmental abnormalities, skin and liver disease, and cancers (Anon., 2004*b*).

Many measures to help limit the harmful effects of incineration of medical waste have been suggested. They include never incinerating materials containing chlorine (such as PVC) or heavy metals (Anon., 2004*b*) and the abolition of incineration in small

and aged local hospital incinerators (Marrack, 1988). Waste emissions should be carefully monitored (Lee *et al.*, 1991) and careful attention paid to protocol during inefficient periods of combustion in existing high temperature incinerators i.e. start up and cool down) (Anon., 2004b). Extra pollution control devices should be added onto the waste flues of existing high temperature incinerators (Ferraz *et al.*, 2000; Alvim-Ferraz and Afonso, 2003). Private veterinary incinerators in the USA have been identified as substandard and no longer meet legislative requirements on emissions (Hannah, 1995).

The ash from incineration of medical waste is not without its toxic properties (as with incinerated veterinary waste as mentioned above). These include heavy metals which can leach out (Lombardi, Mangialardi, Piga and Sirini, 1998), and still more dioxins, furans and PCBs (Anon., 2004b). The ash may not be any more toxic than that of incinerated general waste (Kuo, Shu, Wu and Lai, 1999). These properties render it unsuitable for landfill and alternative safe means for its disposal, which centre on stabilising the metals and avoiding leachate, are currently under development. These include incorporation into cement (Lombardi *et al.*, 1998; Fillipponi, Poletini, Pomi and Sirini, 2003), and conversion into a slag which stabilises the heavy metals (Idris and Saed, 2002), and can then be incorporated into road surfacing (Azni, Katayon, Ratnasamy and Johari, 2005).

1.7.2 Alternatives to Incineration

Given the high costs associated with incineration both in monetary terms and in terms of its impact on the environment it is not surprising that much attention has been given to the devising of alternative methods of managing medical hazardous waste.

Landfill can not be considered an alternative since hazardous waste has been banned from municipal landfill under the landfill directive even though landfill is sometimes used in the USA (Walker, 1990) and in the UK if the waste is known to be free from infectious hazard (Moritz, 1995). Medical hazardous waste going to landfill has led to contamination of drinking water (Anon., 2000b) and possibly also to congenital birth defects (Elliott *et al.*, 2001).

Alternatives to incineration already in use include low pressure steam sterilisation or autoclaving (Anon., 1994), high pressure steam or steam reforming (Rau *et al.*, 2000), maceration and microwave treatment (Blenkarn, 1995; Lee *et al.*, 2004), and plasma pyrolysis (Nema and Ganeshprasad, 2002). Proposed alternatives include

shredding followed by enzymatic digestion (Garg *et al.*, 1994), disinfection with high energy electrons (Rolingson, Waite, Kundalkar and Kurucz, 1997), and composting of biodegradable components of medical hazardous waste with the aid of cow manure (Ghosh, Kapadnis, and Singh, 2000). It is likely that in the future various combinations of these treatments may be used as an alternative to or in combination with incineration (Anon., 2000*b*).

1.8 Legislation governing Veterinary Waste in Ireland

1.8.1 Overview of Veterinary Waste Regulation

The legislation governing the management of veterinary hazardous waste is extensive. A large amount of the legislation has much in common with that governing general hazardous waste and medical healthcare waste but some of it does specifically relate to veterinary practice, especially that which relates to disposal of animal carcasses and body parts. The hazardous waste is mainly governed by the Waste Management Act, 1996 and associated legislation. The BSE crisis led to issues with the disposal of animal carcasses and consequently led to the drafting of legislation specifically governing this type of waste. The relevant legislation is reviewed below in chronological order. In the case of each item of legislation the synopsis includes the information which is most relevant to veterinary practice waste issues.

1.8.2 Council Directive 91/689/EEC of 12 December 1991 on Hazardous Waste

This is the source document on which most of the Irish hazardous waste legislation is based. The aim of the directive was to bring together the approaches of the various member states on the controlled management of hazardous waste. The directive defines hazardous waste based on three annexes. Annex III describes the properties of substances in waste which render the waste hazardous. Wastes are automatically considered hazardous if they are explosive, oxidising, highly flammable, flammable, irritant, harmful, toxic, carcinogenic, corrosive, infectious, teratogenic, mutagenic, or ecotoxic. Annex I(a) lists items of waste automatically categorised as hazardous if they have any of the properties listed in Annex III. Interestingly numbers one and two on the Annex I list are of direct relevance to veterinary practice namely “anatomical substances; hospital and other clinical wastes;” and “pharmaceuticals, medicines and veterinary compounds”. Annex I(b) lists additional wastes which are considered

hazardous if they contain any of the constituents of Annex II and have any of the properties of Annex III. Annex II lists various toxic substances which render waste hazardous if they are contained therein. Such substances of relevance to veterinary practice include for example cobalt, copper, zinc, silver, peroxides, pharmaceutical and veterinary compounds, biocides and phyto-pharmaceuticals (e.g. pesticides etc.), infectious substances, mercury and lead.

In addition to describing hazardous waste the directive also laid down the principles of how such waste should be handled. Hazardous waste must not be mixed with non-hazardous waste and different types of hazardous waste must be segregated. Waste must be properly packaged and labelled in accordance with international and community standards, and must be accompanied by appropriate documentation. Authorities must draw up plans for the management of hazardous wastes and make them public. The directive also dictated that member states have to maintain a register of companies providing hazardous waste collection and treatment services and must report this annually to the commission. Member states were also instructed to implement this directive and report on its implementation to the commission every three years.

1.8.3 European Communities (Disposal, Processing and Placing on the Market of Animal By-products) Regulations, 1994; S.I. No. 257/1994

These regulations were introduced in the wake of the BSE crisis. They were designed in an industrial and agricultural context to govern the disposal of animal carcasses and products derived thereof with a view to the prevention of protein of animal origin getting into the food chain. They regulated the disposal of all animal and carcasses, which by definition included the bodies of companion animals. Under this regulation the bodies of *all* animals were classed as “animal by-products”, and as such were not permitted to be buried other than under very specific circumstances. There were specific contexts under which a Veterinary Inspector from a District Veterinary Office might issue a permit to a private individual to bury an “animal by-product”. In issuing such a licence the Inspector may even have had to consult with the relevant local authority or Health Board and issues of public health and environmental pollution had to be taken into account. For a time this legislation essentially prohibited the burial of a family pet on the owner’s property. It did not however preclude applications to District Veterinary Offices for burial licences by owners who wish to do so. The restrictions placed on the

disposal of family pets by this legislation have been removed by more recent legislation (European Communities (Animal By-Products) Regulations, 2003; S.I. No. 248/2003) described in section 1.8.15.

1.8.4 Waste Management Act, 1996

This is the major legislative instrument governing municipal and hazardous waste in Ireland and was drafted at least from the point of view of hazardous waste as a direct result of Council Directive 91/689/EEC of 12 December 1991 on Hazardous Waste. The act uses the same definition of hazardous waste as that described in this directive. The descriptions of “Category I waste” and “Category II waste” are identical to those of the hazardous wastes described in Annex I(a) and Annex I(b) in the European directive, and Annexes I, II, and III of the Second Schedule are copied almost verbatim. Annex III has an additional hazardous property over its source document; that of a “residuary hazardous property”, substances which though not themselves toxic can yield toxic substances following disposal. The third and fourth schedules of this act related to waste disposal and recovery activities were altered in the Protection of the Environment Act, 2003.

The Act empowers the Minister to regulate every aspect of waste management in Ireland from prevention, minimisation and reduction of waste, through storage, packaging, collection and transport of waste, to recovery or final disposal of waste. Enforcement is carried out by the Environmental Protection Agency (EPA) and by local authorities. Local authorities have the dual role of regulation and also the provision of many of the waste management services regulated by the Act. This synopsis of the Act concentrates on the sections of the Act which are of relevance to veterinary practices.

The Act makes provisions for the local authority to carry out such inspections of premises dealing with waste “as it considers necessary for the performance of its functions under this Act”, potentially at the expense of the enterprise being inspected. A register of waste audits and violations and other relevant records must be maintained by local authorities and the EPA. Each local authority must compile a plan in relation the waste produced in its area with a separate section within this plan specifically devoted to hazardous waste, which is to be reviewed at least every five years. Copies of these plans are available from local authorities for a fee. Also under the Act, guidelines for waste management for local authorities were to be published by the Minister including

how they are to conduct waste audits and waste reduction programmes and the publication of audit results.

At the national level the Act also made obligatory the devising of a “National Hazardous Waste Management Plan” to include planning for the prevention, minimisation, recovery collection, movement and disposal of hazardous waste. The plan to be devised by the EPA was to comprehensively quantify and describe the origin and fate of hazardous waste nationally, to predict changes in its production, to propose desirable targets and the infrastructural means to meet those targets, and to specify policies to be pursued by the EPA. The plan is to be reviewed at least every five years. The EPA was to notify the public of its intention to make the plan and to accept submissions from the public and private industry. As part of this plan the EPA could make recommendation to local authorities in relation to the management of hazardous waste.

The Act places a responsibility on all those involved in the commercial activity including agriculture and manufacture to prevent or minimise the production of waste from that activity including waste relating to any product manufactured by him or her. The Act allows for the introduction of regulations which would place an obligation on producers, distributors or retailers to collect or take back or arrange for the collection (without charge) of any product made, distributed or sold by a producer once the purchaser no longer has a use for it. Similarly there is a provision for the introduction of regulations which would place an obligation on the consumer to return certain items to the producer when they are no longer useful.

It is an offence under the Act for any holder of waste (hazardous or otherwise) to hold, transport or dispose of waste in a manner likely to cause environmental pollution and in the event of and loss or spillage of hazardous waste the waste holder is obliged to immediately notify the local authority and the EPA. Where control of waste is transferred by the holder to an unauthorised person the original holder remains responsible for that waste. Companies can only transport waste under permit from the relevant local authority. Such permits can be comprehensive in their description of the types of waste carried, the receptacles containing waste, the transport vehicle specifications and identifications, the documentation to accompany waste, and record keeping in relation to the waste shipments, and the company indemnity insurance. The Act provides for the introduction at any time of regulations governing any aspect of the holding and shipment of waste including packaging, documentation, requirements for

notification of authorities, inspection of waste consignments, and seizures of waste consignments.

Waste may not be discarded at a local authority waste facility other than in accordance with the specific requirements of the local authority regarding the nature, type and quantity of waste. Any unauthorised waste so deposited remains the property of the polluter and they are liable for any costs the Authority may incur in the disposal of this waste.

Companies which handle or process wastes in some way require specific waste licences which are heavily regulated. Such enterprises must operate under specified conditions of storage and treatment of wastes. They must have incident management plans in force which will prevent or minimise environmental pollution due to loss of release of wastes. These companies will be subject to investigations by the EPA of environmental impact statements, and the quality of air and water emissions. Waste licences are only issued to companies operating waste handling facilities which observe strict environmental standards including the best available technology (changed to “techniques” in the Protection of the Environment Act, 2003) not entailing excessive costs used to prevent or limit emissions from the activity concerned. Each licence applies specifically to particular types, compositions and volumes of wastes carried out at specific locations using specified protocols and procedures. The licensed enterprise must have regard to the emissions to air and water courses and specific technological treatments to air and water emissions are usually a requirement of the licence. Both activities within the plant and the emissions must be strictly monitored with suitable equipment, sampling procedures and analysis and results must be recorded. Emission standards are usually set in addition to specific periods during which emissions may be made. Formal written and oral objections which comply with certain conditions can be made by any person against the granting of a waste licence. All existing waste licences are to be reviewed at least every three years. Waste licences are not required for the recovery (land spreading or injection) of animal blood, faecal matter (manure or slurry) or other agricultural waste. However the Act provides for the regulation of the amount of waste spread and the recording of spreading and if necessary the testing of land on which such waste is spread. The Act also provides separately for the regulation of fertilisation of soil for agricultural purposes and requires the formulation of a “nutrient management plan” including the testing of both materials to be spread and the land

itself, the setting of limits on the volumes of material and the timing and recording of spreading.

The Act provides local authorities with the power to impose measures on enterprises handling waste not regulated by waste licences, particularly where there is felt to be a danger to the environment. They have the power to cease activities at the premises until remedial measures are taken, and if measures have to be taken by the local authority itself the polluter is liable for all costs incurred.

1.8.5 Waste Management (Planning) Regulations, 1997; S.I. No. 137/1997

These regulations were introduced on the strength of the Waste Management Act, 1996 detailing the requirements for the devising of waste management plans by local authorities either individually or jointly. It relates little to veterinary practices directly except that there is a requirement as part of the devised plan that the extent of the generation of healthcare waste by veterinary practices (in addition to hospital and dental waste) be described within the functional area of the local authority, including a breakdown of the hazardous component, if any, of such wastes. Also written into the regulations is a recommendation for the application of the “polluter pays principle”, in relation to the collection and disposal of waste.

1.8.6 Waste Management (Movement of Hazardous Waste) Regulations, 1998; S.I. No. 147/1998

Introduced under the Waste Management Act, 1996, these regulations strictly detail how hazardous waste is to be treated in transit from the “consignor” (in this case a veterinary practice) to the “consignee” (the waste management contractor) within Ireland. Hazardous wastes of different types must be segregated and also separated from non-hazardous wastes. Wastes must be labelled according to Community standards and labels must be legible at all times. The only exception to the rule excluding the mixing of hazardous wastes is if the relevant local authority has given prior written permission to do so. Each consignment of waste must be accompanied by a consignment note comprised of three parts A, B, and C each of which is completed in quintuplicate. Copies of these consignment notes are obtained from the local authority, and an example of such a consignment note (designated C.1) is illustrated in **Appendix 1, Figure 1.**

The regulations detail how this documentation is to be completed by consignors, carriers, and consignees in the context of hazardous waste shipments between consignor and consignee, and also details how copies of such documents must also be sent to the relevant authorities. The regulations also detail procedures to be followed in the event of a consignee refusing to accept a shipment from a consignor. Furthermore the EPA may require consignors to notify them in writing in advance of hazardous waste shipments and may require of local authorities to carry out inspections of consignments of waste either prior to shipping or during transit. Local authorities are required to maintain records of consignment notes and inspections and consignors are required to maintain records of consignment notes for five years.

1.8.7 Waste Management (Hazardous Waste) Regulations, 1998; S.I. No. 163/1998

These regulations were introduced on foot of the Waste Management Act, 1996 providing additional restrictions on asbestos, batteries, waste oils, polychlorinated biphenyls (PCBs) and products containing PCBs, and also providing further regulations on hazardous waste generally. The regulations relating to asbestos, batteries, waste oils and PCBs are of no relevance to veterinary practice.

Of relevance to veterinary practitioners includes a provision for the recording of the quantity, nature and origin of the hazardous waste produced by producers (which here would include veterinary practices) and any treatment carried out e.g. disinfection or autoclaving of waste, in addition to recording of the quantity, nature, destination, mode of transport, frequency of collection of hazardous waste which is transferred to another person. Such records must be maintained for three years and must be made available to local authorities and the EPA on demand. During the temporary storage of hazardous waste at the veterinary practice the waste must be labelled according to Community standards and segregated from other types of hazardous waste and from non-hazardous waste.

1.8.8 Waste Management (Amendment) Act, 2001

This act amended certain aspects of the 1996 act. It specified new regulations in relation to local authority waste management plans (mostly relating to municipal waste). It allowed for the introduction of the environmental levy as it relates to the use of plastic carrier bags. It also allowed for the introduction of a “landfill levy” on the disposal of

waste at landfill facilities. An “Environment Fund” was to be established at governmental level from revenue generated from the environmental plastic bag levy and additional funds aimed among other things at the prevention and reduction of waste, the establishment of waste re-use and recycling, to assist in the implementation of waste and hazardous waste management plans. There is little relating to veterinary practices in this act.

1.8.9 Waste Management (Collection Permit) Regulations 2001; S.I. No. 402/2001

These regulations govern the licensing of waste contractors in Ireland. Waste collection companies can only operate under permit. Detailed applications for waste collection permits must be made to each local authority in whose functional area the waste is to be collected. A permit holder must be deemed to be a fit “person” (e.g. no history of criminal convictions etc.). Applications involving hazardous wastes must also be referred to the EPA in addition to the local authority. At the application stage members of the public can make submissions in relation to the application sought. Where the activity involves waste recovery, collection permits will only be granted where the premises concerned as already been granted a waste licence or an application for such a licence has been sought. On granting of a licence the waste collector must ensure that appropriate records are kept and a summary of these records must be reported on an annual basis. The collector must also ensure that all conditions of the permit are complied with. Permits are to be reviewed by local authorities once every two years. A register of permits is to be maintained by the EPA.

1.8.10 Waste Management (Licensing)(Amendment) Regulations, 2002; S.I. No. 336/2002

These regulations were introduced on foot of Council Directive 99/31/EC of 26 April 1999 on the landfill of waste also known as the “Landfill Directive”. They make amendments to the Waste Management (Licensing) Regulations, 2000; S.I. No. 185 of 2000 regarding certain aspects of the licensing of waste facilities. The area of these regulations that relates especially to veterinary practices concerns landfill.

The regulations state that landfill facilities are to be classified into three classes: landfill for hazardous waste, landfill for non-hazardous waste, and landfill for inert waste, a fact which must be specified in the waste licences for each type of facility.

According to the regulations liquid waste (any waste in liquid form, including waters but excluding sludge), explosive, corrosive, oxidising, flammable or highly flammable waste, and infectious healthcare waste are prohibited from landfill other than new hazardous waste landfill facilities. The regulations specify infectious healthcare waste as that “likely to cause disease in humans or animals, arising from medical or veterinary establishments”. In addition waste specified under category 14 of Annex 1.A of Council Directive 91/689/EC is prohibited i.e. “chemical substances arising from research and development or teaching activities which are not identified, and/or are new and whose effects on man and/or the environment are not known (e.g. laboratory residues etc.)”.

Hazardous waste landfill facilities can only accept hazardous waste that fulfils certain relevant waste acceptance criteria. Non-hazardous waste landfill facilities can accept municipal waste, non-hazardous waste other than municipal waste that fulfils relevant waste acceptance criteria, and stable non-reactive hazardous waste with low leaching behaviour that also fulfils relevant waste acceptance criteria. Likewise a landfill for inert waste may only accept inert waste that fulfils relevant waste acceptance criteria. The relevant acceptance criteria in these cases are a reference to the waste acceptance criteria described in the Landfill Directive. This directive advocated either the compilation of a national list of wastes to be accepted at each class of landfill, or to define the criteria required to be on each of the lists. To be accepted at a landfill site the waste must either be on the list of accepted material or fulfil criteria similar to those required to be on the list.

1.8.11 Regulation (EC) No. 1774/2002 Of The European Parliament And Of The Council Of 3 October 2002

These EC regulations lay down health rules concerning animal by-products not intended for human consumption. The regulations lay down rules for the “collection, transport, storage, handling, processing and use or disposal of animal by-products, to prevent these products from presenting a risk to animal or public health”. Excluded from these regulations are raw pet food, liquid milk, bodies of wild animals (where human or animal diseases are not an issue), ova, embryos and semen for breeding and catering waste (unless destined for animal consumption).

The regulations classify animal by-products into three categories. Included in category 1 material are all body parts of animals suspected of infection with or confirmed to be infected with a TSE, specified risk material (SRM), pet animals, zoo

animals, circus animals, experimental animals and wild animals where they are suspected of being infected with diseases communicable to humans or other animals, and catering waste from planes, ships and international trains,. Category 1 waste must be disposed of by incineration in a Category 1 approved plant, by processing in a Category 1 approved plant followed by incineration or approved landfill, by landfill (catering waste only). Included in Category 2 waste is manure and digestive tract content of all animals but these can be applied to land when not considered a risk by the competent authority.

Animal by-products must be transported at a temperature appropriate to prevent danger to human health (e.g. refrigeration) and must be accompanied by commercial documents containing specified information and/or health certificates, which must be retained as records for at least two years. By-product packaging and/or vehicles must be leak proof, and following usage vehicles must be cleaned and disinfected. The regulations also dictate the approval and operating standards of pet crematoria which are exempt from the same regulations as other animal by-product incineration plants, including the necessity for incineration to take place in excess of 850°C (to prevent dioxin formation).

However despite giving pet animals the Category 1 designation the regulations make a derogation for the competent authority of individual member states to allow dead pet animals to be directly disposed of as waste by burial, while maintaining that such disposal does not endanger animal or human health, and preventing the abandonment, dumping or uncontrolled disposal of animal by-products.

1.8.12 Waste Management (Packaging) Regulations, 2003; S.I. No. 61 of 2003

While these regulations do not directly relate to hazardous wastes in veterinary practices *per se* they do relate to general waste management in veterinary practice, particularly in relation to veterinary practices with a strong retail component of which there are now a considerable number. These regulations essentially govern the reuse and recycling of packaging materials as it pertains to wholesalers and retailers. For the purposes of the regulations a “producer” is any person who for trade or business supplies packaging materials or packaged products. Thus veterinary practices retailing anything from dog food to cattle worm doses are classed as producers. Veterinary wholesalers in the main would be considered “major producers”. Major producers have a turnover in excess of €1 million, and supply to producers more than 25 tonnes of packaging material in a

calendar year. The regulations place an obligation on producers (e.g. veterinary practices) to either return packaging waste to where it came from or to transfer it to a recovery operator (recycling company) for the purposes of recovery. The material may also be used as a fuel but only in accordance with an appropriate permit. Waste contaminated by anything which could pose a risk to human health is exempt. It is the producer's responsibility to ensure that the recovery operator has the appropriate licensing.

There are additional obligations placed on major producers with regard to packaging waste however they do have a choice in how they can deal with their packaging waste. They can pay into a scheme for the recovery of packaging and packaging waste (such as that now operated by Repak) which discharges any obligation they may have towards the packaging waste they send to producers or they can opt to receive and accept back packaging waste from the producers they supply. If they choose this route they must post notices to the effect that they will accept packaging waste, provide facilities for the acceptance of packaging waste, accept free of charge packaging waste originating from products of a type supplied by the major producer, and collect or arrange for the collection of any packaging material originating from products of a type supplied by their company. They need to receive at least 50% of the weight of packaging waste they send out in any quarterly period, and can only stop accepting packaging waste when they have exceeded the weight of waste that they despatched in the same period. Even then they must apply to the local authority for permission to refuse packaging waste and have to post a public notice to that effect. Major producers grouped within a confined area (250m) can join together for the purposes of compliance and operate out of one building (up to a maximum of 10 major producers). The premises for accepting waste must be licensed with the local authority which is renewed on an annual basis. Extensive records must be kept for three years on the amounts of packaging delivered from and accepted at the premises. Major producers are to compile a plan to achieve compliance with these regulations to be reviewed every three years and are to prepare a report on the execution of this plan which is to be made available on demand. This could be of relevance to veterinary practices receiving packaging waste from large scale veterinary wholesalers. For practices located within a convenient distance of such a supplier who may also be incurring costs in the disposal of packaging wastes received from that supplier the direct return of such wastes to the wholesaler could represent an alternative to paying for the collection of those wastes.

1.8.13 European Communities (Animal By-Products) Regulations, 2003; S.I. No. 248/2003

These regulations were brought in on foot of Commission Regulation (EC) No. 811/2003 of 12 May 2003. The regulations are similar in many respects to those of the earlier European Communities (Disposal, Processing and Placing on the Market of Animal By-products) Regulations, 1994; S.I. No. 257/1994. The regulations prohibit the incorporation of cooking oil into animal feed, and regulate the processing, transport and disposal of animal by-products, the approval of animal by-product processing plants, the burial of animals and animal by-products, the use of animal by-products in research, and the processing and fate of knackery meat. Again the regulations that relate to veterinary practice concern the burial of animals.

As in the 1994 regulations, these regulations state that animals or animal by-products (including the bodies of companion animals) can only be buried in accordance with a “burial licence” issued by the Minister for Agriculture or an authorised officer, only following application for burial on an appropriate form and only under certain extenuating circumstances e.g. the animal must be located in a place too remote for it to be disposed of in an appropriate manner, or if movement of the animal poses a serious risk to human or animal health. If granted a burial licence the animal owner must ensure that the burial does not cause nuisance, pollution or pose a threat to the environment. However there is a clear division made in these regulations between pet animals and all other animals and animal by-products. In the section on burial (section 7), It is clearly stated (point 14) that “nothing in this regulation shall prevent the disposal of dead pet animals by burial”. This removes the uncertainty of the situation created by the 1994 regulations in which it was unclear whether pet animals were to be treated as all other animals and animal by-products for the purposes of the regulation of burial.

Regarding research, in which practicing veterinary surgeons are occasionally involved, the regulations state that animal by-products can only be used in diagnosis, education or research in accordance with a “research licence” granted by the Minister for Agriculture. Such licences are granted only following the appropriate application in writing to the Minister.

1.8.14 Waste Management (Packaging) (Amendment) Regulations, 2004; S.I. No. 871/2004

These regulations change the wording of some of the sections of the 2003 regulations. There is little real change to the regulations overall as they are described in the section above. There is an additional requirement on local authorities to annually publish lists of major producers in the local media in their functional area.

1.8.15 Waste Management (Electrical And Electronic Equipment) Regulations 2005; S.I. No. 290/2005

These regulations were brought in on foot of the “WEEE directive” i.e. Council Directive 2002/96/EC of 27 January 2003 on waste electrical and electronic equipment (WEEE), and its amendment directive Council Directive 2003/108/EC of 8 December 2003. These are the first of a series of regulations governing the environmentally sound management of waste electrical and electronic equipment. The regulations place obligations individually on the producers, distributors and end-users of such equipment.

Producers are obliged in the design and construction of equipment to take into account reuse and recycling of such equipment, to encourage the reuse of waste components, and to ensure that there are no prohibited substances included in their equipment. They are also obliged to finance the management (recycling/disposal) of all waste returned by private householders and waste returned by non-householders (commercial enterprises) when it is being replaced by similar equipment. Distributors must take back from final users on a one for one basis and free of charge any electrical or electronic equipment that is being replaced by equipment of equivalent type or function. Final users must finance the disposal of electrical or electronic equipment that they are not replacing with like equipment. Thus a veterinary practice disposing of a defunct item of electrical equipment for example a blood biochemistry analyser or a computer which is not being replaced by another similar item of equipment would be liable for the disposal of that equipment. The regulations also make provision for the registration of major producers for the purposes of compliance with the regulations. The regulations allow for the further introduction or regulations requiring newly manufactured equipment to be marked either as unfit or fit for municipal waste i.e. whether or not it contains specified hazardous waste, and placing an onus on producers and distributors to inform the public of the benefits of recycling, the hazards of not recycling and the systems available to them for the return and recycling of equipment.


Regulations may also be introduced requiring producers to make technical data on equipment design available to recovery facilities to facilitate recycling.

1.8.16 Waste Management (Waste Electrical And Electronic Equipment)

Regulations 2005; S.I. No. 340/2005

These regulations elaborate on many of the points raised in the preceding regulations. The First Schedule categorises electrical and electronic equipment into ten categories. The Second Schedule describes the types of items in each category. Examples of the categories and the types of appliances found in veterinary practices are listed in **Appendix 1, Table 2.**

The regulations allow for the establishment of a registration body self-funded by registration fees collected from producers. This body will compile a register of all producers placing electrical and electronic equipment on the market and will determine the proportion of market share held by each producer, and will have access to financial information on the annual sales of each producer. Producers have to register with the approved body then obtaining a registration number which must be displayed on all documentation, and must provide independent evidence on an annual basis of their participation in a scheme for the environmentally sound management of waste electrical and electronic equipment. Distributors can only trade with registered producers, and are obliged to accept old equipment when supplying similar new equipment (on a one-to-one basis), including collection of old product where the new product is delivered directly to the final user. The exchange must be made within 15 days of purchase. With the introduction of a new product on the market producers are required to financially guarantee the cost of the environmentally sound management of the equipment that will be accepted from private households when the new product is purchased. Producers are to recoup this financial cost from the final users in the form of a levy on new equipment (the “Producer Recycling Fund”). Where distributors display the additional cost of the environmentally sound management of an item of equipment on sale to the final user they are obliged separately identify this additional cost as the “Producer Recycling Fund” and to ensure that they are not overstating this cost. Producers are obliged to collect from civic amenity facilities, within five days of a request to do so any product of a type and brand supplied by that producer. From 13 August 2005 final users can deposit free of charge any waste electrical or electronic equipment at such facilities free of charge. In the case of products sold to concerns that are not private householders if




old product is replaced by new product the producer must accept the old product and is liable for the cost of environmentally sound management of that product. Where the final user is disposing of but not replacing old electrical or electronic equipment he or she is responsible for the environmentally sound management of that product. From 31 December 2008 all waste equipment must be recovered (to a minimum of 70 to 80% depending on category) and reused (to a minimum of 50 to 75%). This liability falls to producers and commercial final users (where they are not replacing product). Producers are required to keep extensive records of the amount of product they release onto the market and the amount of WEEE they receive as part of their environmentally sound management policy. They must have compiled a waste management plan on the date at which they first seek registration. They must report on this plan every time they seek registration renewal and must draft a new plan every three years. Producers must also supply to recovery agents detailed data on their product to facilitate its recovery. The regulations also allow for the establishment of an approved body for the policing of these regulations. Local authorities are required to maintain a register of distributors of electrical and electronic equipment as and from 27 July 2005.

1.8.17 Waste Management (Restriction Of Certain Hazardous Substances In Electrical And Electronic Equipment) Regulations 2005; S.I. No. 341/2005

These regulations append to the earlier descriptions of the types of equipment to be found in the Second Schedule of the Waste Management (Waste Electrical And Electronic Equipment) Regulations 2005; S.I. No. 340/2005. The additions are included in **Appendix 1, Table 2**. They also prohibit the inclusion of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated biphenyl ethers (PBDE) in all new electrical and electronic equipment with the exception of medical (category 8) and monitoring and control equipment (category 9) from 1 July 2006.

1.8.18 Animal Remedies Regulations 2005; S.I. No. 733/2005

While this legislation deals in the main with the licensing and sale of animal remedies the regulations do place an obligation on both the manufacturers and distributors (in this case veterinary surgeons) to ensure the lawful disposal of unused animal remedies. The manufacturer (the “holder of an animal remedies authorisation”) is responsible for the maintenance of “a system designed to ensure, in accordance with Article 95a of the



Directive, that an animal remedy sold or supplied by him or her, in the State which is unused or reaches its expiry date is disposed of lawfully”. The Directive referred to is Directive 2004/28/EC of the European Parliament and of the Council of 31 March 2004 which amends Directive 2001/82/EC of the European Parliament and of the Council of 6 November 2001. Article 95a of the Directive states that “member states shall ensure that appropriate collection systems are in place for veterinary medicinal products that are unused or expired”. To achieve this end in Ireland according to the above regulations holders of animal remedies authorisations must put in place the necessary arrangements with all groups to whom they supply product including wholesalers, registered veterinary practitioners, pharmacists, and licensed merchants with a view to receiving the unused or out of date animal remedies which have been returned to any of these groups. The regulations further place obligations on wholesalers to “receive and ensure that animal remedies returned which are unused or have reached their expiry date, are returned to the marketing authorisation holder”. Likewise retailers of animal remedies including holders of animal remedies merchant’s licences (those selling products to commercial animals) and also retailers of companion animal medicines are required to have in place arrangements to “receive and return to the person from whom he or she purchased them, an animal remedy that its unused or has reached its expiry date and in addition to take steps to ensure that customers are aware of the arrangements”.

1.9 Additional Relevant Publications

1.9.1 National Hazardous Waste Management Plan, 2001 (Anon., 2001)

This document was drawn up in accordance with Section 26 of the Waste Management Act, 1996. The document looked at accumulated data on hazardous waste accrued between 1996 and 1998, examining the source and fate of this waste and attempting to project future data. Prevention of hazardous waste plays an important part in the plan. The aim was to reduce hazardous waste production to 1996 levels and to eliminate unreported hazardous waste (estimated at 25% in 1998). Small scale producers (industrial, commercial, agricultural, and households) were seen as a major source of unreported waste. The lack of Ireland’s self-sufficiency in the handling of hazardous waste was also seen as a problem with so much being exported for solvent recovery, incineration and landfill. Self-sufficiency was recommended. Local authorities who are

usually responsible for the management of hazardous waste in their respective areas were seen as crucial to the plan. The three principal areas requiring investment were seen to be waste prevention, waste recovery and disposal, and enforcement of the legislation.

There are several areas of the plan of relevance to veterinary practices. Among the priorities set for 2001-2006 were: (point 3) “the identification and elimination of unreported hazardous waste to prevent its uncontrolled disposal” and (point 5) the “establishment of an improved collection infrastructure for hazardous household, agricultural and SME (small and medium enterprise) wastes”.

The introduction section has a very useful flowchart (based on the hazardous waste definition in the Waste Management Act, 1996) as an aid to establishing whether a waste is hazardous or not. This chart is also repeated in the EPA document the European Waste Catalogue and Hazardous Waste List (Anon., 2002) (description to follow) and is shown in **Appendix 1, Figure 2**. The same section also explains the term “healthcare risk waste” which is of relevance to veterinary practices in addition to human hospitals. Healthcare risk waste is a subdivision of healthcare waste “whose collection and disposal is subject to special requirements in view of the prevention of infection”, and is thus regarded as hazardous waste. Thus not all healthcare waste is hazardous although it explains that the new hazardous waste list includes additional categories of healthcare waste within the scope of hazardous waste e.g. chemicals containing dangerous substances, cytotoxic and cytostatic medicines, and amalgam waste.

The amount of unreported veterinary medicine waste was estimated to be 500 tonnes in 1996 and 483 tonnes in 1998, although this was lower than the estimate of unreported household medicines (1,575 tonnes in 1996; not estimated for 1998) and was grossly overshadowed by sheep dip (28,000 tonnes in 1996 and 19,000 tonnes in 1998). By comparison the level of unreported mercury waste in the form of amalgam from dental practices was estimated as only one tonne in 1996. Unreported photochemical waste (some of which is generated by veterinary practices) was estimated at 642 tonnes (1996) and 1,572 tonnes (1998). Overall the agricultural sector (including veterinary medicines) was second only to non-IPC licensed industry as a source of unreported hazardous waste representing 34% of total unreported hazardous waste and 10% of total hazardous waste overall in 1996. The 2001 plan also made predictions of the level of hazardous wastes to be produced by 2006. It is likely that in the review of the plan (due

this year) that the actual figures for wastes generated will be more accurate thanks to additional sources of information such as waste generator records, local authority consignment notes and waste licensing records. The trends in hazardous waste showed an increase the overall production of hazardous wastes and in the export of hazardous wastes and a decrease in the amount of unreported waste from 1996 to 1998.

The section on waste prevention pays particular attention to the unreported waste category, highlighting the massive cost to each sector producing this waste if the waste was to be handled properly at the expense of the producer as in reported waste. The only way to reduce this cost is to reduce the waste. The danger of our reliance on export for disposal is also highlighted give the uncertain future of this route. The targets set for waste prevention are two-pronged aiming at the elimination of unreported waste and a standstill scenario where future hazardous waste production should not exceed that of the base year 1996. Waste prevention programmes are divided into two groups based on whether the waste is produced during the production (“process waste programme”) or consumption (“product waste programme”) of products. Veterinary practices would fall into the product waste programme category. Tools for the prevention of waste in this category involve the provision of choice to the consumer (of alternative products which are hazard free), deposit and refund schemes, and supplementary charges or taxes on products at the time of purchase.

Regarding collection of hazardous waste, the problem is not so much that the machinery is not in place for the collection of waste but rather that it is not availed of by generators of small quantities of hazardous waste, because of the high cost involved, a lack of required knowledge, or a general unwillingness to deal with hazardous waste. Only 500 of the 5000 Irish industrial companies were using available collection services let alone the companies within the service sector (such as veterinary practices). To improve collection rates from SME’s a number of proposals were suggested including the use of civic amenity sites and depots, the return of waste to suppliers, the collection on demand by commercial providers, and mobile collection services. In the case of households Section 33 of the Waste Management Act, 1996 requires local authorities to arrange for the provision of waste collection services (door-to-door) to households. The plan also suggests that while there is no statutory obligation on local authorities to provide such services other than to households, any such collection services should be extended to small scale generators of hazardous waste as the collection of such waste by commercial providers is not economical. Alternatively such services could be made

more economical by subsidising such collections or introducing charges. Whether or not door-to-door collection services are set up the plan states that at minimum local authorities should establish receptacles for hazardous waste at civic amenity sites and that such depots “should serve both households and small businesses...who may not have alternative affordable means of managing hazardous waste”. In addition to civic amenity sites it may be possible to increase the number of collection points by allowing on a voluntary basis shops, wholesalers, and retailers to provide receptacles for certain types of hazardous wastes.

Regarding recovery the document states that for many types of hazardous waste streams there is adequate capacity for recovery within Ireland without resorting to export and that in fact many facilities are under-supplied due to poor collection rates. The plan also refers to the extent of export for incineration and makes a case for a waste incineration facility to be set up in Ireland and also for a purpose-built hazardous waste landfill. The country’s capacity for healthcare risk waste is satisfactory for infectious waste (which is treated at non-incineration disinfection facilities and land-filled), but other hazardous healthcare wastes e.g. medicines and amalgam are exported for treatment (usually incineration). The plan suggests that segregation of waste types at “ward level” would reduce bottlenecks on healthcare risk waste. In other areas there is adequate capacity in the country to recover fluorescent lamps and photochemicals, but there is no capacity for batteries, agrochemicals, or paints and inks.

The section on hazardous waste disposal sites examines the potential for environmental damage from existing or historical dumping of hazardous wastes at landfill. The article does refer to waste acceptance criteria at individual landfills and cites the example of Clare County Council where items prohibited include “dead or aborted animal carcasses” and “any medical wastes including healthcare and veterinary wastes”.

Finally, among the priorities listed for the plan for 2001-2006 were “the identification and elimination of unreported hazardous waste” and the “establishment of an improved collection infrastructure for hazardous household, agricultural and SME wastes”.

1.9.2 European Waste Catalogue & Hazardous Waste List, 2002 (Anon., 2002)

This document represents a harmonised list of different types of wastes including hazardous wastes published by the EPA and adopted from January 1, 2002.

It has its origins in the first European Waste Catalogue (Commission Decision 94/3/EC) and hazardous waste list (Commission Decision 94/904/EC) initially published as separate lists. The EPA first published a combined list in 1996 but the present list refers to four more recent documents: Commission Decision 2000/532/EC, and its amendments Commission Decision 2001/118/EC, 2001/119/EC, and 2001/573/EC. All waste reporting following January 1, 2002 should use the classifications in this document. Each waste is represented by a six digit code. The list is divided into chapters 01 through to 20 depending on the source of the waste. However any activity including veterinary practice would likely produce wastes falling into more than one chapter. Wastes which are hazardous are marked in the list with an asterisk (*). Any waste which cannot readily be classified anywhere on the list is given the 99 code. Waste codes from the list potentially produced by veterinary practices are shown in **Appendix 1, Tables 1(a), 1(b), and 1(c)**.

1.9.3 Segregation, Packaging and Storage Guidelines for Healthcare Risk Waste; 3rd Edition, April 2004 (Anon., 2004c)

In the absence of any specific guidelines from a government department in relation to veterinary clinical waste, this document, the third edition of which was published by the Department of Health and Children in 2004 has to be the next most relevant to the handling of veterinary waste. While it “attempts to bring together good practice principles and the various regulatory requirements relating to waste generation and management”, it “does not purport to be a legal interpretation of such regulations”. The document was produced in response to a change in the management of hospital waste away from on-site incineration towards rotoclaving at a small number of high-standard treatment plants. The disinfected waste is then disposed of either at municipal landfill or via commercial waste disposal. This entails much more transport of waste, and thus there was a need both for a reduction in the volume of waste and the careful and appropriate packaging of waste for transport.

According to the document the basic desirable elements in any up-to-date healthcare waste management system are:

- A proper understanding of the nature of the waste generated.
- The ability to identify and segregate hazardous waste.

- The ability to safely segregate different hazardous waste fractions into separate streams in accordance with the disposal method appropriate to each stream.
- The use of packaging which keeps any hazard confined so that personnel and the environment are protected during storage, handling and transportation.
- The use of appropriate vehicles for transportation of the waste to licensed treatment and disposal facilities.
- The use of a uniform tagging and tracking system which enables the waste to be identified and traced at all stages from generation to disposal.
- Accountability supported by well maintained and comprehensive records.

Healthcare waste is defined as the “solid or liquid waste arising from healthcare”. Only a small proportion of this waste is technically hazardous or “healthcare risk waste”. The current emphasis is on the segregation of this risk waste from the bulk of the waste. Within the risk waste most of it is classified as hazardous because of the risk of it being infectious or because it contains used sharps which might cause injury. These wastes are currently treated by rotoclaving (pulverisation and heat treatment to disinfect). The document describes some of the difficulties in the categorisation of risk and non-risk healthcare wastes based on various EU and domestic legislation. The current practical working categorisation as adopted by the Department of Health and Children was drawn up in 1998 by a group including the Infection Control Nurses Association and the Irish Society of Clinical Microbiologists. This categorisation is detailed in Appendix 1 of the document and is reproduced here in **Appendix 1, Table 3(a)** (Healthcare Risk Waste) and **Appendix 1, Table 3(b)** (Healthcare Non-Risk Waste). Using this system the broad classifications of healthcare risk waste are (i) infectious, (ii) biological, (iii) sharps, (iv) radioactive, and (v) chemical. The criteria used to decide whether there is an infectious hazard associated with a particular healthcare waste for the purposes of this classification system is based on the following definition of **infectious waste**:

- a) Infectious waste is healthcare waste known or clinically assessed to be at risk of being contaminated with any of the biological agents, mentioned in article 2(d) group 3 and 4 of Council Directive 90/679/EEC on the protection of workers from risks related to exposure to biological agents at work.

and/or

- b) Infectious waste is healthcare waste containing “substances contaminated with viable micro-organisms or their toxins which are known or reliably believed to cause disease in man or other living organisms”.

The biological agent group classification referred to in a) above is further elaborated on in Appendix 3 of the same document. The original source of this classification is the *Laboratory Biosafety Manual, 2nd Edition, 2003; World Health Organisation (WHO)*. Micro-organisms are divided into risk groups characterised by the pathogenicity of the organism, the mode and relative ease of transmission, the degree of risk to both the individual and the community, and the reversibility of the disease through the availability of known and effective preventative agents and treatment. The risk group criteria are as follows:


- (a) Risk Group 1: micro-organisms that are unlikely to cause human or animal disease (i.e. no, or very low, individual or community risk)
- (b) Risk Group 2: a pathogen that can cause human or animal disease but is unlikely to be a serious hazard, and, while capable of causing serious infection on exposure, for which effective treatment and preventative measures are available and the risk or spread if infection is limited (i.e. moderate individual risk and low community risk)
- (c) Risk Group 3: a pathogen that usually causes serious human or animal disease but does not ordinarily spread from one infected individual to another, and for which effective treatment and preventative measures are available (i.e. high individual risk and low community risk)
- (d) Risk Group 4: a pathogen that usually causes serious human or animal disease and that can be readily transmitted from one individual to another, directly or indirectly, and for which effective treatment and preventative measures are not usually available (i.e. high individual and community risk)

It should be noted that infectious waste definition b) (above) would likely encompass all of groups 2, 3, and 4 in the above classification system. Appendix 4 of the Segregation, Packaging and Storage Guidelines for Healthcare Risk Waste provides a list of infectious agents potentially occurring in healthcare waste which originates from the Fourth Schedule of the SAFETY, HEALTH, AND WELFARE AT WORK

(BIOLOGICAL AGENTS) (AMENDMENT) REGULATIONS, 1998; S.I. No. 248 of 1998. Each infectious agent (listed alphabetically and grouped according to bacteria, viruses, parasites and fungi) is assigned a code placing them in one of the risk groups 2 to 4. The organisms in risk groups 2, 3 and 4 referred to in definition a) (above) are shown in **Appendix 1, Tables 4(a) to 4(e)**. Immediately obvious from a perusal of this list is that many of the pathogens, particularly bacterial pathogens regularly cause disease in animals.

Segregation, which is best achieved at the point of generation of the waste (where the nature of the waste is best understood), is key to the effective management of healthcare waste. The first level of segregation is between risk and non-risk waste. This segregation should also take into account any local recycling schemes in operation for non-risk waste. The second level of segregation is to differentiate between and package appropriately the different types of risk waste, and this segregation must also be mindful not just of the different categories of healthcare risk waste but also of how the waste is to be disposed. The majority of the waste (95%) is hazardous because of its infectious status or because it is sharp, and will go for rotoclaving (pulverisation and disinfection). However some of the remaining 5% of risk waste qualifies as infectious waste or sharps waste but must not be included with other waste destined for rotoclaving for special reasons e.g. contaminated large metal implants which can damage the machinery responsible for grinding during rotoclaving, and blood or blood components assessed as likely to contain transmissible spongiform encephalopathy agents (not destroyed by rotoclaving), and sharps which have been used in chemotherapy regimes. Large recognisable anatomical parts must also go for incineration. The other hazardous wastes (chemical and cytotoxic wastes, and radioactive wastes) are not treated by rotoclaving and require automatic segregation and special treatment according to the legislation.

In addition to segregation, special attention must also be paid to how the waste is packaged so that little or no hazard is presented to personnel involved in handling, transport or disposing of waste. Non-risk waste includes waste of a domestic nature which does not require any special packaging other than black plastic sacs or regular waste bins, and non-infectious but potentially offensive wastes, which while there is deemed to be no infectious risk to handlers may where appropriate require extra packaging so as to take account of the potential offence to waste handlers.



Packaging of healthcare risk waste generally is of two types: plastic bags or sacs for infectious waste which do not contain sharp objects or liquids, and rigid (usually plastic) spill-proof containers and bins which are used for infectious wastes with a liquid component, sharps, pharmaceuticals/cytotoxic materials, anatomical material such as organs and recognisable body parts. The packaging should conform to specifications satisfying minimum requirements for leak resistance, strength, penetration and tear resistance. The packaging of healthcare risk waste is also governed by legislation governing the transport of hazardous goods by road, the most up to date legislation being the Carriage of Dangerous Goods by Road Regulations, 2004 (S.I. 029 of 2004) which is based on regulations laid down by the UN/ECE European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR). The ADR requirements are based on UN model regulations and adopt UN technical specifications for packaging. These regulations also set down the various requirements on the consignor, carriers, and consignees of waste including documentation e.g. it requires the completion of a transport document as well as a consignment note to accompany each shipment of waste. The ADR agreement breaks down the various dangerous substances carried by road into nine different classes. Two of these classes relate to healthcare risk waste: Class 6.1 (toxic substances e.g. cytotoxic pharmaceuticals and laboratory chemicals) and Class 6.2 (infectious substances). Class 6.2 is split into four subdivisions:

- I1, UN 2814 - Infectious substance, affecting humans
- I2, UN 2900 - Infectious substance, affecting animals only
- I3, UN 3291 - Clinical waste, unspecified, or not otherwise specified (N.O.S)
- I4, UN 3373 - Diagnostic specimens

This means that where the infectious substance within a waste can be specified (i.e. specified as one of the agents in Risk Groups 2, 3, or 4 described above) it will be assigned accordingly to either UN 2814 or UN 2900. Where the wastes are derived from the medical treatment of animals or humans or from bio-research and there is a relatively low probability of infectious substances being present they are assigned UN 3291. Almost invariably all infectious wastes produced by veterinary practices will fall into this category.

The Segregation, Packaging and Storage Guidelines for Healthcare Risk Waste make a special comment with regard to the infectious hazard from Risk Group 2 infectious substances. It considers that wastes contaminated by Risk Group 2 organisms

should only be considered an infectious hazard (and thus as healthcare risk waste) if they are capable of causing disease e.g. if they have been artificially cultivated to significantly elevated numbers, or if they are otherwise considered to be present in numbers adequate to spread and cause disease.

All UN approved packaging is produced to a certain standard of construction and must be tested independently to ensure that it meets that standard. Once passed such packaging carries a specific UN mark which (in code) details the type of packaging, the material from which it is made, the packing group (I to III depending on the level of danger they present), S for solids or the test pressure for liquids, the year and country of manufacture and the manufacturer's name. Additional labelling for the container should include a diamond shape hazard label (e.g. a biohazard label for infectious waste), the relevant class number for the waste (e.g. 6 for infectious waste), a written description of the waste (e.g. "Infectious Material"), and the UN number of the material contained (e.g. UN 3291).

The Carriage of Dangerous Goods by Road Regulations, 2004 (S.I. 029 of 2004) also dictate requirements for carriers of such waste such as vehicle specifications and identification marks, driver qualifications and training to deal with waste materials, and spillage cleaning kits.

The Segregation, Packaging and Storage Guidelines for Healthcare Risk Waste propose a preferred packaging system for healthcare risk waste which does make some changes from traditional healthcare risk waste management. The traditional use of bags or sacs and rigid containers has been superseded by the use of wheeled bins to transport these items. UN approved plastic bags now only conform to ADR requirements if they are contained in outer packaging such as a wheeled bin. The ADR requirements also dictate the colour-coding with packaging in healthcare waste. The universally accepted colour is yellow. For boxes lid colours determine the disposal stream. Yellow lids denote non-incineration disinfection technology. Red or blue lids are sometimes used by manufacturers to distinguish sharps from other wastes destined for disinfection. Purple lids denote pharmaceuticals and cytotoxic/cytostatic waste destined for incineration. Black lids denote recognisable anatomical material also destined for incineration. Specific information about the contents e.g. "cytotoxic healthcare risk waste – for disposal by incineration only" should be included on the label in addition to the regular ADR required information (discussed above). Containers must not be overfilled (more than $\frac{2}{3}$ for bags and $\frac{3}{4}$ for boxes), such containers can not be closed without risk to the

individual closing them, and are at higher risk of causing spillage. Bags should be sealed by swan-necking, tape or cable-tie. Lids of boxes must be fitted tightly and closed in accordance with manufacturer's instructions. Tagging of each waste package is also obligatory to ensure that the waste can be traced back to source if there are any problems, and records of the tag numbers must be kept for 3 years. **Appendix 1, Figure 3** illustrates schematically these guidelines for the segregation of healthcare waste. The detailed guidelines for the segregation and packaging of healthcare risk waste are illustrated in **Appendix 1, Figure 1.4**. The same diagram also includes examples of material considered non-risk waste in the section titled "Black Bag".

Regarding the pharmaceutical waste box (rigid yellow box with a purple lid), where they are disposed of in bulk they should be classified 6.1 (toxic substances even though they are not strictly cytotoxic/cytostatic) and should only be disposed of by incineration. Notably the document states that discarded medicines which are neither ecotoxic nor hazardous to handlers may be disposed of as general healthcare risk waste, and not as non-risk waste.

The yellow rigid box with a black lid should contain large human anatomical waste or body parts. In addition this is the route for blood or blood components assessed as being likely to contain TSE agents since all such wastes are destined for incineration. This type of receptacle will generally not be found in Irish veterinary practices since this type of material is not generated in the average veterinary practice.

Toxic chemical wastes produced as a result of specialist processes in hospitals should be disposed of in consultation with a hazardous waste contractor and transportation and packaging should conform to ADR. Solvent waste, concentrated iodine or mercury waste must be segregated and identified according to its contents. Radioactive wastes must be disposed of in accordance with the terms of the hospitals licence with the Radiological Protection Institute of Ireland. Laboratory waste where group 3 or 4 organisms have been cultured to elevated numbers should be autoclaved prior to disposal. Laboratory waste contaminated with group 2 organisms only that have not been artificially cultured (e.g. blood samples) can be packaged un-autoclaved in a yellow box or a sharps box (bags should not contain fluids).

The document then describes how healthcare waste should be stored prior to collection. Each department within a hospital should have its own waste sub-collection station and waste should be periodically taken from here to a central waste store where they are stored in locked yellow bins prior to collection. The waste should never be

compacted or mixed with a non-risk waste stream. While the document states that “specialist forms of storage, such as freezers or temperature-controlled stores are not normally necessary, and should only be considered where collection frequencies are such that the waste could give rise to offence and nuisance”, they are likely to be very necessary under veterinary practice conditions because of the comparatively small volume of material produced and the low frequency of collections.

The last section of the document details the requirements of the hospital regarding the health and safety issues raised by employees handling healthcare risk waste. Requirements include, healthcare waste training, written instructions, auditing of procedures, accident and incident recording procedures, hygiene facilities and training, and the provision of personal protective equipment.

In the context of veterinary practices the types of packaging most likely to be used in the management of clinical waste are yellow bags (both because these are readily accepted by veterinary hazardous waste contractors and because the reduced frequency of collections necessitates freezing of these bags usually in chest freezers), yellow sharps boxes/bins, yellow rigid boxes/bins with purple lids used either for pharmaceutical waste or cytotoxic/cytostatic waste, yellow sharps boxes/bins with purple lids (for sharps used in chemotherapy protocols).

Appendix 2 of the Segregation, Packaging and Storage Guidelines for Healthcare Risk Waste contains a more detailed description of the specifications for the various types of packaging required for healthcare risk waste than that portrayed in **Appendix 1, Figure 4**. The Appendix also includes a note on the handling of wastes known to be contaminated with definite agents from risk groups 2 or 3. This places such waste not in the most common group (UN 3291; “Clinical Waste, unspecified”) but in either of groups UN 2814 or UN2900 (already described above). There are extra precautions to be taken with such wastes, including double leak proof packaging within an outer stronger package, the placing of absorbent material between containers. In addition the outer label must contain the specified UN number (2814 or 2900) and the words “Infectious substance. In case of damage or leakage immediately notify Public Health Authority”.

Chapter 2

MATERIALS & METHODS

2.1 Veterinary Practitioner Hazardous Waste Survey

The bulk of the investigative work of this thesis was concerned with the gathering of information regarding the management of hazardous waste by veterinarians in practice. While some of this information was to be gathered indirectly via hazardous waste collection contractors and regulatory bodies the bulk of the information was to be obtained in good faith directly from veterinary practitioners via a survey.

2.1.1 Objectives

The objectives of the survey were as follows:

- 1) To identify the types of veterinary practice being surveyed, (e.g. small, equine, mixed or exclusively large animal practice).
- 2) To identify the geographical locations of these practices including the practice hinterland but also the physical location of the practice premises.
- 3) To identify the veterinary activities carried out at the practices as these activities determine the types of waste produced.
- 4) To investigate the theoretical knowledge of practitioners of the legislative requirements governing veterinary practice waste management.
- 5) To identify the various sources of information availed of by vets regarding hazardous waste management.
- 6) To investigate the general management of waste by veterinary practices, including the volumes of municipal waste being produced, and whether recycling was in operation.
- 7) To identify the types and volumes of hazardous wastes being produced by veterinary practitioners including some of the more obscure waste streams.
- 8) To investigate the actual fate of the hazardous wastes as produced by veterinary practices.

- 9) To identify the Hazardous Waste collection contractors being used by the practices surveyed so that they could be contacted as an aid to the validation of the results.
- 10) To identify the extent of the expenditure on municipal waste and hazardous waste management by veterinary practices.
- 11) To identify whether practices had been audited by or been the subjects of complaint(s) to the regulatory authorities regarding their waste management practices.
- 12) To identify whether or not practices felt they were complying with current regulations and if not to identify the reasons why they were not complying.

2.1.2 Design of Survey Text

The survey text was designed to consist almost entirely of multiple choice questions. It was felt that the survey would be more interesting to practitioners when presented in this way, and that it would be more easily completed than a series of open-ended questions. Where relevant an opportunity was left at the end of each question (following the multiple choice answers) for open ended answers. A time constraint was placed on the survey in that it was designed to be completed within ten minutes as it assumed that most busy veterinary practitioners would not spend any longer than ten minutes on a survey of this nature. Within this time constraint the multiple choice format would allow the maximum amount of information to be gleaned.

The survey (see **Appendix II**) was divided into three sections. The first section was to provide general information on the type of veterinary practice (i.e. whether it was small animal, large animal, equine or mixed practice), on the geographical location of the practice hinterland, and on the physical location of the practice premises itself. The last question in this section was designed to identify the types of activities carried out at the practice which determine the types of waste being produced.

The second section was to test the practitioner's knowledge of the hazardous waste legislation. Question one was an extensive investigation of the vet's theoretical knowledge of how veterinary practice waste materials should be handled. A list of waste materials potentially produced in a veterinary practice (but not necessarily in the practice surveyed) was provided and practitioners were asked to state based on their current knowledge whether they would consider the waste materials to be hazardous or not. In the second question vets were asked to identify the legislation most relevant to hazardous waste management from a list of acts and regulations. The last question was

to identify the main sources of information available to vets in relation to veterinary hazardous waste management.

The third section was to provide the bulk of the relevant information regarding the actual fate of waste in the veterinary practice surveyed. The answers to the first few questions would describe the general waste management within the veterinary practice i.e. how much municipal waste they produced, who collected it, whether there was any recycling at the practice, and how much the practice spent on municipal waste disposal. The middle questions investigated the veterinarian's management of key hazardous waste streams within the practice such as cadavers, out of date and unused prescription drugs, cytotoxic drugs, sharps, radiographic processing reagents, and clinical and chemical wastes. In the remaining questions practices were asked who were their hazardous waste collection contractors, how much this service cost annually, if they had ever had any dealings with regulatory authorities, and if they felt they were fully compliant with waste regulations. The final question was to be answered only by those vets who felt they were not fully compliant. It asked them the reasons for their lack of compliance (whether actual or perceived). A page at the back of the survey was offered for additional comments.

2.1.3 Selection of Practices for Survey

While theoretically it may have been possible to obtain a list of veterinary practitioners from Veterinary Ireland (the Irish veterinary union) it was decided to compile an independent list of vets in practice as it was felt the information may not have been easily forthcoming from the union given the subject matter. The list of veterinary practices was compiled from personal knowledge and in consultation with the online Golden Pages[©] entries for each practice and individual veterinary practitioner details in the Veterinary Register, 2005[©]. Copyright was neither infringed on the Golden Pages nor on the Veterinary Register, 2005. Every effort was also made to avoid duplication of entries for individual practices (e.g. sending surveys to different practitioners in the same practice). Practitioners who had graduated prior to 1965, and those employed in the Department of Agriculture were not surveyed. While many of these individuals still had entries in the Golden Pages it was felt that it was unlikely they were still actively in practice. This brought the list to a total of 644 practices. A mailing list was compiled in the Mail Merge[®] tool of Microsoft Word[®]. The list was alphabetised in the Mail Merge[®] sorting facility according to practice title (or practitioner surname in the absence of a

practice title). It was decided to survey one hundred and fifty practices from this list. Practices were selected from the full list in non-random fashion as follows. Starting at position one of the alphabetised list, every fifth entry was selected up to a total of 150 entries. These 150 selected practices were to receive the survey.

2.1.4 Survey Logistics

It was decided from the beginning that the survey was to be anonymous. It was felt that anonymity, without any fear of reprisals in the event of non-compliance, or simply avoiding any potential embarrassment, would secure the most honest responses to the survey. The price of potentially more honest anonymous replies was that there would be no way to follow up non-respondents by phone to encourage them to complete the survey as had been the protocol in similar surveys identified in the literature review (Clark, 1997). Using this approach, the success rate in securing replies was up to 70%. This would mean that if the returns from the 150 practices surveyed were low it would be more efficient to send out additional surveys to new practices to make up the desired sample numbers than to individually contact the practices already surveyed, not to mention the fact that this would render the anonymity of the survey null and void. Nevertheless it was felt that the benefits of anonymity outweighed the potential disadvantages of a low response to the initial wave of surveys. It was hoped that replies would be obtained from at least 50 practices from the 150 surveyed.

In an attempt to personalise the survey, the envelope posted to each of the one hundred and fifty practices contained a cover letter (along with the survey itself, and a stamped addressed envelope) explaining the context, aims and anonymity of the survey (see **Appendix VI**). In the event of a survey not being completed, it was requested that the blank survey be returned in the envelope provided so that it could be sent out to another practice. To avoid any potential acrimony with the veterinary union, a similar explanatory letter (see **Appendix VI**) was also sent to Veterinary Ireland along with three copies of the survey at the same time as the survey was posted out to veterinary practices. The results of this survey are presented in **Chapter 3.1**.

2.2 Local Authority Questionnaire

A questionnaire relating to veterinary waste regulation was circulated to waste enforcement officers within the various local authorities in synchrony with the veterinary survey.

2.2.1 Objectives

The objectives of the questionnaire were as follows:

- 1) To identify whether veterinary practices are consciously under the attention of local authority inspectors as producers of hazardous waste.
- 2) To find out whether individual local authorities were carrying out waste audits of veterinary practices or similar professional establishments such as general medical practitioner clinics or dental surgeries.
- 3) To identify the extent of non-compliance by and/or prosecutions of veterinary practices with regard to waste violations.
- 4) To find out whether vets were complying with their obligations regarding documentation (i.e. completion of C1 forms).
- 5) To find out whether any local authorities produce guidelines for vets in relation to correct procedures for waste disposal.
- 6) To find out whether any local authorities are providing bring centres or other facilities for the disposal of hazardous wastes which veterinary practices could potentially avail of.
- 7) To find out how veterinary cadavers produced in large numbers by local authority dog pounds are disposed of.

2.2.2 Questionnaire Design and Execution

As with the veterinary practice survey, a multiple choice approach was adopted with the local authority survey with an opportunity left for open ended answers where appropriate. The questions were designed to gain answers satisfying the objectives described above (see survey text **Appendix III**). Unlike the veterinary survey it was felt that anonymity was not a priority, as a high return rate was expected from the public servants being surveyed. A list of 32 contacts concerned with waste enforcement in each of the regional local authorities was compiled. Each of these contacts received a copy of the survey, with an introductory explanatory cover letter (see **Appendix VI**),

and a stamped, addressed envelope. These surveys were mailed within one week of the veterinary surveys. The results of the local authority questionnaire are presented in **Chapter 3.2**.

2.3 Hazardous Waste Contractor Questionnaire

The results of question sixteen of the veterinary hazardous waste survey identified the major hazardous waste collection contractors providing a waste collection service for the practices surveyed. Partly as an information gathering exercise, and partly as a means of validating some of the data generated by the veterinary hazardous waste survey it was decided to send a questionnaire to each of the waste management companies named by veterinary practices in the hazardous waste survey.

2.3.1 Objectives

The objectives of the questionnaire were as follows:

- 1) To identify the number of veterinary practices who have contracts with hazardous waste collection companies.
- 2) To identify whether local authorities availed of the services of the companies for disposal of veterinary cadaver waste from local authority dog pounds.
- 3) To identify the nature of the business carried out by the company involved e.g. does the company simply transport hazardous waste or do they also process it.
- 4) To identify the range of operations of the company i.e. does the company operate on a nationwide or regional basis?
- 5) To identify the frequency of the collection service made available to practitioners by the companies involved.
- 6) To identify the types of waste handled by the company, the approximate cost of collection of that waste, and the eventual fate of the waste once collected.

2.3.2 Questionnaire Design and Execution

As with the questionnaire to the local authorities a combination of direct questions and multiple choice questions and answers was used in the design of the questionnaire. The questions were designed to gain answers satisfying the objectives described above (see survey text **Appendix IV**). The list of companies to whom a questionnaire would be

sent was generated by the veterinary practice survey answers to question 16 and included the following companies (in no particular order):

Veterinary Environmental Management, t/a Irish Pet Crematorium, Unit 3,
Renmore Business Park, Kilcoole, Co. Wicklow

Ecosafe Systems Ltd., Unit 1A, Allied Industrial Estate, Kylemore Industrial Estate,
Dublin 10

Sterile Technologies Ireland (STI) Ltd., Unit 430, Beech Road, Western Industrial
Estate, Dublin 12

Rentokil Initial Ltd., Initial Healthcare, 47 Terenure Road East, Dublin 6

Transafe Ltd., Unit 1A, Renmore Business Complex, Kilcoole Ind. Est., Kilcoole,
Co, Wicklow

In addition to these five companies, questionnaires were sent to three extra companies. The first company (Cara Waste Management Ltd.) is a large hazardous waste collection company not mentioned by any of the vets surveyed. The other companies are not strictly hazardous waste management companies (in fact they are rendering plants), but were mentioned by vets and local authorities in their responses to the survey and questionnaire respectively in the context of the disposal of small animal cadavers. The three extra companies were as follows:

Cara Waste Management Ltd., Cedar House, Greenogue Bus. Pk., Rathcoole,
Co. Dublin

College Proteins, College Road, Nobber, Co. Meath

Premier Proteins, Poolboy, Ballinasloe, Co. Galway

Initially questionnaires were sent as hard copy via regular post, accompanied by a cover letter (see **Appendix VI**). Only two companies responded to the initial mailing. Non-respondents received one follow-up e-mail (with the questionnaire and cover letter as attachments) and if they failed to respond to that, an identified contact for the company received one additional phone call to request completion and return of the questionnaire. This approach secured replies from six out of the eight companies. Neither of the rendering plants replied directly to the questionnaire however Premier Proteins did discuss the questions raised during an informal phone conversation.

The results of this questionnaire are presented in **Chapter 3.3**.

2.4 Regulatory Authority Questionnaire

In the course of the literature review, and also during the examination of the veterinary practice responses to the hazardous waste survey (particularly the comments section) it became apparent that there is confusion among veterinary surgeons in the interpretation of some of the legislation. In an effort to clarify some of these interpretative problems it was decided to seek the opinion of the EPA on some specific questions which were particularly problematic. A letter (see **Appendix V**) containing eight pertinent questions was e-mailed to the EPA and was kindly replied to by a senior member of the organisation. The name of the officer has been stricken from the letter. The comments of the EPA officer in relation to the questions raised are synthesised in **Chapter 3.4**.

Chapter 3

RESULTS

3.1 Veterinary Practice Hazardous Waste Survey

3.1.1 Response to the Survey

A total of 150 veterinary practices had been sent a survey. In the eight week period following mailing, 57 completed surveys and three blank surveys were returned, a response rate of 38%. Since this exceeded the target minimum response ($n = 50$), and represented a significant 8.9% of the total estimated population (644), no further survey mailings were carried out.

3.1.2 Surveyed Veterinary Practice Demographics

Section one of the survey was designed to create a profile of the practices responding to the survey, in terms of nature of the clientele, hinterland, number of practice employees, premises location, and the clinical activities at the practice. Questions one to five examined the demographics of the veterinary practices responding to the survey. Of the 57 practices responding to the survey eight (14%) were large animal practices only, thirty five (61.4%) were mixed practices, ten (17.6%) were small animal practices and four (7%) were equine only practices. Of the mixed veterinary practices the majority (74%) were mainly large animal practices and 26% were divided equally between large and small animal work. The majority of practices (79%) were based in either large or small towns around the country with the remainder divided between cities (9%) and rural areas (12%). Most practice premises (65%) were located in residential areas either as clinics built on to occupied residences, or residences given over entirely to the clinic. Of the remaining practices, 23% had premises out in rural areas and only seven practices (12%) were operating from clinics within commercial or industrial areas.

Clinical activities within the surveyed veterinary practices were examined in survey question six of section one and the results are described in **Figure 3.1**. From the point of view of production of clinical and hazardous waste it is obvious from the data that almost all practices should be generating clinical waste from house and farm visits,

general surgery, fluid therapy and euthanasia of pets. In addition many practices would be generating waste from specialist activities such as radiography, overnight care of animals, laboratory techniques, orthopaedic and dental surgery, gaseous anaesthesia and ultrasonography.

Routine Clinical Activities in Veterinary Practices

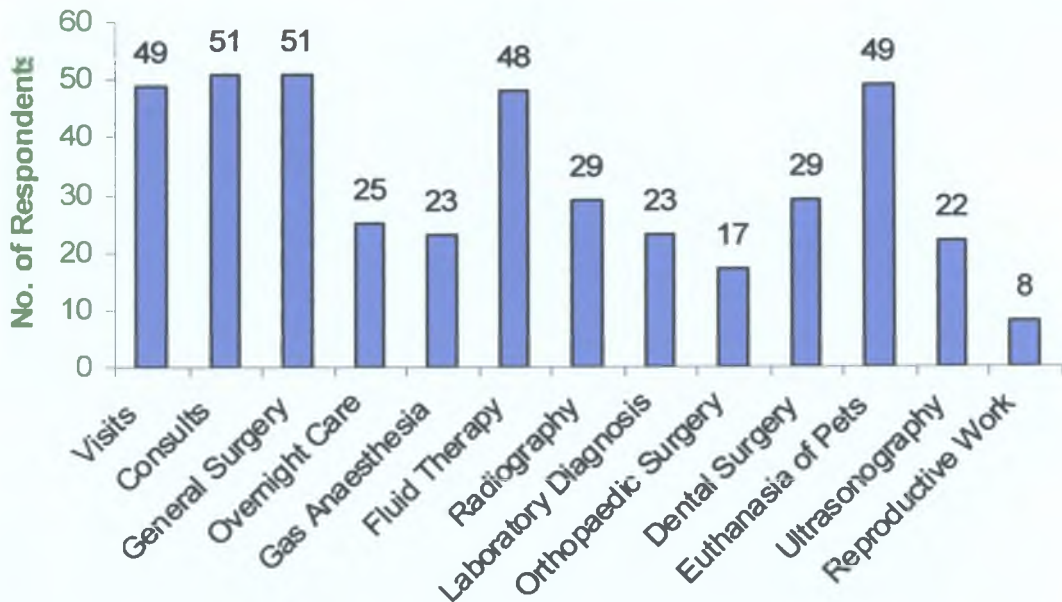


Figure 3.1: Clinical activities described as routine by veterinary practices surveyed (from survey question six)

3.1.3 Practitioner knowledge of the Legislation

Section two of the survey examined the veterinary practitioner’s knowledge of the legislation governing waste management. In response to question one of section two of the survey the majority of veterinary practitioners (67%) recognised that the Waste Management Act 1996 was the major legislative instrument governing veterinary hazardous and non-hazardous waste. However there were many practitioners who believed erroneously that other legislation was relevant to waste. For example the Veterinary Practice Act, 2005 was identified by 32% of practitioners as being the major legislative tool governing waste management in veterinary practice.

In question two of section two vets were asked to identify whether they would consider items from a list of wastes to be hazardous or not. The list as compiled included definite items of hazardous waste (broken mercury thermometer, a used hypodermic needle with cap on, a tissue sample preserved in formalin, etc.), hazardous clinical waste items posing a definite infectious hazard (an amputated infected limb,

used dressings from an infected wound), and non-infectious clinical waste (used intravenous giving set, used urinary catheter). The results are presented in **Figure 3.2**. The data is presented in the negative i.e. in numbers of practices that did not identify the various wastes as hazardous. The majority of veterinary practitioners correctly identified the hazardous wastes on the list. Notable exceptions include empty catgut cassettes (containing isopropyl alcohol), used inkjet cartridges (containing heavy metals), and used soda lime canisters which were identified as non-hazardous by 38, 34, and 23 practices respectively. However many practices also identified many non-hazardous waste items on the list as hazardous e.g. only 23, 17 and 10 practices respectively correctly identified used intravenous giving sets, used urinary catheters and dog carcasses as non-hazardous wastes. The results highlight confusion among veterinary practices as regards what constitutes hazardous waste.

In answer to the last question in this section the Irish Veterinary Journal (63%), Veterinary Ireland (60%), the hazardous waste collecting company Veterinary Environmental Management (40%), and veterinary colleagues (39%) were identified as the major sources of waste-related information available to practitioners. Lesser numbers of practices listed their local authority, the EPA, and the Department of Agriculture among the organisation offering information on waste management.

3.1.4 General Waste Management by Vets

The first four questions of section three of the survey examined municipal waste management and recycling policies in veterinary practices.

The majority of veterinary practices (77%) have their municipal waste collected by private waste companies. Most veterinary practices seem to be able to keep their municipal waste production to a minimum with 60% producing little more municipal waste than the average household (one small 240litre wheelie bin per week). The level of recycling by veterinary practices was appreciable. Only three practices (5%) were not recycling at all. The best recycling rate (88% of practices) was for cardboard. The worst recycling rate was for inkjet cartridges and laser toners with only 35% of practices were recycling. Practice recycling may reduce the volume of municipal waste produced by a practice. Of the ten practices requiring a large commercial bin (1100litre), two were not doing any recycling, and five more were only recycling three items or less from the recycling list.

Number of Practices Identifying Veterinary Waste Items as Non-hazardous

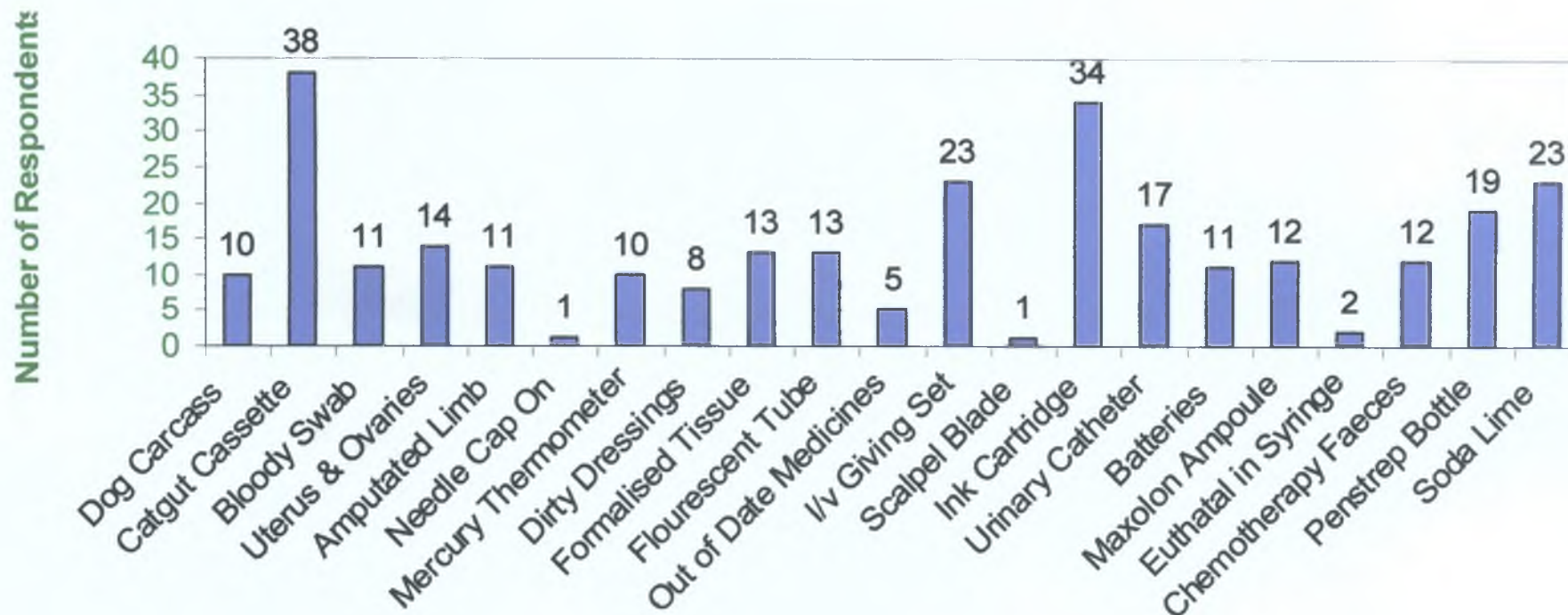


Figure 3.2: Items of waste considered by veterinary practices to be non-hazardous (according to responses to question 2, section 2 of the veterinary practice hazardous waste survey)

The low level of municipal waste production is reflected in the low level of expenditure on municipal waste disposal by veterinary practices, with 45% of practices spending less than €500 per annum and a further 37.5% spending less than €1000.

3.1.5 Fate of Companion Animal Cadavers

Questions five and six of section three of the survey examined how practices dispose of the carcasses of companion animals. In response to question five which asked how they treat the cadaver of a euthanised cat, 58% of practices said they would encourage the owner to take the animal home and bury it. Licensed waste contractors were used by only 47% of veterinary practices for cat cadaver disposal. This figure includes some of those practices who would encourage the animal to be buried at home. Three practices put the carcass in the bin (municipal waste), one buried the cat themselves, and one placed it in a specified risk material (SRM) skip at an abattoir. The numbers of cadavers produced by veterinary practices is likely to be considerable. Of the 56% of practices who provided a disposal service for dog cadavers 43% dispose of between one and five carcasses per week and the remaining 13% dispose of at least six per week. Of the remaining practices 28% admitted to not providing a service for disposal of dog cadavers and the rest of the practices did not answer the question.

3.1.6 Out of Date, Unused, and Waste Pharmaceuticals

Questions seven, eight and ten of section three examined veterinary practice management of waste medicines. Licensed waste contractors were used as a disposal route for waste medicines by only 52% of responding practices. The return of out of date product to the manufacturer was used by 21% of practices to dispose of unused out of date drugs. Thirty three per cent of veterinary practices admitted to disposing of waste pharmaceuticals in municipal waste and a further six per cent to flushing them down the toilet. Six per cent of practices claimed they produced little or no unused or waste pharmaceuticals. When questioned about specific used pharmaceutical items in question ten, only 54% of practices insisted that none of the items would end up in the municipal (non-hazardous) waste bin in their premises. Both empty antibiotic bottles and vaccine vials were placed in the bin by 39% of practices. Bottles half filled with antibiotic were placed into the municipal bin in 21% of practices, and the same fate befell ampoules and syringes containing drugs in 12.5% of practices. Only 21% of

practices said they had a policy of informing clients about what they should do with leftover drugs.

3.1.7 Sharps

Question 11 of section three of the survey examined management of sharps in veterinary practices. In general sharps were handled appropriately by respondents with 86% of practices placing them in approved UN 3291 containers and disposing of them through licensed waste contractors. Only 7% of practices admitted to letting sharps go to municipal waste and then only in tough plastic containers. The remainder disposed of them through rather obscure means including “burial in slatted shed foundation”.

3.1.8 Photochemicals and Other Hazardous Chemicals

As identified in response to section one question six of the survey, disposal of waste chemicals from radiographic processing did not apply to 47% of practices surveyed who did not provide a radiographic service to clients and thus did not have radiographic equipment. Question 12 of section three examined the fate of photo chemicals in those practices routinely taking radiographs. Only 47% disposed of the waste chemicals appropriately (through a licensed waste contractor), although one additional practice disposed of waste chemicals through a local photography shop. From the remainder of practices used photo chemicals make their way to wastewater either via the sink or the toilet. While practices were not specifically questioned about how they disposed of other hazardous chemicals within the practice in section three question 14 they were asked about whether they were in possession of these chemicals. The results are presented in **Figure 3.3**. As can be seen from the graph the majority of practices were in possession of both formaldehyde and hydrogen peroxide. Amounts of these chemicals were not quantified by the survey.

Hazardous Chemicals in Veterinary Practices

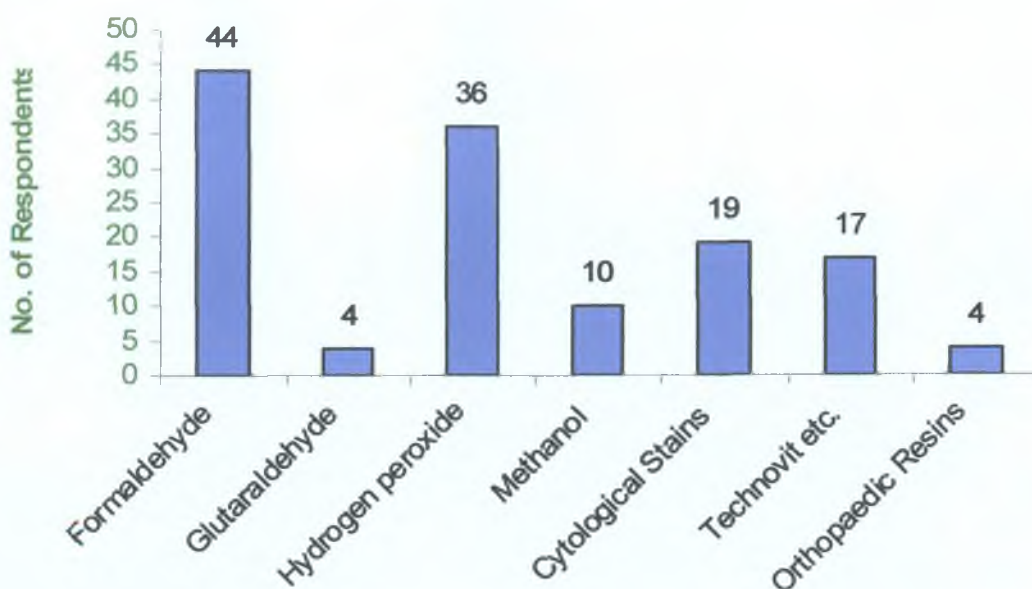


Figure 3.3: Hazardous chemicals kept in stock in veterinary practices surveyed.

3.1.9 Chemotherapy Waste and Dental Amalgam

Dental amalgam had not been used in any of the practices surveyed (question nine). It is unlikely to be a problem in relation to waste in veterinary practice in Ireland.

In relation to chemotherapeutic chemicals (survey question 13), only two of the 57 practices surveyed had ever carried out a chemotherapy protocol. One of these had treated the waste as hazardous and disposed of the waste material via a hazardous waste contractor. The other declined to give details on how the waste had been treated.

3.1.10 Veterinary Clinical Waste

Question fifteen examined the practice's handling of veterinary clinical waste. Practices were asked whether any of seven different items of clinical waste were routinely placed in municipal waste. While two of the items listed could within reason be consigned to municipal waste (used gloves and an intravenous fluid giving sets), the remainder should under current guidelines be consigned to yellow bag waste. Five respondents (9%) left this section of the survey blank. For those practices who did complete the question the data is detailed in **Figure 3.4**. 26% of responding practices stated that none of the listed items ever went to municipal waste. The level of non-compliance demonstrated here is substantial given that this kind of waste is produced on a day-to-

day basis in the majority of the practices surveyed and that it is an offence for any clinical waste from a veterinary practice to go to landfill as stated in the Waste Management (Licensing)(Amendment) Regulations, 2002.

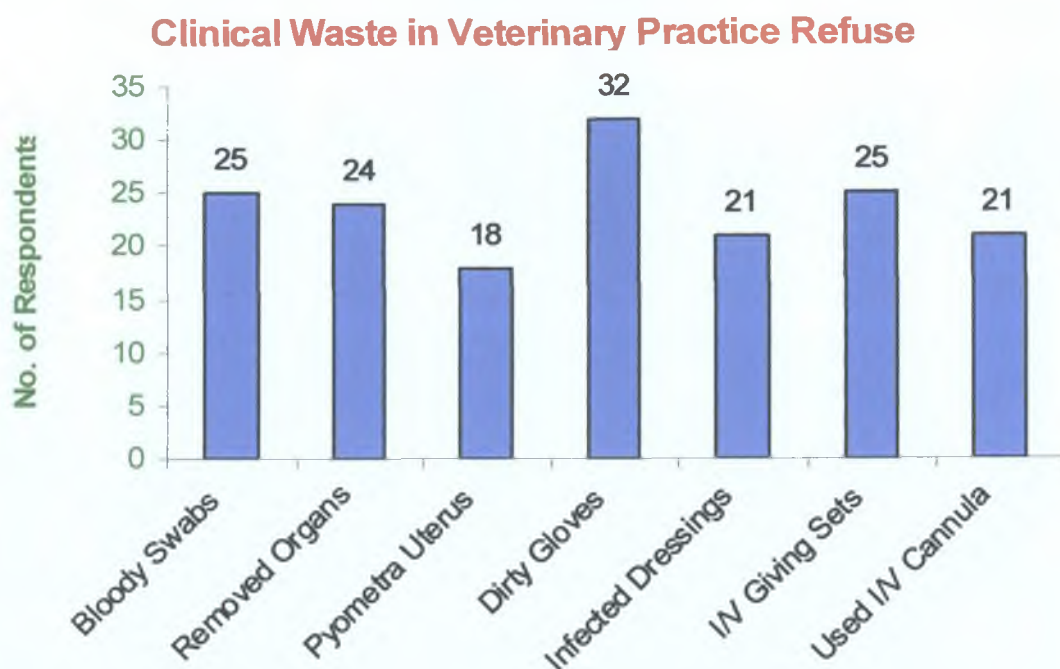


Figure 3.4: Items of clinical waste consigned to municipal waste bins by veterinary practices responding to the survey.

3.1.11 Licensed Hazardous Waste Contractors

Question 16 was used to establish how many practices availed of licensed hazardous waste contractors, and also to establish who those contractors were. The response to this question would allow the compilation of a list of the hazardous waste contractors most frequently used by veterinary practices. This question was not answered by 26% of practices. The breakdown on the companies providing collection service to the veterinary practices surveyed is detailed in **Figure 3.5**. As can be seen from the chart Veterinary Environmental Management Ltd. has the largest share of the market.

Question 17 asked practices to indicate what their hazardous waste collection service was costing them. The results show that 49% of veterinary practices spent between zero and €500 per annum. This did not differentiate between those spending nothing on hazardous waste collection and those with a low level of expenditure. 51% of practices were spending in excess of €500 per annum, including 14% who spent between €1000 and €2000 and 14% of practices who spent in excess of €2000 annually.

Veterinary Licenced Hazardous Waste Contractors

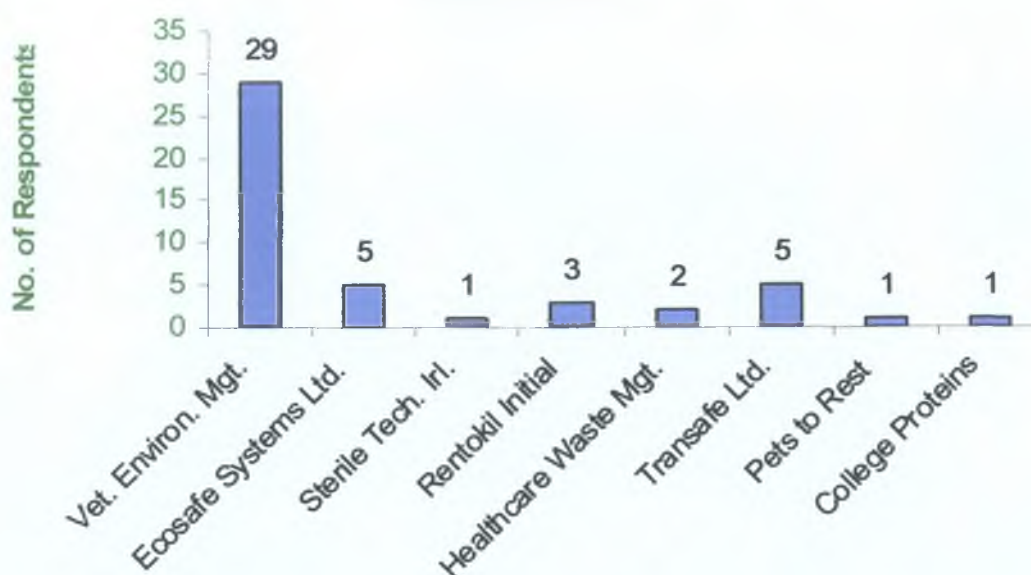


Figure 3.5: Hazardous waste contractors availed of by veterinary practices responding to question 16 of the survey.

3.1.12 Regulatory Authorities and Veterinary Waste Management

While none of the practices surveyed had been prosecuted for waste offences there was some evidence to suggest that veterinary practices are coming under the scrutiny of both the general public and the regulatory authorities from the point of view of waste management. In each case nine percent of practices had been the subject of a verbal or written complaint from members of the general public regarding waste or had received a verbal and/or written request from a local authority or the EPA regarding waste. One practice had also received a full waste audit from a local authority. The relationship between the regulatory authorities and veterinary practices from the point of view of the regulators is further examined in the results section of the local authority questionnaire.

3.1.13 Veterinary Practice Opinions on Waste Management Compliance

When it came down to the question of whether veterinary practices felt they were compliant with waste management regulations or not, more than half of practices (53%) felt they were not fully compliant. When practices who felt they were non-compliant were asked their reasons for non-compliance the main reasons given were lack of

sufficient knowledge of the regulations (all respondents), a reluctance to bear the costs of proper waste disposal (40%), and fears that levying clients to assist in paying the extra cost would make them uncompetitive (33%). Other important issues included the effort associated with waste segregation (27%) and the perception that other practitioners were not complying so why should they (20%).

In the last question of the veterinary practice survey vets were invited for their comments on the survey and on veterinary waste management. Only 11 vets had comments to make. Several issues were raised. The following is a synopsis of the comments made. The issue of waste management in veterinary practice was described as very important; practices said they would rather be compliant but that it is difficult and too expensive to comply with all the regulations. Overheads are already high in veterinary practice and the expenses of running practices will force vets out of business. Waste segregation is difficult to achieve in busy veterinary practices. Pharmaceutical manufacturers should be responsible for the disposal of their bottle and packaging waste and the Department of Agriculture should be responsible for the waste associated with the TB and Brucellosis eradication schemes. Waste antibiotics are not properly disposed of by veterinary practices and farmers have no interest in waste management. There are no clear guidelines on veterinary waste disposal, and there is insufficient enforcement of the regulations. Veterinary practices should be independently audited from the point of view of waste compliance. No suggestions were made as to who might carry out such audits.

3.2 Local Authority Questionnaire

Questionnaires relating to veterinary hazardous waste management were sent to 32 local authorities within in one week of the mailing of the veterinary practice surveys. The text of the questionnaire is presented in **Appendix III**. Over the following five weeks a total of 15 completed surveys were returned. This represented a 47% response to the first wave of surveys. A series of follow-up phone calls and e-mails secured another 3 responses bringing the total to 18 local authorities responding to the questionnaire, which represents a 56% response. This is despite the initial mailing being followed up by multiple e-mails and phone calls. Responses were obtained from the following local authorities in order of the receipt of the questionnaire: Dublin, Louth, Monaghan, Galway, Mayo, Wicklow, Tipperary South, Cavan, Tipperary North, Carlow, Donegal,

Sligo, Kildare, Roscommon, Dun Laoighre Rathdown, Wexford and Longford. There was one additional questionnaire returned where the respondent gave his personal details but not the name of the local authority represented. The results of this questionnaire are also included in the results section although no effort was made to identify the local authority involved.

Four out of eighteen local authorities (22%) answered that veterinary practice do not immediately spring to mind as a source of hazardous waste. Regarding complaints against veterinary practices regarding waste, five local authorities (28%) had received public complaints about veterinary practices in relation to waste in the preceding three year period, and one local authority had a prosecution case pending against a veterinary practice over a waste issue. Five local authorities had carried out waste audits of veterinary practices over the same period. By comparison only two local authorities had carried out audits of medical general practitioners, and three of dental surgeons in the same period. When asked whether they had received C1 forms associated with hazardous waste movements from veterinary practices during 2005, 66% confirmed that they had received C1 forms, 28% confirmed that they had not received any C1 forms, and one local authority did not have the information to hand. Five local authorities said that they issued advice (in various forms written and verbal) to veterinary practices regarding hazardous waste management. None of the local authorities said that they made hazardous waste collection facilities or collection services available to vets.

Local authorities were also asked about the disposal of cadavers from the local authority dog pounds run within their jurisdictions. Two local authorities did not run dog pounds but contracted out the work to private organisations. Eight used rendering plants to dispose of cadaver waste. Four used the services of the waste management company Veterinary Environmental Management to dispose of cadavers. The remainder used various small local waste disposal companies.

3.3 Hazardous Waste Contractor Questionnaire

The main objective of the questionnaire to the hazardous waste contractors was to establish the extent of the uptake of the services provided by these companies by veterinary surgeons, and thereby provide a degree of validation of the data obtained from the veterinary practice survey. Six out of the eight companies to whom a questionnaire was sent responded. Neither of the rendering plants (not strictly hazardous

waste contractors) replied to the survey although Premier Proteins, Ballinasloe did phone to informally discuss the questionnaire over the phone. Five out of the six companies surveyed concurred that they had veterinary practices as customers. The sixth company (Cedar Resource Management) had not been mentioned by any of the veterinary practitioners responding to the survey. This company was contacted because it provides hazardous waste collection services which could be availed of by veterinary practices other than those contacted in the survey including its ChemCar® service.

Veterinary Environmental Management (VEM) reported that they had 350 veterinary practice customers, and they also collect cadavers from local authorities. Rogers Healthcare Waste Management Services reported in the region of 50 customers, and Rentokil Initial reported 50 customers. In addition Transafe report that 10% of their customers are veterinary practices (but did not give an absolute number). Cedar Resource Management reported that they did not have any vets as customers but their ChemCar® service does collect the hazardous waste from around 40 local authority civic amenity sites, and individual or group collections of hazardous wastes could be organised from veterinary practices.

Four of the six companies reported that they were transporters of hazardous wastes and did not engage in any waste recovery or processing. VEM incinerate the cadavers but deliver the rest of the material to Ecosafe for processing. Ecosafe and Sterile Technologies Ireland (STI) appear to be the only companies actually engaged in waste recovery from hazardous wastes originating from veterinary practices. STI were not sent a questionnaire but Rogers Healthcare reported sending their waste to them for processing. Transafe does provide an additional service in that they carry out on-site clean-ups when required. All companies provide a nationwide service and most will tailor the frequency of the collection service to the needs of the customer.

Only VEM handle veterinary cadaver waste. All other companies handle sharps, yellow bag waste, pharmaceuticals, cytotoxic drugs and photochemistry. All companies (except Rentokil Initial) handle the more irregular types of hazardous wastes such as chemicals, batteries, fluorescent tubes, mercury wastes including amalgam, and WEEE. The extent of the uptake of these services by veterinary practices was not quantified by all respondents except Rogers Healthcare who reported that all of their veterinary practice customers availed of the sharps, yellow bag and pharmaceuticals collections, some availed of photochemistry collections and a small number of practices used them for disposal of mercury and chemical wastes.

All companies reported that sharps and yellow bag waste were rotoclaved (heat treatment and disinfection) and ultimately sent to landfill. This is carried out within the country by either Ecosafe or STI. With the exception of cadaver waste (cremated by VEM), and some waste equipment and radioactive waste material (treated in house by Ecosafe), all other hazardous waste materials are currently exported for recovery in other EU countries.

3.4 Regulatory Authority Questionnaire

A number of difficult issues arose during the literature review and the veterinary practice hazardous waste survey for which there were no obvious solutions. These issues were raised in a letter sent to the EPA (see **Appendix V**), which was kindly answered by a senior officer within the organisation. The following is a synopsis (including some quotations) of the replies to the questions asked.

3.4.1 Veterinary Practices as Small to Medium Enterprises (SMEs); The Availability of Local Authority Hazardous Waste Facilities to Veterinary Practices

Questions one and two posed to the EPA officer concerned references to the National Hazardous Waste Management Plan, (Anon., 2001), and facilities which the plan had proposed be made available to small businesses for the disposal of hazardous wastes. According to the plan the establishment of hazardous waste facilities for households and for Small to Medium Enterprises (SME) was considered one of the highest priorities. Such facilities could include collection services but at the very least should include access to hazardous waste depots at civic amenity facilities (in addition to ordinary householders). When asked if the EPA considered veterinary practices to be classed as SMEs, The officer replied that while there were certain criteria (e.g. turnover and number of employees) involved he suspected that most veterinary practices would be SMEs. Regarding the current situation in relation to the provision of hazardous waste depots/collection service by local authorities he stated that more and more facilities will accept a range of household and small business wastes although they were unlikely to accept veterinary clinical wastes, sharps, potentially infectious wastes, chemicals or medicines. He stated that he did not know of any local authorities who provide a door-to-door hazardous waste collection service nor did he know of any local authorities who

invite SMEs to use their facilities; however some local authorities will report that small businesses do use their facilities. On the other hand “local authorities can, and typically do, refuse access to the commercial sector to their civic amenity sites”. He added that “we have a long way to go to provide a full and proper hazardous waste collection service to small scale generators of hazardous waste who can face considerable barriers to proper hazardous waste management – cost awareness etc.”

3.4.2 Pharmaceutical Wastes – Veterinary Practice Obligations; The “Take Back” Scheme and The Manufacturer’s Obligations

Questions three, four, five and six posed to the EPA officer sought clarification on issues pertaining to various aspects of the management of waste veterinary medicines and pharmaceuticals. The review of the legislation highlighted some ambiguity in the legislation regarding the hazardous status of non-cytotoxic or non-cytostatic medicines. While these could be potentially hazardous according to the Second Schedule of the Waste Management Act, 1996, (if they exhibited any of the hazardous properties in Annex III) there is no catalogue designation for hazardous pharmaceutical waste other than cytotoxic or cytostatic drugs in the European Waste Catalogue and Hazardous Waste List, (Anon., 2002). The spokesman for the EPA agreed with this comment. “The EWC list is quite ambiguous in its definition of medicines and chemicals”. He advised a precautionary approach be applied to unused and out of date medicines. “Medicines are chemicals, and if those chemicals are or contain dangerous substances, then they should be classified as hazardous waste”. When asked about the issue of “nominally empty” chemical containers and the unofficial “less than 1%” rule of thumb, he responded that he could not say that the so-called rule of thumb was correct. If in doubt over any potentially hazardous waste the EPA’s Paper Tool of the Procedure for the Identification of the Hazardous Components of Waste (Anon., 2004d) should be consulted. In relation to the acceptance of nominally empty veterinary medicine containers at landfill, each local landfill operator should be queried as to their waste acceptance criteria and whether they are licensed to accept empty veterinary medicine containers. “Veterinary practices are responsible for their own waste and cannot sign-off responsibility to a waste contractor. If a vet is unsure he or she should take it upon themselves to contact the landfill where their waste is being taken and ask the question”. While the EPA representative was unfamiliar with any statutory requirement on veterinary surgeons to inform their clients on how unused drugs should be disposed of it

is apparent from the review of the Animal Remedies Regulations 2005, that such a statutory obligation does now exist. Regarding the currently controversial “Take Back” policy which has been imposed by the same regulations it was said that the EPA was not involved in making those regulations. They had advised the Department of Agriculture to liaise with the Department of the Environment in making the regulations in question to ensure that the medicines regulations tied in with the waste regulations. “We (the EPA) may now have to retrospectively look at the issues arising”. Again regarding the issue of taking back unused drugs from farm clients the EPA representative said the matter was one for the Department of Agriculture, since it related to the Animal Remedies Regulations.

3.4.3 Clinical Waste from Veterinary Practices – Infectious hazard or not?

When asked (question seven) whether the EPA would consider the segregation of veterinary clinical waste according to potential infectious hazard and allow non-infectious waste to go to landfill untreated the representative answered that he had no information on the potential infectious risk of veterinary waste, but suggested reference to the detailed guidelines produced by the Department of Health and Children and the HSE which are used by hospitals in relation to the segregation of different waste streams and what can and cannot go to landfill.

3.4.4 Waste from Brucellosis and Bovine TB Eradication Schemes

When asked in question eight to comment on queries raised by vets in the course of the survey regarding the Department of Agriculture’s responsibility towards the wastes generated as a result of the veterinary practitioners involvement in the Bovine TB and Brucellosis eradication schemes (i.e. waste tuberculin, and sharps) the EPA representative replied simply that the issue should be raised with the Department of Agriculture.

Chapter 4

DISCUSSION

While several studies have been made of hazardous waste production in relation to health risk waste and the production of hazardous waste by dental practitioners, this is the first study of its kind to examine the management of veterinary hazardous waste from the point of view of the producers of the waste (veterinary practices), the regulators of veterinary waste management (local authorities and the EPA), and the hazardous waste contracting companies responsible for waste collection. The bulk of the study centres on the production and management of hazardous and other wastes by veterinary practices.

The veterinary practice survey was designed to be anonymous in an attempt to ensure honesty in the replies of the respondents. Even though the survey was anonymous it is probably fair to assume that of the veterinary surgeons who responded to the survey, there is more likely to be a higher percentage of veterinary surgeons who feel they are compliant (from the veterinary population as a whole) than those who feel they are not fully complying with waste management regulations at their place of work. Correspondingly, it is likely that there would be a higher percentage of non-compliant than compliant practices among the 60% of practices surveyed who did not respond. Consequently any evidence of non-compliance on the part of the surveyed practitioners is likely to be at least representative of and more likely to be an underestimate of non-compliance in the population as a whole, and likewise the extent of veterinary compliance is if anything probably overestimated by the survey. However the large sample number relative to the population being surveyed ensures the validity of the survey despite any skewing of data which may occur due to the above considerations.

The veterinary practice survey first examined the demographics of the veterinary practices responding to the survey. The results seemed to be consistent with the general nature of practices around the country. The majority of practices were mixed (business based on farm animals, equines, and companion animals) with lesser numbers of small animal practices, farm animal practices and equine practices. Most practices surveyed were based in small and large towns around the country with the remainder in cities and

rural areas. This places a large proportion of veterinary practices outside of major cities and places an onus on hazardous waste collection companies to make their services available to veterinary practices over a wide ranging area. The location of veterinary practices was predominantly within residential areas either with a former residence given over completely to a veterinary practice or a practice premises as an annex to a residence. It would seem likely that in such surroundings there would be a low tolerance from adjacent residents to any waste nuisance of a hazardous or other nature caused by a veterinary practice. The types of activities carried out at veterinary practices indicated that there was the potential for every veterinary practice to generate a considerable volume of clinical waste and that many more would be generating additional hazardous wastes as a result of specialist activities such as radiography, laboratory diagnosis, orthopaedic and dental surgery, and reproductive work.

From the point of view of awareness of the legislation governing hazardous waste and waste in general, the majority of veterinary practices are aware that the Waste Management Act, 1996 is the major legislative instrument governing waste in Ireland, and were also aware of the types of materials within their waste streams which should be considered hazardous with only a few exceptions e.g. ink cartridges and toners. Most of practitioner knowledge on waste management had been gleaned from articles in the Irish Veterinary Journal, from the Irish veterinary union: Veterinary Ireland, and from one of the hazardous waste contracting companies: Veterinary Environmental Management.

The management of municipal waste by veterinary practices was also examined by the survey. It was felt that how veterinary practices handle their municipal waste management, for example participation in local recycling schemes might be reflective of how they might handle hazardous wastes. The majority of veterinary practices used private waste collection companies to collect their municipal waste. There may be a number of reasons for this. There may be no local authority waste collection service in some of the areas surveyed. Many local authorities have completely privatised municipal waste collection and no longer offer a collection service. Even if this is not the case, it is likely that many practices avail of lower collection costs from privatised waste collectors. What is also likely is that the privatised collection of veterinary waste may contribute to the low incidence of waste violation reporting in relation to veterinary practices (as suggested by the response to the local authority questionnaire), since a private collection company could be considered less likely to report a violation of waste

collection than a local authority collection service. The volume of municipal waste produced by veterinary practices in general is quite low, with 60% producing no more than the average household, and consequently the level of expense incurred in municipal waste disposal is also insignificant. This may in part be achieved by the high level of participation in recycling schemes among veterinary practices, particularly cardboard. Not all materials were being recycled however. Only 35% of practices were recycling inkjet cartridges and since 60% of practices did not regard them as hazardous, a corresponding amount may be making their way to refuse from veterinary practices. Participation in recycling schemes requires a certain amount of waste segregation. If veterinary practices can carry out the waste segregation required for recycling then the segregation of hazardous waste should not prove too exacting.

The issue of disposal of companion animal cadavers arises regularly in mixed and small animal veterinary practice. In relation to dog and cat carcasses from the survey it is apparent that almost half of Irish veterinary practices do not offer a disposal service for pet cadavers and rely on the owner taking the pet home for burial. Legally in the UK where pet cadavers are considered hazardous clinical waste there are problems with this practice (Anon., 1993; Tavernor, 1993; Gripper, 1995). In Ireland up until 2003 due to a generalisation in the definition of an animal by-product on the part of the legislation (European Communities (Disposal, Processing and Placing on the Market of Animal By-products) Regulations, 1994), it was unclear whether pets could be buried by the owner. In 2004 Kelly in his Irish Veterinary Journal paper reminded vets that the legal classification of cadavers as “waste” meant that they had to be handled by a licensed operator. Legislation introduced the preceding year (European Communities (Animal By-Products) Regulations, 2003) had however taken away any doubt about the legality of an owner burying a deceased pet. The legislation stated specifically that there was nothing to prohibit an owner burying a pet on his/her own property. A common sense approach was to be taken to the location of the burial plot, e.g. water courses were to be avoided. The Irish legislators availed of derogation in the source EU legislation (Regulation (EC) No. 1774/2002 of the European Parliament and of the Council of 3 October 2002) to allow the practice of pet burial by an owner to continue. There could be some doubt thrown over the legality of the transport of a deceased animal body by an owner home from the veterinary practice where it had met its end, since at an EU level at least there are desired practices for the movement even of companion animal carcasses which are not consistent with the carriage of a cadaver on the back seat or in

the boot of a car. However it seems likely that in Ireland, as in the UK (Tavernor, 1993), this is unlikely to be enforced under such circumstances. An exception could have to be made to the owner taking a deceased pet home for burial if the pet was suspected or confirmed to be suffering from a group 2 or group 3 disease prior to its demise, thus placing the owners at risk of infectious disease in handling the carcass. Under such circumstances it should be at the discretion of the veterinary clinician treating the pet prior to its death, to suggest to the clients that cremation may be a more appropriate means of dealing with the cadaver. Such an approach would be in keeping with the Segregation, Packaging and Storage Guidelines for Healthcare Risk Waste; 3rd Edition, April 2004, where the waste material (in this case a pet cadaver) becomes risk (hazardous) waste due to its infectious status whether actual or potential.


Over half (56%) of practices surveyed did avail of the services of one hazardous waste contractor (Veterinary Environmental Management) for the disposal of cat and dog carcasses. VEM disposes of these carcasses by incineration in an oil-fired incinerator facility in Wicklow. In addition to incineration of animal cadavers *en masse* the company also provides for individual cremation at a higher cost to the client. The number of animal carcasses being disposed of in this fashion is not insignificant. Of the veterinary practices providing a disposal service, 23% disposed of more than six dogs per week. While some (22%) of the local authorities who responded to the questionnaire also avail of the services of VEM for disposal of the dog cadaver waste arising as a result of the euthanasia of stray dogs at local authority dog pounds, other (44%) local authorities use rendering plants. From an environmental point of view this may be a more energy efficient means of disposal of this waste and would more than likely be considerably cheaper to veterinary practices that might avail of such a service. Obviously there would be no possibility of the retrieval of ashes for the client (as there is with the individual cremation service offered by VEM) but anecdotal evidence suggests that there is minimum uptake of this service due to the high cost to the client and possibly also for cultural reasons. Appropriate transportation of the carcasses (particularly in bulk) to the rendering plant would have to be used in accordance with EU Regulations.

In the USA (Miller, 2000) and in Canada (Mc Kelvey, 1997) small animal carcasses are not regarded as clinical waste unless they are known to be suffering from a zoonosis (Mc Kelvey, 1997; Krauss, 2003) and consequently can be sent to landfill as well as for incineration if desired (Sanders et al., 2002). Only laboratory animal

carcasses are automatically cremated (Rau et al., 2000), or treated by alkaline hydrolysis (Sanders et al., 2002). However, where companion animals have been euthanized with barbiturates they are not permitted to be rendered as they are in Ireland (Sanders et al., 2002). This is due to the fact that rendering plant material can still potentially make its way into the food chain by going for animal consumption in the USA. Also in the US, composting is an acceptable means of disposal of farm animal and equine waste, although some states prohibit the composting of farm animal carcasses because of issues over Transmissible Spongiform Encephalopathies (TSEs) (Sanders, Warbington and Myers, 2002). Companion animals are not generally affected by TSEs and thus composting under controlled circumstances could also present a solution for pet cadaver disposal in Ireland, although this is an avenue as yet unexplored.


Perhaps the most important waste stream generated from veterinary practices if only for reasons of the potential volume of waste produced is veterinary clinical waste also described in the literature review as “yellow bag” waste. This waste is also the most difficult to deal with especially from the point of view of waste segregation and the identification of potential infectious hazard. As yet, other than the fact that infectious healthcare waste from veterinary establishments is prohibited from landfill under the Waste Management (Licensing)(Amendment) Regulations 2002, there is no legislation that deals specifically with veterinary clinical waste. As suggested by the EPA representative consulted in the course of this study, in the absence of any specific veterinary legislation the guidelines for human healthcare waste should be followed. Perhaps the best example of such guidelines is the Segregation, Packaging and Storage Guidelines for Healthcare Risk Waste; 3rd Edition, April 2004 (Anon., 2004c). If human healthcare risk waste infectious criteria are to be used to decide whether veterinary clinical waste is hazardous (“risk”) or non-hazardous (“non-risk”) then much of the clinical waste material generated by veterinary practices should in fact be designated non-hazardous.

Firstly there is the waste that is not considered hazardous under the Irish healthcare waste criteria. This includes potentially offensive material such as faecal material, urine, foetal membranes (where no zoonosis is suspected), urinary drainage bags and catheters, stoma bags, and naso-gastric tubes. By contrast much of this material is considered to be yellow bag waste in the UK, where even faecal material produced in boarding kennels is designated yellow bag waste (Anon., 1993; Gripper, 1995; Gillies, 2001). It must be remembered however that faecal material and all



excreta from animals on chemotherapy is considered hazardous within two days of treatment and must be disposed of with chemotherapy waste (Lucrey, 2001; Takada, 2003). Other wastes considered non-hazardous under these criteria include items of medical equipment which are assessed to be non-infectious e.g. plastic items and packaging, i/v solution fluid bags and sets (the sharp tips should be removed and disposed of with sharps), enteral feed bags, uncontaminated dressings and casts etc. Even if it is not considered hazardous it should be considered sound waste management practice to avoid where possible the generation of these types of waste e.g. by avoiding the overuse of disposable items such as gowns and drapes (Krauss, 2003). There is much concern within medical circles about the minimisation of plastics in yellow bag waste mostly because of the practice of incineration of this type of material and the potential for dioxin generation as a result particularly from plastics containing chlorine such as polyvinylchloride (PVC) (Rau et al., 2000; Anon., 2004b). While this is not currently a concern in Ireland because yellow bag waste is normally rotoclaved it may become an issue in the future if such waste is incinerated. There may also be potential for the recycling of some of this plastic waste (Lee, Ellenbecker and Moure-Ersaso, 2002 and 2004) although recovered plastic could not be used in similar product. According to the Segregation, Packaging and Storage Guidelines for Healthcare Risk Waste (Anon., 2004c), all of this waste material can go into black plastic bags and be disposed of alongside municipal waste.

Then there is the clinical waste that would be designated hazardous if it was human healthcare waste but with which there is minimal infectious hazard associated in veterinary practice. Unlike the situation in human healthcare, where diseases such as HIV and Hepatitis B and C render the blood from clinically normal carriers potentially infectious, there is little or no infectious risk associated with the blood of clinically normal companion animals and horses, sheep and cattle. Human anatomical waste is regarded as potentially infectious for the same reason. However most of the tissue, organ and blood-contaminated waste within veterinary practices is generated by the swabbing and draping of surgical sites during sterile procedures carried out on healthy animals, by the dressing of fresh traumatic wounds on otherwise healthy animals, by the removal of organs from healthy animals at neutering, and as a result of obstetrical treatment of healthy animals. None of this material has any group 2, 3, or 4 microbiological hazard associated with it *per se*. This issue of the low potential infectious risk associated with veterinary clinical waste was specifically raised by




several of the vets responding to the veterinary survey. Even in relation to human healthcare waste, while there are older studies providing evidence to the contrary (Marrack, 1988; Brenniman and Allen, 1993), several recent studies have found that the infectious risk from healthcare waste is no worse than that of general household waste (Soparajee, 1999; Rau et al., 2000; Mohanty and Tiwari, 2001; Saini et al., 2004). There are arguments against this type of material going to landfill. For example after a few days in a black bin bag during summertime it could be hard to prove that there was no infectious hazard from a uterus from a bitch ovariohysterectomy even if a discarded sirloin steak in the same bag would have undergone the same amount of putrefaction. There may however be alternatives to hazardous waste disposal for this type of material which do not involve landfill. Almost all of the material involved is biodegradable (organs, cotton swabs, etc.). The composting of the biodegradable components of waste has been tested as a disposal technique for human healthcare risk waste with good results (Ghosh, Kapadnis and Singh, 2000). Composting was also proposed by Krauss (2003) in relation to US veterinary practice waste management as a means of dealing with at least some of the biodegradable elements of veterinary clinical waste. The temperatures achieved in efficient composting would be more than enough to destroy any low level infectious hazard at least from companion animals and equines where TSEs are not an issue. It may be possible for individual veterinary practices to segregate the non-infectious biodegradable clinical waste which is not of ruminant origin and compost it. This would also be in keeping with the National Strategy on Biodegradable Waste, (Anon., 2006).

Of course there are clinical wastes generated in veterinary practices on a day to day basis which do have an infectious risk associated with them. Examples could include blood and faecal material from animals suspected to be infected with group 2 or group 3 pathogens such as salmonellosis, items contaminated with pus, or peritoneal fluid such as suction equipment, wound or chest drains, wound dressings, contaminated swabs, disposable gloves, gowns and drapes, infected amputated tissues and body parts, foetal membranes from obstetrical procedures where zoonoses are suspected and microbiological cultures. Such materials obviously have to be segregated from non-risk waste, stored and disposed of appropriately (as “yellow bag” waste). Through sound waste management it should be possible for a veterinary practice to minimise the amount of yellow bag waste produced but all practices will produce infectious clinical

waste to some degree and will therefore have a requirement for a storage facility for this material (usually a freezer) and a hazardous waste collection service for this material.

The present survey questioned veterinary practices on their processing of a number of items of waste potentially considered to be hazardous clinical waste. They included items with a quasi infectious hazard (bloody swabs, uterus from a spay, dirty gloves, used i/v cannula), items with a definite infectious hazard (a pyometra uterus, infected dressings), and an item with no infectious hazard associated with it that can freely go to land fill (i/v giving set). Practices were asked whether each of these items were ever allowed to go to municipal waste at their practice. The results showed that many of these items including those that have a definite infectious hazard associated with them are making their way to landfill from veterinary practices. They also show a lack of discrimination among veterinary practices which suggests that all of the practices were unclear as to what constituted an infectious hazard and what items they could safely allow to go to landfill. A quarter of the practices said that they allowed none of the materials to be disposed of with municipal waste, and disposed of all the items as yellow bag waste. Of all the waste materials, the items most commonly allowed into municipal waste were dirty gloves. Using human healthcare risk waste criteria the majority of dirty gloves (often contaminated with faeces from healthy animals) would be considered safe for landfill, and only those contaminated with infective material e.g. pus, or faeces from animals suspected to be suffering from enteric conditions caused by group 2 pathogens should be disposed of as yellow bag waste. These results demonstrate that veterinary practices are not being discriminatory in the items they place in yellow bag waste. Information recently provided to vets by their own union, The Veterinary Ireland Guide to Waste Management in Practice, (Anon., 2005c), may have something to do with the apparent lack of discrimination by veterinary practices when it comes to veterinary clinical waste. These guidelines advise vets to consign used gloves, blood stained swabs, dressings, drip bags and empty plastic medicine containers to yellow bag waste. If human healthcare waste management criteria are to be applied to veterinary clinical waste, then there is a need for these guidelines to be revised.

The volumes of waste medicines being generated from veterinary practice and associated activities in Ireland are significant. The National Hazardous Waste Management Plan, (Anon., 2001) provided estimates for the years 1996 and 1998 at 500 and 483 tonnes of waste veterinary medicines, respectively. These wastes originate from



medicines distributed through veterinary practices, co-operatives, and pharmacies. On a global scale the issue of waste arising from unused and out of date medicines and pharmaceuticals is a very contentious one at present. Medicines are becoming significant pollutants (Rau et al., 2000; Xia, Bhandari, Das and Pillar, 2005). The latest evidence shows that even drugs not traditionally presumed to be hazardous such as antibiotics can have hazardous properties and persist in the environment (Al-Ahmad, Daschner, and Kuemmerer, 1999; Rau et al., 2000; Alexy, Kumpel and Kuemmerer, 2004). Despite this worldwide concern, the European Waste Catalogue and Hazardous Waste List lists only cytotoxic and cytostatic medicines as hazardous, under the designation 18 02 07* where “*” denotes hazardous waste. Using this list all other medicines are designated non-hazardous and given the code 18 02 08. The EPA representative consulted during the course of this investigation agreed with the notion that this is an over-simplistic view of the potential hazard from waste medicines. His opinion was that all drugs are chemicals which should be individually appraised for hazardous properties and if such properties can be demonstrated, or are believed to be present they should be treated as hazardous waste. While this sounds like a reasonable approach, in practice it may not be so easy to use, or may be deliberately disregarded to save costs.

It is not difficult to decide on the non-hazardous status of some waste veterinary pharmaceuticals for example vitamins and nutraceuticals. It is likely that if these cannot be returned to the manufacturer they could be disposed of with municipal waste. To make an informed decision on other waste items, a vet may be required to be in possession of up to date scientific knowledge on the potential drug toxicity and ecotoxicity of the product concerned. Where the constituents of a medication may not be immediately obvious from the datasheet, the provision of additional technical data from the manufacturer may be required e.g. for animal vaccines and diagnostic medications such as bovine and avian tuberculin. Indeed drug manufacturers would undoubtedly be the best sources for this type of information having undergone extensive testing for each product manufactured. Manufacturers could indeed routinely include this type of information on product labels. In practice if the volume of such wastes could be kept to a minimum the simplest approach to medicinal and pharmaceutical waste may be that adopted by hospitals and human healthcare establishments. These follow the Segregation, Packaging and Storage Guidelines for Healthcare Risk Waste

(Anon., 2004c), which state that all waste pharmaceuticals and medicines require appropriate segregation, storage and disposal.

Taking all these factors into account the results of the veterinary practice survey in relation to the management of veterinary drug waste are highly significant. Almost half (48%) of veterinary practices surveyed were not using licensed hazardous waste contracting companies to dispose of their waste drugs. The majority of practices not availing of the services of a waste contracting company were using municipal waste as a disposal route, and a few practices flushed their waste drugs down the toilet. The material placed into municipal waste by veterinary practices included empty and part-empty antibiotic bottles, empty vaccine bottles, used drug ampoules and syringes containing drugs. Unused and out of date medicines were returned to the manufacturer by only 21% of practices. A fifth of practices informed their clients about appropriate drug disposal. If the survey is representative of the waste practices of Irish veterinarians in general then it is likely that tonnes of waste medicines originating from veterinary practices are entering landfill and wastewater every year. However it must be remembered that waste animal remedies are not the only source of waste medicines potentially contaminating the environment in Ireland. The National Hazardous Waste Management Plan, 2001 estimated the volume of unreported household medicines at 1,575 tonnes for 1996.

Some reviewers (Gillies, 2001; Kelly, 2004) have described the existence of an unofficial dispensation to allow used medicine containers which contain less than 1% of their original volume to be disposed of with municipal waste. Another earlier UK reviewer held a position contrary to that of Gillies, being of the opinion that all empty medicine containers should be disposed of as special pharmaceutical waste (Anon., 1998). This 1% rule is again referred to in the “Veterinary Ireland Guide to Waste Management in Practice” in which one of the above writers (Kelly) was instrumental. Mr. Kelly during an informal conversation suggested that this “rule of thumb” had originated with the EPA. The EPA representative consulted was aware of the so-called loophole concerning “nominally empty” pharmaceutical containers but could not confirm if there was any legal basis for this exception. He suggested that where there was a doubt over *any* potentially hazardous waste the EPA’s Paper Tool of the Procedure for the Identification of the Hazardous Components of Waste (Anon., 2004d) should be consulted. He also suggested that vets consult with their local landfill operator regarding the disposal of such containers to check whether such waste meets

with the individual waste acceptance criteria for that landfill in accordance with Waste Management (Licensing)(Amendment) Regulations, 2002.

American authors have mentioned two other factors in the management of medicinal waste namely, the US vet's obligation to accept unused product originally supplied to clients, and the US manufacturer's obligation to likewise accept unused and out of date product returned by a vet (Meerdink, 2000; Miller, 2000; Haskell et al., 2003b). These same issues are now also of major relevance in Ireland due to legislation introduced at the end of 2005 (Animal Remedies Regulations, 2005). Under these new regulations vets, wholesalers, and manufacturers are required to accept unused or expired animal remedies. Vets must return them to the wholesaler and/or manufacturer. Vets must also notify their clients as to the availability of this facility. According to the EPA representative consulted during the course of this study this legislation was introduced by the Department of Agriculture without consulting either the Department of the Environment or the EPA, and has created issues which are currently under review. A major implication of this legislation is that much of the waste medicines produced in veterinary practice should now be returned ultimately to the manufacturer for disposal rather than be disposed of via a hazardous waste contractor at the private expense of the individual practice. However, until a satisfactory protocol has been established for this "take back" policy it is unlikely that the status quo will change or that the new legislation will be enforced.

In this study the veterinary practice survey did not query vets in relation to waste minimisation practices particularly regarding medicines. However, annotated comments from surveyed veterinary practitioners and anecdotal evidence suggest that there is much room for improvement in this area. Pharmaceutical manufacturers and distributors have long fostered a culture of large product orders. Practices are encouraged to order enough stock to meet their requirements for months ahead in order to avail of "bonus" sales or substantial discounts for many products, and occasionally even to avail of junket trips abroad. In practices where stock is not well controlled this often leads to large volumes of out of date stock. Out of date medicines are waste medicines, and to date pharmaceutical manufacturers have not been so quick to receive returned stock. In the past sales representatives would accept such waste material and return it to the manufacturer. This is no longer common practice however, and couriers are now required to transport returned medicines. Manufacturers are understandably slow to incur the double costs of the transport and disposal of such waste materials. The

introduction of the recent animal remedies legislation may change this position. Miller (2000) and Krauss (2003) writing in relation to US veterinary practices proposed a few simple steps to avoid such wastes. These included resisting discounts offered by suppliers, monitoring of expiration dates on incoming stock (something which is now required in Ireland under the new Animal Remedies Regulations), good stock control to ensure that older product is sold first (the “first in first out” principle), and the return of outdated product to the manufacturer within the time normally allotted by the manufacturer.


The measures required to be taken in the handling of waste from the chemotherapeutic treatment of animals have been well described (Lucrey, 2001; Takada, 2003). Invariably the use of chemotherapy drugs in animals is carried out “off licence” since no such products are licensed for use in animals. Thus chemotherapy wastes must be treated in the same manner as wastes generated in the chemotherapeutic treatment of human patients. Such waste is required to be segregated and separately identified from other pharmaceutical waste, stored, and disposed of in accordance with the Segregation, Packaging and Storage Guidelines for Healthcare Risk Waste. While use of chemotherapy is on the increase in the UK (Dobson, 1998) it is apparent from the present survey that few Irish practices are offering it as a treatment option. Only two practices from the fifty seven surveyed had carried out a chemotherapy protocol. However of the two practices only one described disposing of the waste produced as “hazardous waste”. The other practice did not say how the waste had been treated. It is likely that as in the UK Irish practices will increasingly offer this service to clients. It is imperative perhaps above all other veterinary generated waste streams that this waste is handled appropriately. Any veterinary practice contemplating engaging in the provision of this type of service should make themselves fully aware of the requirements for the proper disposal of all materials considered hazardous, and put the procedures in place to ensure that all materials are handled appropriately.

Even though the European Waste Catalogue differentiates between non-hazardous (18 02 01) and hazardous (18 02 02*) sharps based on their potential infectious hazard, all sharps have been traditionally regarded as hazardous across all medical disciplines because of their potential to cause personal injury. Such injuries are common in human healthcare (Branson, 1995) and have been reported as a result of veterinary wastes also leading to prosecution (Anon., 2000a). In relation to the current survey, sharps were perhaps the best handled of all the veterinary practice waste streams

amongst those practices surveyed. The majority of practices (86%) disposed of sharps in approved containers through hazardous waste contractors, a better uptake than for any other waste stream. There may be some doubts cast over the legitimacy of this figure when 26% of practices surveyed declined to name the hazardous waste contractor they used. According to the survey the remaining practices disposed of sharps either in municipal waste in tough plastic containers or through other obscure means. Neither of these are acceptable means of disposal. Sharps containers must meet industrial criteria for puncture resistant containers. Any means of disposal other than appropriate containers disposed of through hazardous waste contractors puts waste handlers at risk of personal injury.


In the course of the survey veterinary practices were also identified as definite sources of hazardous chemical wastes including laboratory reagents, solvents, and photo chemicals. Waste chemicals used in the processing of radiographs are perhaps the most significant since they will be produced by those veterinary practices using radiography as a diagnostic tool (53% of practices in this survey) in quite substantial amounts. Both waste developer (09 01 01* or 20 01 17*) and fixer (09 01 04* or 20 01 17*) are regarded as hazardous under the European Waste Catalogue and Hazardous Waste List, 2002 because of the toxic chemicals they contain including glutaraldehyde, hydroquinone, potassium hydroxide and silver (Anon., 1999). Most veterinary practices use wet chemistry (and not digital technology) for processing radiographs either manually or in automatic processing machines. Irrespective of processing method this will lead to the production of around 20kg (five litres each of developer and fixer changed every two weeks) of hazardous photochemical waste by each practice every month. Given the large volume of hazardous waste generated the extent of non-compliance by veterinary practices was somewhat alarming, particularly considering that these practices could be considered to be among the more progressive practices. Less than half (47%) of practices using radiographical equipment disposed of their photochemical waste via licensed hazardous waste contractors. The main routes of disposal for practices not complying were to wastewater either via the sink or the toilet. It is worth noting that where practices are not connected to a sewerage system (23% of surveyed practices were located in rural areas) these waste chemicals will end up in the septic tank.

Surveyed practices were also asked whether they possessed any of the chemicals from a list including laboratory chemicals and solvents used in animal treatments such



as hoof care and orthopaedics. Formaldehyde and hydrogen peroxide were the most widely used chemicals on the list, but all were to be found in some practices. Vets were not asked how they disposed of waste material from this list, but based on data from the hazardous waste collection companies it is unlikely that many practices dispose of any of this material through appropriate channels. The issue of disposal of this small volume hazardous waste was also raised with the EPA representative. The National Hazardous Waste Management Plan, 2001 held as one of its aims the provision of hazardous waste management facilities in the form of access to civic amenity waste depots or possibly even collection services to small to medium enterprises (SMEs). Since the publication of the plan most local authorities have provided facilities at civic amenity sites for the general public to deposit hazardous chemical waste using the ChemCar® service provided by Cedars Resource Management to dispose of this waste. Commenting on the current situation in relation to SMEs the EPA representative stated that he did not know of any local authorities who invited SMEs to use these facilities, and that local authorities in fact can and typically do refuse access to the commercial sector to their civic amenity sites. This was also backed up by information gained from the local authority questionnaire in which all of the 18 local authorities responding to the questionnaire reported that they did not provide hazardous waste collection services to veterinary practices or allow access to civic amenity depot facilities by veterinary practices. This situation does fall short of the aspirations of the National Hazardous Waste Management Plan, however it seems likely that there will be no change in this *status quo* and that small business such as veterinary practices will continue to be required to arrange for and fund the disposal of their small volume chemical wastes through hazardous waste contractors. For the purposes of disposal of this material chemicals should be kept segregated in original packaging and containers (Mc Killen, 1999). It is illegal to mix hazardous waste of one type with another or with non-hazardous waste. Another approach to avoid the generation of wastes of this type is to avoid the material altogether and at least one writer (Krauss, 2003) has suggested the use of alternative less toxic products wherever possible.

The veterinary practices surveyed were asked both directly and indirectly about the waste management of mercury sources in practice. The majority of practices recognised that a broken mercury thermometer and used fluorescent tube are classed as hazardous waste in the theoretical section of the survey. Used batteries (some contain mercury) were also recognised as hazardous by the majority of vets. Used fluorescent



light tubes are currently refused from landfill in the USA (Rinfret, 1995; Anon., 1996b), and clinicians in the US are encouraged to segregate batteries as sources of mercury (Cocchiarella, Deitchman and Young, 2000). Most of the hazardous waste contractors currently provide a collection service for this type of material. However since they are not obviously veterinary waste, local authority civic amenity bring centres would probably also have a difficult time turning away fluorescent tubes and batteries. Used inkjet cartridges were not identified as hazardous by the majority of veterinary practices surveyed. These are easily recycled, it saves money and only 35% of practices are doing so. Vets should use alternatives to mercury wherever possible. None of the veterinary practices surveyed has used dental amalgam as part of dental surgical procedures. While they are more expensive to use, veterinary practitioners contemplating reconstructive dental work should consider glass ionomers or other composites as alternatives to amalgam as has been the case in human dentistry (Spencer, 2000). Diagnostic equipment using mercury should also be replaced by digital equivalents e.g. digital thermometers should replace mercury thermometers which are widely used and very often broken in veterinary practice. In the event of thermometer breakage and spillage on site in the clinic the collected mercury and cleaning implements used should be segregated and disposed of as hazardous waste. Indeed according to the hazardous waste contractor questionnaire this kind of material has been disposed of by veterinary practices through at least one company (Rogers Healthcare Waste Management Ltd.).

There were a number of items of potentially hazardous waste whose management by veterinary practices was not examined by the veterinary practice survey. These included halogenated organic compounds, pressurised containers, radioactive waste and waste electronic and electrical equipment. While the use of halogenated organic compounds is probably widespread in veterinary practices compared to human hospitals the use of these materials as a diagnostic tool is sporadic and the volumes of waste generated are consequently likely to be miniscule. Pressurised containers in the veterinary practice such as those for anaesthetic gases are usually rented and consequently do not end up as waste. Outside of veterinary laboratories and university establishments the likelihood of radioactive waste in veterinary practice is negligible.

The absence of a question on WEEE from the survey was an oversight. The importance of WEEE as a source of hazardous waste in relation to veterinary practices has been described in the literature (Anon., 2005a). Waste office computers and

associated equipment can now be managed through various channels including local authority civic amenity sites (unless access is denied by the relevant authority). Waste laboratory equipment does present a different scenario since if it is not being replaced with similar equipment the veterinary practice must fund and find a route for its disposal in accordance with the Waste Management (Waste Electrical and Electronic Equipment) Regulations 2005. According to responses to the questionnaire sent out during the course of this study at least a few of the hazardous waste contractors will accept and are licensed to handle this kind of material. Many veterinary practices may not be aware of their obligations in this regard.

The response to the question on contracts with licensed waste contractors in the veterinary practice survey raised some questions as to the validity of the responses to some of the preceding questions. This question was not answered by 26% of respondents, thus only 74% of practices identified the hazardous waste contractor with whom they had a contract, yet 86% of practices claimed to be disposing of sharps through hazardous waste contractors. However the phrasing of this question did not allow for veterinary practices to categorically state that they did not have a contract with a hazardous waste contractor. In general it was felt that those responding to the survey would be likely to be more compliant and that the results of the survey would thus be an overestimate of compliance with waste regulations, and this may have been the case. Based on the hazardous waste contractor questionnaire the total number of practices with contracts with hazardous waste companies was estimated at between 350 and 450 which represents only 50-60% of veterinary practices operating within the country. If veterinary practices that did engage the services of hazardous waste contractors were going to be more likely to fill in the questionnaire then the survey could make it seem like there was a higher level of compliance within veterinary practices than may actually be the case. In terms of the companies that were identified in the responses to this question the data very much agrees with that obtained from the hazardous waste contractors themselves with Veterinary Environmental Management holding the majority share of the market and small numbers of practices availing of the services of the other hazardous waste companies. This would seem to validate the data that was obtained from the 74% of veterinary practices that did name their hazardous waste collection service provider. There was also a design flaw in the question on the annual level of expenditure on hazardous waste disposal since there was no provision made for veterinary practices that did not spend anything on hazardous waste disposal to

specifically identify themselves. The results do however identify a very low level of expenditure on hazardous waste disposal by 49% of veterinary practices who spend less than €500 annually, and due to a design fault in the survey a high proportion of these respondents likely have zero expenditure on hazardous waste management. The study identified as might be expected that the more compliant a practice is the higher their expenditure on hazardous waste disposal is with 14% of practices having to spend in excess of €2000 annually. Even of those practices that do have contracts with hazardous waste companies it is unlikely that practices spending less than €500 are being fully compliant with their waste obligations.

This study also examined the extent of the enforcement of waste regulations by local authorities on veterinary practices both from the veterinary practice end and from the local authority end. The results showed that veterinary practices are attracting attention from local authority enforcers, often on foot of complaints from members of the general public. Nine per cent of practices admitted to having had a verbal or written complaint made about them in relation to waste, and the same percentage of practices had also been the subject of enquiries in verbal or written form from their local authority in relation to potential waste violations. One practice admitted to being the subject of a full waste audit by a local authority. Surprisingly 22% of local authorities admitted that they would not immediately associate veterinary practices with hazardous waste. Of the eighteen local authorities who responded to the questionnaire five (28%) had received public complaints in relation to waste from veterinary practices in the preceding three year period and the same number had carried out waste audits of veterinary practices in the same period. One local authority had a prosecution pending against a veterinary practice. Despite the fact that over a fifth of local authorities did not associate vets with hazardous waste, veterinary practices were still attracting more attention from local authorities from the point of view of waste than either medical general practitioners or dentists. A substantial number (28%) of local authorities had not received any C1 forms relating to hazardous waste shipments from veterinary practices in the preceding year (2005). This could mean that hazardous waste collections are taking place but that the appropriate reporting of such collections is not taking place or that there are entire local authority jurisdictions in which veterinary practices do not appropriately dispose of hazardous waste through waste contractors.

Perhaps the best evidence that veterinary practices are not fully waste compliant comes from the practices themselves. Of the fifty seven veterinary practices responding

to the survey more than half (53%) felt that they were not fully compliant including many practices who did have contracts with hazardous waste collection companies. Of the reasons stated for non-compliance all of the respondents stated that insufficient knowledge of their obligations was their main reason, followed by issues of cost, the bother of waste segregation and the feeling that other vets were not compliant either. Interestingly of those respondents who felt they were fully compliant a further seven practices (12% of the total number) were actually committing waste violations based on their responses to the preceding questions. This means that only 35% of veterinary are correctly presuming that they are complying with their requirements under the legislation regarding hazardous waste.

Chapter 5

CONCLUSIONS

A wide range of hazardous waste is produced in veterinary practice in Ireland with the result that the legislation governing the management of hazardous wastes in veterinary practice is also wide ranging and complex. Most veterinary practices whether mixed, large animal, small animal, or equine, have the potential to produce at least some of the various hazardous waste streams. The greater the range of diagnostic and therapeutic services provided by a veterinary practice the greater the range of hazardous wastes produced.

Vets cite a lack of familiarity with their requirements with regard to hazardous waste as the major reason for non-compliance. In fact, most already have the expertise to identify the hazardous wastes from a line-up of common veterinary practice wastes and are aware of at least some of the legislation regulating their handling of wastes in general and hazardous wastes in particular.

Veterinary cadaver waste in Ireland is handled appropriately by both veterinarians and local authority dog pounds, being either returned to the owner for burial at home, disposed of by incineration through a hazardous waste contractor, or disposed of by rendering in a rendering plant, a facility which is mainly used by local authority dog pounds.

While veterinary practices seem to be efficient in their management of municipal wastes including participation in recycling programmes, with the possible exception of sharps there is considerable lack of compliance among vets in relation to hazardous waste streams arising in their practices. Many veterinary practices do not have contracts with hazardous waste collection companies. Many of those who do have contracts with such companies are under-using their services. Many routinely dispose of hazardous wastes such as pharmaceuticals, infectious clinical waste, and photochemicals via municipal

waste and wastewater routes. Lack of knowledge and economic factors are cited by vets as the major reasons for the lack of compliance.

There is little legislation specifically governing infectious veterinary hazardous waste in Ireland. In the absence of new legislation in this area criteria used for human healthcare waste must be applied. There are however fundamental differences between clinical waste arising from veterinary and healthcare establishments particularly in relation to their potential for infectious hazard. There is a need for clarification to be sought on behalf of veterinary practitioners on the issue of what should constitute infectious veterinary clinical waste. This would enable the minimisation of veterinary infectious waste by allowing more appropriate clinical waste segregation, and possibly also facilitate the exploration of alternative methods of disposal of non-infectious biodegradable clinical waste such as by composting.

Recent legislation in relation to veterinary medicines and pharmaceuticals includes new rules on the management of veterinary pharmaceutical waste. This is an area where there is currently a lot of non-compliance on the part of veterinary practices and there is an urgent need for working protocols to be put in place to ensure the appropriate flow of this waste stream from client to practice to manufacturer.

The current waste management guidelines to veterinary practitioners produced by the veterinary union, Veterinary Ireland, were produced by a hazardous waste management company, Veterinary Environmental Management. There is no emphasis whatsoever placed on the minimisation of hazardous wastes. The guidelines do not take into account the use of human healthcare criteria in the segregation and disposal of infectious veterinary clinical waste. They recommend the disposal as yellow bag waste of items of clinical waste that in hospitals are not considered healthcare risk waste and are recommended to be disposed of with municipal waste by healthcare guidelines. They also pay lip service to questionable practices such as the 1% rule on nominally empty medicine containers. There is a need for new impartial hazardous waste guidelines for veterinary practitioners, with additional emphasis to be placed on waste minimisation and good waste segregation.

There is no shortage in the provision of hazardous waste collection services. There are several companies who service the entire country and most will handle all of the hazardous waste streams potentially produced in a veterinary practice, although only one can currently collect and process cadaver waste.

Local authorities are aware of veterinary practices as sources of hazardous waste. They receive public complaints about veterinary practices in relation to waste violations and they act on them in the form of requests for explanations, audits, and prosecutions. Currently vets are receiving more attention in relation to waste from local authorities than either general medical practitioners or dentists.

Vets need to make themselves aware of their responsibilities with regard to appropriate hazardous waste management. They are directly responsible for the production of a diverse range of hazardous waste streams some of which in the case of certain streams such as infectious waste and photochemical waste may be produced in considerable volumes. They individually or collectively need to find ways to minimise the volumes of hazardous waste produced through minimising the use of toxic products, good waste segregation, knowledge of what constitutes hazardous waste, and the dissemination of this knowledge to all members of staff. They need to compile standard operating procedures for the handling of hazardous wastes in practice, and regularly audit waste management activities within the practice. They also need to find ways to fund the disposal of hazardous wastes. This could be achieved for example through environmental levies applied to clinical and surgical services to clients.

Chapter 6

RECOMMENDATIONS

The following are the recommendations offered for the improvement of veterinary hazardous waste management in Ireland on foot of this study.

1. New guidelines on hazardous waste management for veterinary practitioners should be drafted by Veterinary Ireland (the Irish veterinary union) which takes account of up to date legislation, waste minimisation, and the segregation of veterinary clinical waste according to infectious hazard. If possible they should not be drafted by a vested interest group.
2. There should be an investigation of the actual infectious hazard from veterinary clinical waste. The identification of a low infectious hazard for such waste in comparison with comparable human healthcare risk waste could allow for more informed and efficient segregation of veterinary clinical waste. This could lead to a significant reduction in the cost to veterinary practitioners. Alternate low cost ways of managing such waste such as (on site?) composting could then also be considered.
3. Veterinary practices, Dental Surgeons, and General Practitioners should consider grouping together for the purposes of hazardous waste collections with a view to reducing costs i.e. a group could negotiate a better deal on centralised hazardous waste collections with a single hazardous waste contractor.
4. Veterinary practices should investigate cheaper and more environmentally friendly alternatives to the collection and incineration of small animal carcasses. The rendering route being availed of by local authority dog pounds is an obvious choice. Deep burial under permit for veterinary surgeons who are also land owners may be another possibility.
5. Veterinary practices should lobby the local authorities in their area to accept small volume miscellaneous hazardous wastes and recyclable materials such as cardboard from their businesses at civic amenity sites if they are not already doing so. They should also seek clarification from their local authorities as to the

waste acceptance criteria (*vis a vis* particularly empty medicine containers) at their local landfill site.

6. Local authorities should make it their business to open the lines of communication with veterinary practices regarding waste management issues. Few offer advice of any description to practices.
7. Demands should be made on pharmaceutical and medicines manufacturers to include on data sheets complete descriptions of the potentially hazardous constituents and/or properties of each product and a recommendation for the route of disposal of any waste product that might result.
8. Veterinary Ireland, the Department of Agriculture, the Department of the Environment, the EPA, veterinary wholesalers, and representatives of the pharmaceutical manufacturers and pharmacists need to get together to sort out the so-called “take back” scheme brought into force by the Animal Remedies Regulations, 2005, and come up with practical workable solutions for the scheme where due consideration is given to who should bear and/or share the costs of the scheme.
9. In the context of future legislation the Department of Agriculture should liaise with the Department of the Environment and the EPA where pending legislation creates issues that relate to waste management.
10. Veterinary Ireland should negotiate on behalf of its members with the Department of Agriculture in relation to waste management issues pertaining to the running of the Tuberculosis and Brucellosis eradication schemes by veterinary practitioners, specifically in relation to the management of the wastes (used needles, syringes and tuberculin) generated at practice level as a consequence of the day to day running of these schemes.
11. University veterinary and veterinary nurse training establishments should consider the introduction of a module/lecture on waste management as part of the veterinary course.
12. Vets should endeavour to seek alternatives wherever possible to the use of diagnostic apparatus containing mercury in an effort to reduce mercury wastes in the environment.

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Appendix I

Figures and Tables

Relating to Literature Review

WASTE MANAGEMENT (MOVEMENT OF HAZARDOUS WASTE) REGULATIONS, 1998

Form C.1.

Consignment Note for consignments of hazardous waste transported within the State
(NOT to be used for transshipment into or out of the State)

B 60519

PART A (to be completed by the consignor)

1. Name and address of consignor¹:
Tel: Fax:
2. Name and chemical composition of waste*
3. European Waste Catalogue/Hazardous Waste List Description(s) and Code(s)²:
4. Origin of waste (name and address of producer, if different from 1.)
5. Process(es) that waste originates from:
6. Quantity (indicate kg or litres):
7. Size, type³ and number of containers:
8. Physical characteristics⁴:
9. Components which are hazardous (giving concentrations in each case):
10. Hazardous properties⁵ and special handling instruction (if any):
11. Name and address of consignee⁶:

20. I, the consignor, certify that the information given in Part A above is complete and correct to the best of my knowledge.

Signed Date
Name (block letters) on behalf of
Position held by person signing

PART B (to be completed by the carrier)

13. I, the carrier,⁷ certify that I collected the waste described in Part A in vehicle (reg. no.) at (time) on (date) and that I have been informed of the hazardous nature of the waste, as set out in that Part.

Signed on behalf of
Name (Block Letters) Signature of consignor as witness

PART C (to be completed by the consignee)

14. Name and address of consignee:
Tel.: Fax:
15. Waste licence number (if applicable)⁸ Waste permit number (if applicable)⁹
Certificate of registration (if applicable)¹⁰
16. The waste described in Part A was delivered to me by (carrier) in vehicle (reg.no.)
at (time) on (date) on behalf of (consignor)
17. (a) The consignment was accepted: (b) The consignment was rejected:
18. If the consignment of waste was rejected, state the reason(s):
19. If the consignment of waste was accepted, state the recovery/disposal activity(ies) to which it will be subject and provide code number and description of the technology involved¹¹

20. I, the consignee, certify that the information given in Part C above is complete and correct to the best of my knowledge.

Signed Date
Name (block letters) on behalf of
Position held by person signing

* full description may be attached on separate page
Footnotes ¹ to ¹¹ see relevant definitions and lists in the "Instructions for completion of Consignment notes for Hazardous Waste".

CARRIER'S COPY - to be given to the carrier of the waste, after completion of PART C by the consignee, and retained by the carrier.



Figure 1: Form C.1; Consignment Note for consignments of hazardous waste transported within the State (Not to be used for transshipment into or out of the State)

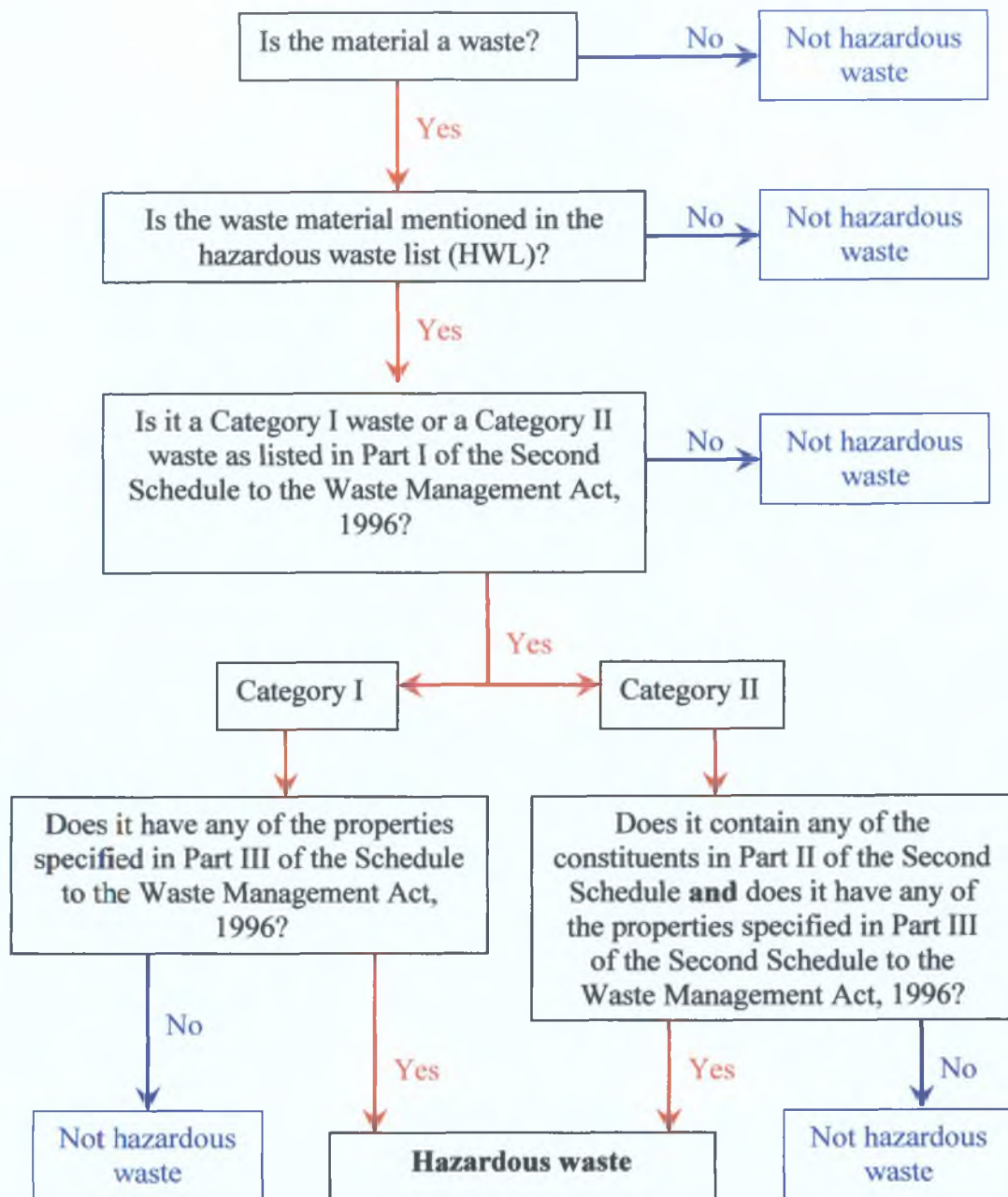


Figure 2: Hazardous waste flowchart (after National Hazardous Waste Management Plan, 2001)

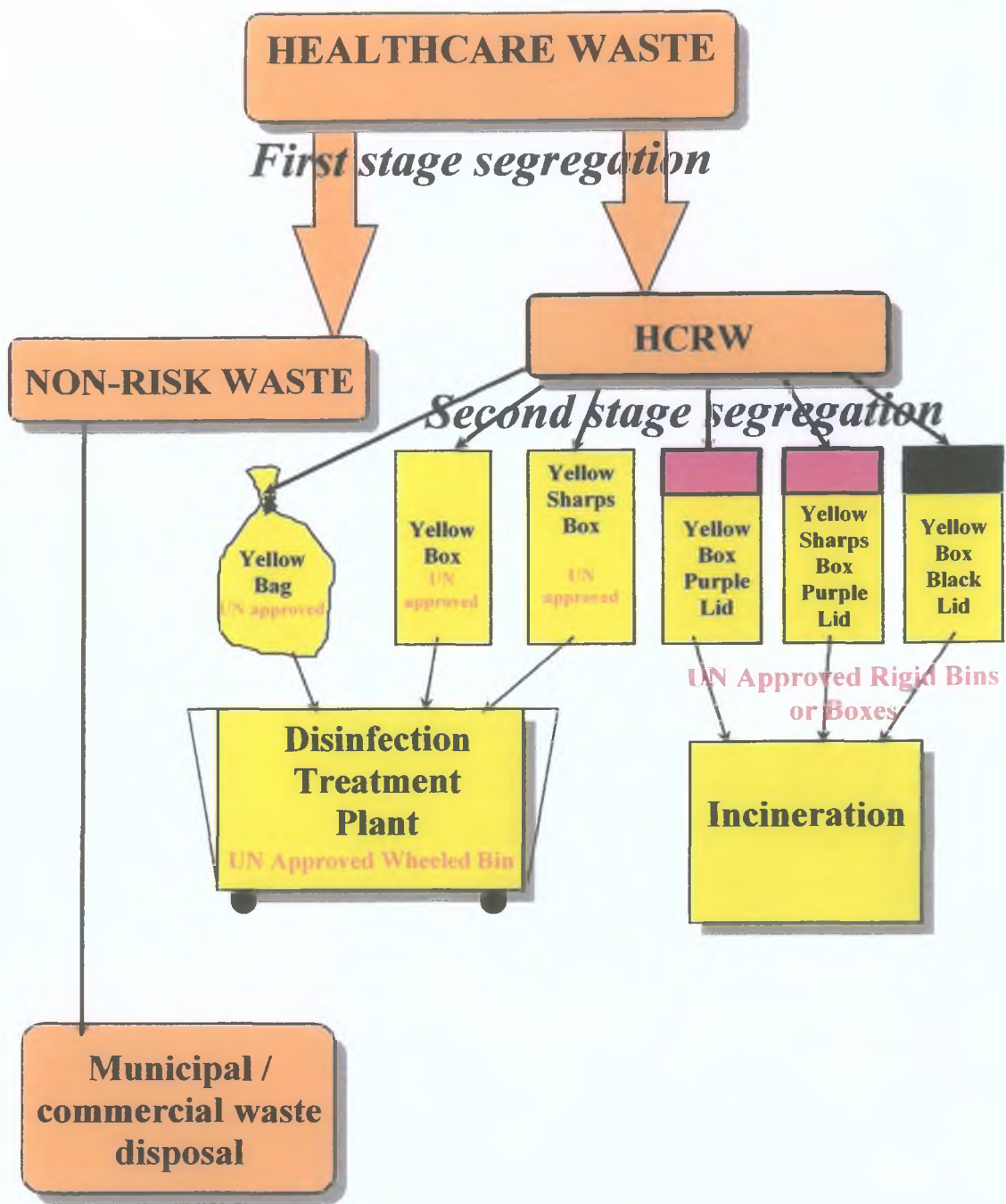


Figure 3: Healthcare Waste – Basic Segregation and Packaging Schematic (from Segregation, Packaging and Storage Guidelines for Healthcare Risk Waste; 3rd Edition, April 2004)

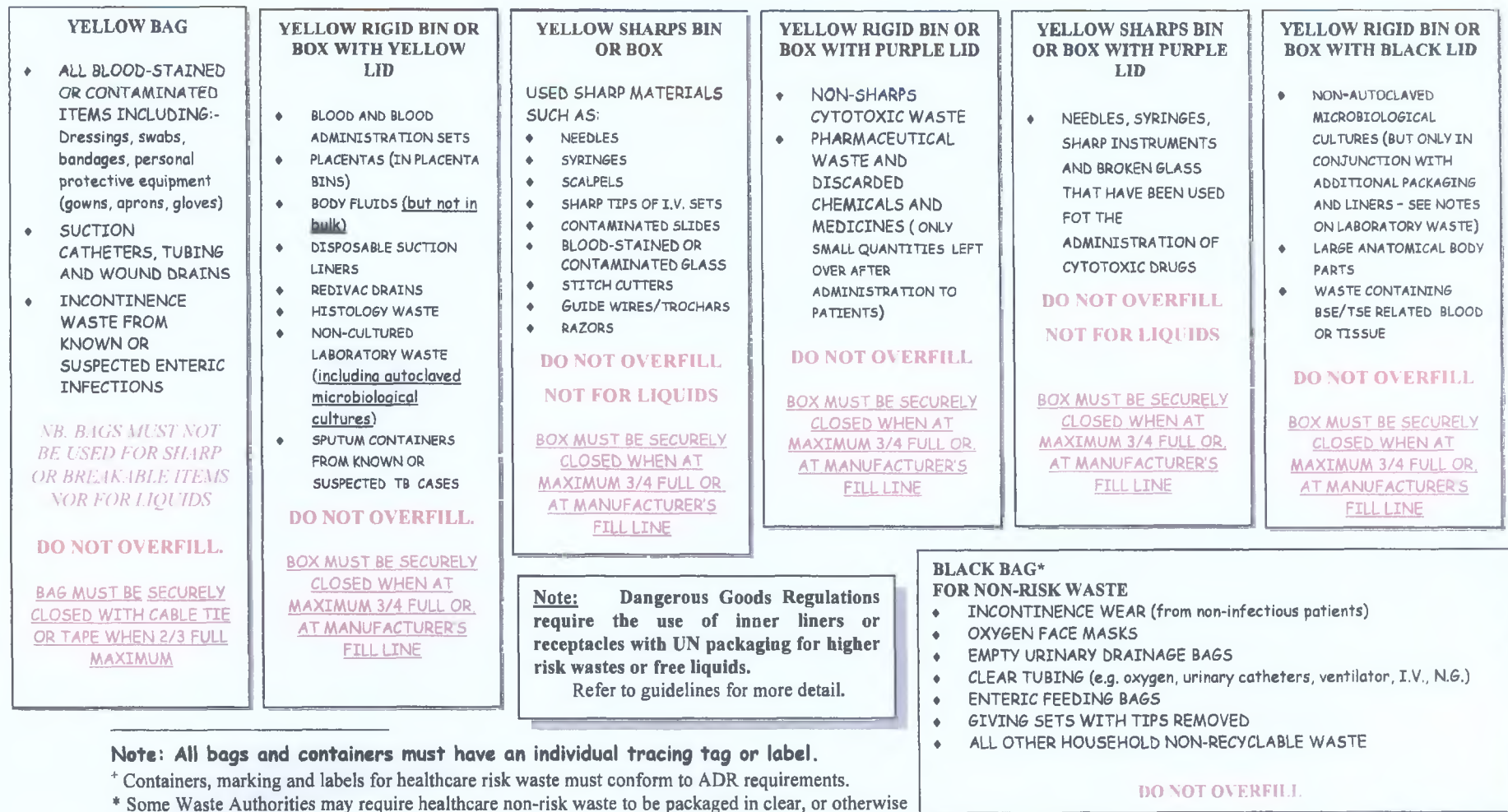


Figure 4: Segregation of Healthcare Risk Waste (Segregation, Packaging and Storage Guidelines for Healthcare Risk Waste; 3rd Edition, April 2004)

Chapter 02	WASTES FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING AND FISHING, FOOD PREPARATION AND PROCESSING
02 01	wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing
02 01 01	sludges from washing and cleaning
02 01 02	animal tissue waste
02 01 06	animal faeces, urine and manure (including spoiled straw), effluent, collected separately and treated off-site
Chapter 06	WASTES FROM INORGANIC CHEMICAL PROCESSES
06 04	metal-containing wastes other than those mentioned in 06 03
06 04 04*	wastes containing mercury
Chapter 09	WASTES FROM THE PHOTOGRAPHIC INDUSTRY
09 01	wastes for the photographic industry
09 01 01*	water-based developer and activator solutions (could also be classified under 20 01 17*)
09 01 04*	fixer solutions (could also be classified under 20 01 17*)
09 01 05*	bleach solutions and bleach fixer solutions (could also be classified under 20 01 17*)
09 01 07	photographic film and paper containing silver or silver compounds
Chapter 15	WASTE PACKAGING; ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED
15 01	packaging (including separately collected municipal packaging waste)
15 01 01	paper and cardboard packaging (could also be classified 20 01 01)
15 01 02	plastic packaging
15 01 06	mixed packaging
15 01 10*	packaging containing residues of or contaminated by dangerous substances
15 02	absorbents, filter materials, wiping cloths and protective clothing
15 02 02*	absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances
15 02 03	absorbents, filter materials, wiping cloths and protective clothing other than those mentioned in 15 02 02
Chapter 16	WASTES NOT OTHERWISE SPECIFIED IN THE LIST
16 02	wastes from electrical and electronic equipment
16 02 10*	discarded equipment containing or contaminated by PCBs other than those mentioned in 16 02 09
16 02 11*	discarded equipment containing chlorofluorocarbons, HCFC, HFC
16 02 13*	discarded equipment containing hazardous components other than those mentioned in 16 02 09 to 16 02 12
16 02 14	discarded equipment other than those mentioned in 16 02 09 to 16 02 13

Table 1(a): European Waste Catalogue and Hazardous Waste List 2002 waste classifications potentially of relevance to veterinary practices.

Chapter 16	WASTES NOT OTHERWISE SPECIFIED IN THE LIST (cont'd)
16 05	gases in pressure containers and discarded chemicals
16 05 04*	gases in pressure containers (including halons) containing dangerous substances
16 05 05	gases in pressure containers other than those mentioned in 16 05 04
16 05 06*	laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals
16 06	batteries and accumulators
16 06 02*	Ni-Cd batteries (could also be classified under 20 01 33*)
16 06 03*	mercury- containing batteries (could also be classified under 20 01 33*)
16 08	spent catalysts
16 08 06*	spent liquids used as catalysts
16 08 07*	spent catalysts contaminated with dangerous substances
16 09	oxidising substances
16 09 01*	permanganates, for example potassium permanganate
16 09 03*	peroxides, for example hydrogen peroxide
Chapter 18	WASTES FROM HUMAN OR ANIMAL HEALTH CARE AND/OR RELATED RESEARCH (except kitchen and restaurant wastes not arising from immediate health care)
18 01	wastes from natal care, diagnosis, treatment or prevention of disease in humans
18 01 10*	amalgam waste from dental care
18 02	wastes from research, diagnosis, treatment or prevention of disease involving animals
18 02 01	sharps except (18 02 02)
18 02 02*	wastes whose collection and disposal is subject to special requirements in order to prevent infection
18 02 03	wastes whose collection and disposal is not subject to special requirements in order to prevent infection ⁽¹⁾
18 02 05*	chemicals consisting of or containing dangerous substances
18 02 06	chemicals other than those mentioned in 18 01 05
18 02 07*	cytotoxic and cytostatic medicines (could also be described by 20 01 31*)
18 02 08	medicines other than those mentioned in 18 02 07 (could also be described by 20 01 32)

Table 1(b): European Waste Catalogue and Hazardous Waste List 2002 waste classifications potentially of relevance to veterinary practices (cont'd).

¹ While this is not elaborated on in this section in section 18 01 (human healthcare waste) it is taken to mean “for example dressings, plaster casts, linen, disposable clothing, diapers”

Chapter 20 MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS	
20 01	separately collected fractions
20 01 01	paper and cardboard
20 01 02	glass
20 01 13*	solvents
20 01 14*	acids
20 01 15*	alkalines
20 01 17*	photochemicals
20 01 19*	pesticides
20 01 21*	fluorescent tubes and other mercury-containing waste
20 01 23*	discarded equipment containing chlorofluorocarbons
20 01 25	edible oil and fat
20 01 26*	oil and fat other than those mentioned in 20 01 25
20 01 27*	paint, inks, adhesives and resins containing dangerous substances
20 01 28	paint, inks, adhesives and resins other than those mentioned in 20 01 27
20 01 29*	detergents containing dangerous substances
20 01 30	detergents other than those mentioned in 20 01 29
20 01 31*	cytotoxic and cytostatic medicines
20 01 32	medicines other than those mentioned in 20 01 31
20 01 33*	batteries and accumulators included in 16 06 01, 16 06 02 or 16 06 03 and unsorted batteries and accumulators containing these batteries
20 01 34	batteries and accumulators other than those mentioned in 20 01 33
20 01 35*	discarded electrical equipment other than those mentioned in 20 01 21 and 20 01 23 containing hazardous components
20 01 36	discarded electrical equipment other than those mentioned in 20 01 21 and 20 01 23 and 20 01 35
20 01 39	plastics
20 03	other municipal waste
20 03 01	mixed municipal waste

Table 1(c): European Waste Catalogue and Hazardous Waste List 2002 waste classifications potentially of relevance to veterinary practices (cont'd).

Category No. (First Schedule)	Category Type (First Schedule)	Description of Items (Second Schedule)
1	Large Household Appliances	refrigerators, freezers, washing machines, clothes dryers, microwaves, electric heating appliances, electric radiators, electric fans, air conditioner appliances, other fanning, exhaust ventilation and conditioning equipment
2	Small Household Appliances	vacuum cleaners, other appliances for cleaning, appliances for hair-cutting, hair drying, tooth brushing, shaving, massage and other body care appliances, clocks, watches and equipment for the purpose of measuring, indicating or registering time, scales
3	IT and Telecommunications Equipment	centralised data processing, mainframes, minicomputers, printer units, personal and laptop computers (CPU, mouse, screen and keyboard included) notebook and notepad computers, printers, copying equipment, pocket and desk calculators, facsimile, telephones including cordless and cellular, answering systems
4	Consumer Equipment	radio sets, television sets, video cameras and recorders and hi-fi recorders
5	Lighting Equipment	fluorescent lamps and luminaires, high intensity lamps, other lighting with the exception of filament bulbs
6	Electric and Electronic Tools	drills, saws, equipment for grinding, sawing, cutting, shearing, drilling, tools for screwing
8	Medical Devices	cardiology equipment, pulmonary ventilators, diagnostic laboratory equipment, and other devices for detecting, preventing, monitoring, treating and alleviating illness, injury or disability
9	Monitoring and Control Instruments	smoke detectors, heating regulators, thermostats, measuring and weighing appliances for household or laboratory, other monitoring and control instruments

Table 2: Categories of electrical and electronic equipment potentially found in a veterinary practice (Waste Management (Waste Electrical and Electronic Equipment) Regulations 2005; S.I. No. 340/2005 and amended by Waste Management (Restriction of Certain Hazardous Substances in Electrical and Electronic Equipment) Regulations 2005; S.I. No. 341/2005)

A. Healthcare Risk Waste	
<i>Risk waste which is potentially hazardous to those who come in contact with it; such wastes must be rendered non-infectious or non-hazardous prior to their final disposal</i>	
1. Infectious Waste	<p>a) Blood, and any item visibly soiled with blood e.g. blood giving sets and bags, wound dressings, wound drains, swabs, disposable aprons, gloves and gowns that are blood stained</p> <p>b) Contaminated waste from patients with transmissible infectious diseases e.g. suction catheters, tissues or sputum containers from patients with Tuberculosis</p> <p>c) Incontinence wear/nappies from patients with known or suspected enteric pathogens e.g. rotavirus or salmonella</p> <p>d) Items contaminated with body fluids other than faeces, urine or breast milk, i.e. pus, sputum, or peritoneal fluid. Examples include suction containers, suction tubing, and other suction related equipment, and thoraseal drains</p> <p>e) Other healthcare infectious waste from treatment areas covered by definition of Infectious Waste</p> <p>f) Microbiological cultures, specimens and potentially infectious waste from Pathology departments (laboratory, post mortem rooms, or research laboratories)</p>
2. Biological	Anatomical waste i.e. all human tissue, organs, body parts, carcasses and animals used for medical tests or research, in includes leeches and worms
3. Sharps	Categorised as any object that has been used in the diagnosis, treatment or prevention of disease and that is likely to cause a puncture wound or cut to the skin. Examples include used needles, scalpels, razors, lancets, contaminated broken glass, guidewires, sharp tips of clear intravenous giving sets, stitch cutters or any other contaminated disposable sharp instrument or item
4. Radioactive waste	Waste that includes materials, in excess of authorised clearance levels, classified as radioactive under the General Control of Radioactive Substances Order, 1993 (S.I. No. 151 of 1993)
5. Chemical waste	Discarded chemicals and medicines

Table 3(a)

Categorisation of Healthcare Risk Waste according to the system adopted by the Department of Health and Children (from Segregation, Packaging and Storage Guidelines for Healthcare Risk Waste; 3rd Edition, April 2004)

B. Healthcare Non-Risk Waste	
<i>Non-risk waste is not hazardous to those who come in contact with it. Its contents are non-infectious, non-radioactive or non-chemical. Such wastes are suitable for landfill, provided they are secured appropriately</i>	
1. Domestic Waste	Includes normal household and catering waste, all non-infectious waste, non-toxic, non-radioactive waste, and non-chemical waste. Examples include flowers, office waste, paper hand towels, wrapping paper, cardboard, newspapers, aerosol canisters and cans
2. Confidential Material	Includes shredded waste documents of a confidential nature. Examples include patient notes and laboratory results
3. Medical Equipment	Equipment which is assessed as non-infectious, i.e. not contaminated with blood or hazardous body fluids or as described in Healthcare Risk Waste (infectious). Examples include plastic items, plastic bottles, plastic packaging, IV solution fluid bags and sets excluding sharp tips, ventilator and oxygen tubing, oxygen facemasks, enteral feeding bags and administration sets
4. Potentially Offensive Material	Material assessed as non-infectious (i.e. not contaminated with blood or hazardous body fluids or not otherwise infectious) but which is still potentially offensive. Examples include nappies/incontinence wear, stoma bags, urinary drainage bags and tubing, urinary catheters, naso-gastric tubes, unless visibly contaminated with blood

Table 3(b)

Categorisation of Healthcare Non-Risk Waste according to the system adopted by the Department of Health and Children (from Segregation, Packaging and Storage Guidelines for Healthcare Risk Waste; 3rd Edition, April 2004)

Risk Group 2

Bacteria

Actinobacillus actinomycetemcomitans	Klebsiella spp.
Actinornadura madurae	Legionella pneumophila
Actinornadura pelletieri	Legionella spp.
Actinomyces gerencseriae	Leptospira interrogans (all serovars)
Actinomyces israelii	Listeria monocytogenes
Actinomyces pyogenes	Vibrio cholerae (including El Tor)
Actinomyces spp.	Vibrio parahaemolyticus
Arcanobacterium haemolyticum (corynebacterium haemolyticum)	Vibrio spp. Listeria ivanovii
Bacteroides fragilis	Morganeila morganii
Bartonella bacilliformis	Mycobacterium aviumlintracellulare Mycobacterium chelonae
Bordetella brochiseptica	Mycobacterium fortuitum
Bordetella parapertussis	Mycobacterium kansasii
Bordetella pertussis	Mycobacterium maimoense
Borrelia burgdorferi	Mycobacterium marinum
Borrelia duttonii	Mycobacterium paratuberculosis
Borrelia recurrentis	Mycobacterium scrofulaceum
Borrelia spp.	Mycobacterium simiae
Campylobacter fetus	Mycobacterium szulgai
Campylobacter jejuni	Mycobacterium xenopi
Campylobacter spp.	Mycobacterium pneumoniae
Cardiobacterium hominis	Mycoplasma hominis
Chlamydia pneumoniae	Mycoplasma cavie
Chlamydia trachomatis	Neisseria gonorrhoeae
Chlamydia psittaci (other strains)	Neisseria meningitidis
Clostridium botulinum	Nocardia asteroides
Clostridium perfringens	Nocardia brasiliensis
Clostridium tetani	Nocardia farcinica
Clostridium spp.	Nocardia nova
Corynebacterium diphtheriae	Nocardia otitidiscavarium
Corynebacterium minutissimum	Pasteurella multocida
Corynebacterium pseudotuberculosis	Pasteurella spp.
Corynebacterium spp.	Peptostreptococcus anaerobus
Edwardsiella tarda	Plesiomonas shigelloides
Ehrlichia sennetsu (Rickettsia sennetsu)	Porphyromonas spp.
Ehrlichia spp.	Prevotella spp.
Eikenella corrodens	Proteus mirabilis
Enterobacter aerogenes/cloacae	Proteus penneri
Enterobacter spp.	Proteus vulgaris
Enterococcus spp.	Providencia alcaifaciens
Erysipelothrix rhusiopaethiae	Providencia rettgeri
Escherichia coli (with the exception of nonpathogenic strains)	Providencia spp.
Flavobacterium meningosepticum	Pseudomonas aeruginosa
Fluoribacter bozemanae (Legionella)	Rhodococcus equi
Francisella tularensis (Type B)	Rickettsia spp.
Fusobacterium necrophorum	Bartonella quintana (Rochalimaea quintana)
Gardnerella vaginalis	Salmonella Arizonae
Haemophilus ducreyi	Salmonella Enteritidis
Haemophilus influenzae	Salmonella Typhimurium
Haemophilus spp.	Salmonella Paratyphi A, B, C
Helicobacter pylori	Salmonella (other serovars)
Klebsiella oxytoca	Serpulina spp.
Klebsiella pneumoniae	Shigella boydii

Table 4(a)

Infectious agents potentially contaminating healthcare waste classified as risk group 2 according to the SAFETY, HEALTH, AND WELFARE AT WORK (BIOLOGICAL AGENTS) (AMENDMENT) REGULATIONS, 1998; S.I. No. 248 of 1998

Risk Group 2 cont'd	
Bacteria	
Shigella dysenteriae other than Type I Shigella flexneri Shigella sonnei Staphylococcus aureus Streptobacillus moniliformis Streptococcus pneumoniae Streptococcus pyogenes Streptococcus suis	Streptococcus spp. Treponema carateum Treponema pallidum Treponema pertenu Treponema spp. Yersinia enterocolitica Yersinia pseudotuberculosis Yersinia spp.
Viruses	
Adenoviridae Arenaviridae LCM-Lassa-Virus Complex (Old World arena viruses) Lymphocytic choriomeningitis virus (other strains) Mopeia virus Other LCM-Lassa complex viruses Tacaribe-Virus-Complex (New World arena viruses) Other Tacaribe complex viruses Astroviridae Bunyaviridae Germiston Bhanja Bunyamwera virus California encephalitis virus Hantaviruses: Puumala virus Prospect Hill virus Other hantaviruses Nairoviruses: Hazara virus Phleboviruses: Sandfly fever Toscana virus Other bunyaviridae known to be pathogenic Caliciviridae Norwalk virus Other Caliciviridae Coronaviridae Flaviviridae Other flaviviruses known to be pathogenic Herpesviridae Human herpes virus 7 Human herpes virus 8 Cytomegalovirus Epstein-Barr virus Herpes simplex virus types 1 and 2 Herpesvirus varicella-zoster Human B-lymphotropic virus (HBL V-HHV6) Orthomyxoviridae Influenza viruses types A, B and C Tick-borne orthomyxoviridae: Dhori and Thogoto viruses	Papovaviridae BK and JC viruses Human papillomaviruses Paramyxoviridae Measles virus Mumps virus Newcastle disease virus Parainfluenza viruses types 1 to 4 Respiratory syncytial virus Parvoviridae Human parvovirus (B 19) Picornaviridae Acute haemorrhagic conjunctivitis virus (AHC) Coxsackie viruses Echo viruses Hepatitis A virus (human enterovirus type 72) Polioviruses Rhinoviruses Poxviridae Buffalopox virus (e) Cowpox virus Elephantpox virus (f) Milkers' node virus Molluscum contagiosum virus Orf virus Rabbitpox virus (g) Vaccinia virus Yatapox virus (Tana & Yaba) Reoviridae Coltivirus Human rotaviruses Orbiviruses Reoviruses Rhabdoviridae Visicular stomatitis virus Togaviridae Alfaviruses. Bebaru virus O'nyong-nyong virus Ross River virus Semliki Forest virus Sindbis virus Other known alphaviruses Rubivirus (rubella)

Table 4(b)

Infectious agents potentially contaminating healthcare waste classified as risk group 2 according to the SAFETY, HEALTH, AND WELFARE AT WORK (BIOLOGICAL AGENTS) (AMENDMENT) REGULATIONS, 1998; S.I. No. 248 of 1998

Risk Group 2 cont'd**Parasites**

Acanthamoeba castellani
 Ancylostoma duodenale
 Angiostrongylus cantonensis
 Angiostrongylus Costaricensis
 Ascaris lumbricoides
 Ascaris suum
 Babesia divergens
 Babesia microti
 Balantidium coli
 Brugia malayi
 Brugia pahangi
 Capillaria philippinensis
 Capillaria spp.
 Clonorchis sinensis
 Clonorchis viverrini
 Cryptosporidium parvum
 Fasciolopsis buski
 Giardia lamblia (Giardia intestinalis)
 Hymenolepis diminuta
 Hymenolepis nana
 Leishmania ethiopia
 Leishmania mexicana
 Leishmania peruviana
 Leishmania tropica
 Leishmania major
 Leishmania spp.

Loa Loa
 Mansonella ozzardi
 Mansonella perstans
 Necator americanus
 Onchocerca volvulus
 Opisthorchis felineus
 Opisthorchis spp.
 Paragonimus westermani.
 Plasmodium spp (human and simian)
 Sarcocystis suis hominis
 Schistosoma haematobium
 Schistosoma intercalatum
 Schistosoma japonicum
 Schistosoma mansoni
 Schistosoma mekongi
 Strongyloides stercoralis
 Strongyloides spp.
 Taenia saginata
 Toxocara canis
 Toxoplasma gondii
 Trichinella spiralis
 Trichuris trichiuria
 Trypanosoma brucei brucei
 Trypanosoma brucei gambiense
 Wuchereria bancrofti

Fungi

Aspergillus fumigatus
 Candida albicans
 Candida tropicalis
 Cryptococcus neoformans var. neoformans
 (Filobasidiella neoformans var. Neoformans)
 Cryptococcus neoformans var. gattii (Filobasidiella
 bacillispora)
 Emmonsia parva var. parva
 Emmonsia parva var. crescens
 Epidermophyton floccosum
 Fonsecaea compacta

Fonsecaea pedrosoi
 Madurella grisea
 Madurella mycetomatis
 Microsporium spp.
 Neotestudina rosatii
 Penicillium mameffeii
 Scedosporium apiospermum (Pseudallescheria boydii)
 Scedosporium proliferans (inflatum)
 Sporothrix schenckii
 Trichophyton rubrum
 Trichophyton spp.

Table 4(c)

Infectious agents potentially contaminating healthcare waste classified as risk group 2 according to the SAFETY, HEALTH, AND WELFARE AT WORK (BIOLOGICAL AGENTS) (AMENDMENT) REGULATIONS, 1998; S.I. No. 248 of 1998

Risk Group 3	
Bacteria	
<p>Bacillus anthracis Brucella abortus Brucella canis Brucella melitensis Brucella suis Chlamydia psittaci (avian strains) Coxiella burnetii Escherichia coli, verocytotoxigenic strains (e.g. O157:H7 or O103) Francisella tularensis (Type A) Mycobacterium africanum Mycobacterium bovis (except BCG strain) Mycobacterium leprae Mycobacterium microti Mycobacterium tuberculosis</p>	<p>Mycobacterium ulcerans Burkholderia mallei (Pseudomonas mallei) Burkholderia pseudomallei (Pseudomonas pseudomallei) Rickettsia akari Rickettsia canada Rickettsia conorii Rickettsia montana Rickettsia typhi (Rickettsia mooseri) Rickettsia prowazeki Rickettsia Rickettsii Rickettsia tsutsugamushi Salmonella Typhi Shigella dysenteriae (Type 1) Yersinia pestis</p>
Viruses	
<p>Arenaviridae LCM-Lassa-Virus Complex (Old World arena viruses) Lymphocytic choriomeningitis virus (neurotropic strains) Tacaribe-Virus-CJmp!ex (New World arena viruses) Flexal virus</p> <p>Bunyaviridae Sin Nombre (formerly Muerto Canyon) Belgrade (also known as Dobrava) Oropouche virus Hantaviruses: Hantaan (Korean haemorrhagic fever) Seoul virus</p> <p>Phleboviruses: Rift Valley fever</p> <p>Caliciviridae Hepatitis E virus</p> <p>Flaviviridae Hepatitis G Australia enceph~litis (Murray Valley encephalitis) Central European tick-borne encephalitis virus Hanzalova Hypr Kumlinge</p>	<p>Flaviviridae cont'd Dengue virus type 1-4 Hepatitis C virus Japanese B encephalitis Kyasanur Forest Louping ill Omsk (a) Powassan Rocio Russian spring-summer encephalitis (TBE)(a) St Louis encephalitis Wesselsbron virus West Nile fever virus Yellow fever</p> <p>Herpesviridae Herpesvirus simiae (B virus)</p> <p>Poxviridae Monkeypox virus</p> <p>Retroviridae SIV virus (h) Human immunodeficiency viruses Human T -celllymphotropic viruses (HTLV) types 1 and 2</p> <p>Rhabdoviridae Hepadnaviridae Hepatitis B virus Hepatitis D Virus (Delta)(b) Rabies virus</p>

Table 4(d)

Infectious agents potentially contaminating healthcare waste classified as risk group 3 according to the SAFETY, HEALTH, AND WELFARE AT WORK (BIOLOGICAL AGENTS) (AMENDMENT) REGULATIONS, 1998; S.I. No. 248 of 1998

Risk Group 3 Cont'd	
Viruses	
Togaviridae Alfaviruses. Eastern equine encephalomyelitis Chickangunya virus Everglades virus Mayaro virus Mucambo virus Ndumu virus Tonate virus Venezuelan equine encephalomyelitis Western equine encephalomyelitis	Toroviridae 2 Unclassified viruses Hepatitis viruses not yet identified Unconventional agents associated with the transmissible spongiform encephalopathies (TSEs) Creutzfeldt-Jacob disease Variant Creutzfeldt-Jakob disease Bovine spongiform encephalopathy (BSE) and other related animal TSEs (i) Gerstmann-Straussler-Scheinker syndrome Kuru
Parasites	
Echinococcus granulosus Echinococcus multilocularis Echinococcus vogeli Leishmania brasiliensis Leishmania donovani	Naegleria fowleri Plasmodium falciparum Taenia solium Trypanosoma brucei rhodesiense Trypanosoma cruzi
Fungi	
Blastomyces dermatitidis (Ajellomycesdermatidis) Cladophialophora bantinia (formerly: Xylophypha bantiana, Cladosporium bantianum or trichoides) Coccidioides immitis	Histoplasma Capsulatum var. Capsulatum (Ajelomyces Capsulatus) Histoplasma capsulatum duboisii Paracoccidioides brasiliensis

Risk Group 4	
Viruses	
Arenaviridae LCM-Lassa-Virus Complex (Old World arena viruses) Lassa virus Tacaribe-Virus-CJmplex (New World arena viruses) Guanarito virus Junin virus Sabia virus Machupo virus	Bunyaviridae Nairoviruses: Crimean-Congo haemorrhagic fever

Table 4(e)

Infectious agents potentially contaminating healthcare waste classified as Risk group 3 and Risk group 4 according to the SAFETY, HEALTH, AND WELFARE AT WORK (BIOLOGICAL AGENTS) (AMENDMENT) REGULATIONS, 1998; S.I. No. 248 of 1998



Plate 1: Waste medicine container



Plate 2: Sharps container



Plate 3: Photochemical waste container



Plate 4: Yellow bag for Healthcare Risk Waste

Plates 1 to 4: Approved receptacles for the storage of waste medicines, sharps, photochemical wastes, and clinical wastes in veterinary practices

Appendix II

Veterinary Practice Hazardous Waste Survey

Veterinary Practice Survey Text

VETERINARY HAZARDOUS WASTE SURVEY 2006

Section 1. Practice Profile

Q.1 Which one of the following best describes your practice? (Tick the appropriate box)

- a) Large/Farm animal practice
- b) Mixed Practice (Farm, Equine and Small animal)
- c) Small animal practice
- d) Equine practice

Q.2 If you ticked *mixed practice* above which one of the following best approximates your practice? (Tick the appropriate box)

- a) 75% Large/Equine: 25% Small animal
- b) 50% Large/Equine: 50% Small animal
- c) 25% Large/Equine: 75% Small animal

Q.3 Which of the following geographical locations best describes the setting of your practice premises? (Tick the appropriate box)

- a) City
- b) Large Provincial Town
- c) Small Town
- d) Rural area

Q.4 How many *vets* (insert here.....) and *other staff* (insert here.....) are employed at your practice?

Q.5 Which one of the following best describes the location of your premises? (Tick the appropriate box)

- a) Rural area
- b) Residential area (practice attached to main dwelling)
- c) Residential area (house given over wholly to practice)
- d) Commercial area/Industrial Estate

Q.6 Which of the following are a ***routine*** part of activities at your practice? (Tick appropriate box to answer yes or no)

- | | | |
|---------------------------------------|------------------------------|-----------------------------|
| a) House or farm visits | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| b) Clinical consultations at practice | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| c) General surgical procedures | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| d) Overnight care of inpatients | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| e) Gaseous anaesthesia | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| f) Intravenous fluid therapy | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| g) Radiographic examination | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| h) In house laboratory investigations | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| i) Orthopaedic surgery | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| j) Dental surgery | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| k) Euthanasia of pets | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| l) Large animal ultrasound scanning | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| m) A.I. or E.T. (any species) | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

Section 2. Waste Management Pop Quiz

Q.1 Hazardous waste management legislation in relation to veterinary practice in Ireland is governed ***mainly*** by which of the following legislation?

- | | |
|---|--------------------------|
| a) Litter Pollution Act, 1997 | <input type="checkbox"/> |
| b) Animal Remedies Act, 1993 | <input type="checkbox"/> |
| c) Waste Management Act, 1996 | <input type="checkbox"/> |
| d) European Communities (Animal By-Products) Regulations 2003 | <input type="checkbox"/> |
| e) Veterinary Practice Act, 2005 | <input type="checkbox"/> |

Q.2 Of the following wastes which might be generated at your practice which would you consider to be ***hazardous wastes***? (Tick the appropriate box)

- | | | |
|---|------------------------------|-----------------------------|
| a) euthanized dog carcass | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| b) used catgut cassette | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| c) bloody swab from routine bitch spay | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| d) uterus and ovaries from routine bitch spay | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

Q.2 cont'd

Which of the following do you consider to be *hazardous wastes*?

- | | | |
|---|------------------------------|-----------------------------|
| e) amputated infected limb | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| f) used injection needle with cap on | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| g) broken mercury thermometer | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| h) used dressings from an infected wound | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| i) tissue sample in 10% formaldehyde | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| j) used fluorescent light tube | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| k) out of date prescription medicine tablets | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| l) used i/v drip giving set | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| m) used scalpel blade | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| n) used ink cartridge from printer | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| o) used urinary catheter | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| p) used household batteries | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| q) empty maxolon injection ampoule | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| r) used syringe with 1.0ml euthatal remaining | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| s) faeces from dog on chemotherapy | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| t) empty 100ml penstrep injection bottle | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| u) spent soda lime canister | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

Q.3 What have been your sources of information to date on waste regulations governing veterinary practices? (Tick the appropriate boxes)

- | | |
|--|--------------------------|
| a) Irish Veterinary Journal | <input type="checkbox"/> |
| b) Veterinary Environmental Management | <input type="checkbox"/> |
| c) Local Authority | <input type="checkbox"/> |
| d) Environmental Protection Agency (EPA) | <input type="checkbox"/> |
| e) Department of Agriculture | <input type="checkbox"/> |
| f) Veterinary Ireland | <input type="checkbox"/> |
| g) Veterinary colleagues | <input type="checkbox"/> |
| h) Other (please specify below) | <input type="checkbox"/> |

.....

Section 3. Waste Management in your practice

Q.1 Your regular practice (municipal, non-hazardous) waste is collected by:

- a) Urban District Council
- b) Local Authority
- c) Private Waste Collection Service
- d) Other (please specify below)

.....

Q.2 The approximate volume of municipal waste produced by your practice per week is:

- a) 1 regular household wheelie bin (240L)
- b) 1 medium sized commercial wheelie bin (360L)
- c) 1 large commercial bin (1100L)
- d) Other (please specify below)

.....

Q.3 Does your practice recycle any of the following?

- a) Cardboard boxes from deliveries Yes No
- b) Office paper Yes No
- c) Non-clinical plastic waste (drinks bottles etc.) Yes No
- d) Non-clinical metal waste (food and drinks cans) Yes No
- e) Non-clinical glass waste Yes No
- f) Spent ink cartridges or toners Yes No

Q.4 The approximate practice expenditure *per annum* on municipal waste disposal is:

- a) < €500
- b) €500 - €1000
- c) €1000 - €2000
- d) > €2000

Q.5 You euthanize a cat for a client on your premises. What do you do with the cadaver?

- a) Insist the owner takes it home with them
- b) Place it in the bin with municipal waste
- c) Bury it yourself
- d) Place it in an SRM skip at an abattoir
- e) Dispose of it privately at a local landfill
- f) Dispose of it through a licensed waste contractor
- g) Other (please specify below)

.....

Q.6 If you provide a disposal service how many cadavers (dog or cat or other) approximately do you dispose of in an *average week* at your practice?

- a) 1 – 5
- b) 6 or more
- c) I do not provide a cadaver disposal service

Q.7 What do you do with out of date prescription drugs at your practice or unused drugs returned by clients? (Tick multiple boxes if required)

- a) Return them to the manufacturer
- b) Place them in the bin with municipal waste
- c) Flush them down the toilet
- d) Dispose of them in an approved UN 3291 container through a hazardous waste contractor
- e) Other (please specify below)

.....

Q.8 Do you have a practice policy of informing clients of how they should dispose of their unused drugs/empty medicine containers at the end of a course of treatment? Yes No

Q.9 Have you ever used dental amalgam as a part of dental work on a patient at your practice? Yes No

If so how did you dispose of waste amalgam?

Q.10 Do the following items go into ordinary refuse (municipal waste) at your practice?

- a) Half empty antibiotic injection bottles Yes No
- b) Empty antibiotic injection bottles Yes No
- c) Used vaccine vials (small or large animal) Yes No
- d) Used glass ampoules containing drugs Yes No
- e) Used syringes still containing drugs Yes No

Q.11 What do you do with sharps produced on calls or house visits and at your practice?

- a) Place them in the bin with municipal waste
- b) Place them in tough plastic containers and then put them in the bin with municipal waste
- c) Place them in an approved UN 3291 container and dispose of them through a hazardous waste contractor
- d) Other (please specify below)

.....

Q.12 If you have radiographic facilities what do you with your waste processing reagents i.e. waste developer and fixer?

- a) Flush them down the toilet
- b) Pour them down the sink
- c) Dispose of them through a hazardous waste contractor
- d) Other (please specify below)

.....

Q.13 Have you ever carried out a chemotherapy protocol on a patient at your practice?

Yes No

If so how did you dispose of :

- a) Left over/empty medication containers?
- b) Contaminated gloves, gowns, syringes etc.?
- c) Excreta and bedding from patients?

Q.14 Please indicate if you have any of the following on your premises at present:

- | | | |
|---|------------------------------|-----------------------------|
| a) Formaldehyde/formalin | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| b) Glutaraldehyde (e.g. Lysetol®) | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| c) Hydrogen peroxide | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| d) Methanol/Ethanol (tissue fixative) | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| e) Cytological stains (Diffquik, Shorrs etc.) | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| f) Technovit® or similar compounds | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| g) Orthopaedic resins such as for APEF system | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

Q.15 Please indicate how you would normally treat the following at your practice from a waste point of view. Tick **refuse** if the item would normally go to municipal waste, and tick **yellow bag** if it would be disposed of as clinical waste.

- | | Refuse | Yellow Bag |
|--|--------------------------|--------------------------|
| a) Blood soaked swabs | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Healthy uterus from a bitch spay | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Uterus removed from a pyometra case | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Dirty used disposable gloves | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Dressings from an infected wound | <input type="checkbox"/> | <input type="checkbox"/> |
| f) Used giving set from a vomiting dog | <input type="checkbox"/> | <input type="checkbox"/> |
| g) Used cannula removed from a cat | <input type="checkbox"/> | <input type="checkbox"/> |

Q.16 If you avail of the services of a licensed hazardous waste collection company please indicate if it is any of the following companies:

- | | |
|--|--------------------------|
| a) Veterinary Environmental Management
(Irish Pet Crematorium & Cranmore Crematorium) | <input type="checkbox"/> |
| b) Eco-safe Systems Ltd. | <input type="checkbox"/> |
| c) Sterile Technologies Ireland (STI) Ltd | <input type="checkbox"/> |
| d) Rentokil Initial Ltd | <input type="checkbox"/> |
| e) Healthcare Waste Management Services
(Novian International Ltd.) | <input type="checkbox"/> |
| f) Oxigen Environmental & Wheelbin Services Ltd. | <input type="checkbox"/> |
| g) Clinical Collections Ltd. | <input type="checkbox"/> |
| h) Other (please specify below) | <input type="checkbox"/> |

.....

Q.17 The approximate practice expenditure *per annum* on **hazardous** waste disposal is:

- e) < €500
- f) €500 - €1000
- g) €1000 - €2000
- h) > €2000

Q.18 Has your practice ever been the subject of:

- a) A verbal/written complaint regarding waste Yes No
- b) A waste audit by Local Authority/EPA Yes No
- c) A prosecution by Local Authority/EPA Yes No
- d) A verbal/written request from a Local Authority/EPA for information regarding hazardous waste disposal Yes No

Q.19 Do you feel you are fully compliant with Irish waste regulations at your practice? Yes No

Q.20 If you feel that your practice **is not fully complying** with waste regulations for one reason or another; please indicate if any of these reasons are included in those listed below. If you wish to tick multiple boxes please rank the reasons in order of importance (1, 2, 3, etc. where one is most important)

- a) I feel I am not fully acquainted with the legal requirements for proper hazardous waste disposal
- b) I am reluctant to bear the costs of proper waste disposal
- c) The waste segregation required would be too much hassle
- d) I would have to levy services to clients to pay for the additional costs and this would make me uncompetitive
- e) I will not bother until I am waste audited by Local Authority or until someone is prosecuted
- f) Nobody else is doing it so why should I?
- g) I cannot get a waste collector to service my practice
- h) I am not really bothered about complying at all
- i) There are types of waste for which I can find no approved outlet for example

j) Other (please specify below)



.....

Q.21 Additional Comments (if any):



Appendix III

Veterinary Practice Hazardous Waste Survey

Local Authority Questionnaire

Hazardous Waste Management in Veterinary Practice in Ireland
Local Authority Questionnaire

Name:

Position:

Local Authority Represented:

Q.1 Would veterinary practices immediately spring to your mind as sources of hazardous waste? (Tick the appropriate box) Yes No

Q.2 In the last 3 years were any waste audits of the following kinds of establishments carried out by your local authority? (Tick the appropriate box)

d) Veterinary Practices Yes No

e) Medical GP practices Yes No

f) Dental Practices Yes No

Q.3 In the last 3 years did your office receive any complaints from members of the public or otherwise in relation to waste from veterinary practices? (Tick the appropriate box) Yes No

Q.4 In the last 3 years to your knowledge were there any prosecutions in your area against veterinary practices for waste regulation violations? (Tick the appropriate box) Yes No

Q.5 In the year 2005 did your office receive C1 hazardous waste transport forms from any veterinary practices or waste collectors servicing veterinary practices in your area? (Tick the appropriate box)
Yes No

If the answer is yes, how many practices submitted forms?

Q.6 Does your local authority issue guidelines to veterinary practices or other small volume clinical waste producers regarding hazardous waste management? (Tick the appropriate box) Yes No

If the answer is yes, please specify

Q.7 Does your local authority provide any specific hazardous waste collection service or bring centres as a facility which veterinary practices can avail of in your area? Yes No

If the answer is yes, please specify

.....

Q.8 Does your local authority have a dedicated dog pound or other such facility as required to be maintained by local authorities under the Control of Dogs Act? Yes No

If the answer is yes, please specify how dog cadavers are disposed of following euthanasia after the obligatory 5 day retention period?

- h) Disposed of through a waste contractor licensed to dispose of animal cadavers
Please name the approved contractor:
- i) Disposed of through a private or local authority municipal waste collection service (destined for landfill)
- j) Disposed of through an unregistered waste collector
- k) Buried under permit issued by the Department of Agriculture
- l) Other (please specify below)

.....
.....

Appendix IV

Veterinary Practice Hazardous Waste Survey

Waste Management Company Questionnaire

**Hazardous Waste Management in Veterinary Practice in Ireland
Waste Management Company Questionnaire**

Name:

Position:

Waste Management Company Represented:

.....

Waste Licence Number

If questions are not applicable to your company please just leave them blank

Q.1 Do veterinary practices number among your customers? (Tick the appropriate box) Yes No

If yes, please indicate how many of your customers are veterinary practices

Veterinary Practices

Q.2 Do local authorities avail of your services for disposal of dog cadavers (Tick the appropriate box) Yes No

If yes, please indicate how many of your customers are local authorities?

Local authorities

Q.3 Does your company:

m) Act strictly as a courier transporting waste to another company for treatment and/or disposal?

n) Collect and dispose of/treat some or all of the waste?

o) Accept waste delivered by veterinary practices and/or local authorities directly to your company?

p) Other? (please specify below)

.....

Q.4 Does your company operate:

a) Nationwide?

b) Regionally? (please specify area below)

.....

Q.5 Which of the following types of waste is your company licensed to transport and/or dispose of?

- a) Animal cadavers (dog and cat etc.)
- b) Veterinary healthcare (yellow bag) waste
- c) Sharps
- d) Pharmaceutical Waste
- e) Cytotoxic pharmaceutical waste
- f) Photochemicals
- g) Other hazardous chemicals (e.g. formaldehyde, laboratory chemicals, solvents)
- h) Mercury and mercury contaminated material
- i) Batteries (household)
- j) Used fluorescent tubes
- k) Other? (please specify below)

.....

Q.6 For each of the above items, how many of your veterinary practice clients would avail of your services for disposal of that material?

- a) Animal cadavers (dog and cat etc.)
- b) Veterinary healthcare (yellow bag) waste
- c) Sharps
- d) Pharmaceutical Waste
- e) Cytotoxic pharmaceutical waste
- f) Photochemicals
- g) Other hazardous chemicals (e.g. formaldehyde, laboratory chemicals, solvents)
- h) Mercury and mercury contaminated material
- i) Batteries (household)
- j) Used fluorescent tubes
- k) Other? (please specify below)

.....

Q.7 If your company offers a collection service from veterinary practices and/or local authorities, please indicate the frequency of collection.

- a) Weekly
- b) Fortnightly
- c) Monthly
- d) Quarterly
- e) Biannually
- f) Annually
- g) Other? (please specify below)

.....

Q.8 Please give an estimate of the cost of disposal exclusive of V.A.T. of the following with your company:

	Cost in €
a) A dog weighing 25kg
b) One full yellow clinical waste bag
c) One 12L sharps box
d) One 30L pharmaceutical waste box
e) One 30L cytotoxic pharmaceutical waste box
f) A 25L drum of waste photochemicals
g) A 5L drum of formaldehyde

Q.9 Please indicate the eventual fate of each of the above with your company i.e. if they undergo some form of processing within your company and/or are exported for processing elsewhere.

	Fate of waste
a) A dog weighing 25kg
b) One full yellow clinical waste bag
c) One 12L sharps box
d) One 30L pharmaceutical waste box
e) One 30L cytotoxic pharmaceutical waste box
f) A 25L drum of waste photochemicals
g) A 5L drum of formaldehyde

Q.10 Additional Comments (if any).



Appendix V

Veterinary Practice Hazardous Waste Survey

Regulatory Authority Questionnaire

Yvonne Mc Redmond
Cloonkeen
Castlebar
Co. Mayo

Mr.
Environmental Protection Agency

RE: Queries on Waste and Hazardous Waste Regulation for Veterinary Practices in Ireland

27th March 2006

Dear Mr.,

I am a veterinary surgeon currently employed as a public health veterinary inspector with the Department of Agriculture. Before I joined the department I completed a two year postgraduate diploma course in Environmental Protection with the Institute of Technology in Sligo. I am now completing my study in this area with a Masters thesis from the same institute. While I am being partly assisted with funding for the project by the Department of Agriculture, the research is independent and has not been commissioned by the Department or any other vested interest group.

The subject of my thesis is "Hazardous Waste Management in Veterinary Practice in Ireland". The major part of my research is an investigation by survey of hazardous waste management by veterinary practitioners in Ireland. Having now completed the veterinary practice survey of 57 veterinary practices around the country, there are a number of issues that have been raised by some of the surveyed veterinary practitioners on waste management, and a few questions that I myself would like to pose. I am hoping to get some clarification on these issues from the EPA. I would thus like to put the following questions to you:

1. Do you consider veterinary practices to fall under the Small and Medium Enterprise (SME) category of hazardous waste producer?
2. In the "National Hazardous Waste Management Plan" (EPA, 2001) the "establishment of an improved collection infrastructure for hazardous household, agricultural and SME wastes" was listed as a priority for the period 2001-2006. It was also stated that "at a minimum each local authority should make provision for the establishment of receptacles for the collection of hazardous wastes at bring banks and civic amenity sites....such depots should serve both households and small businesses."

How many local authorities currently provide such a facility for the disposal of hazardous waste?

What kinds of hazardous wastes can be disposed of at these facilities?
Specifically do such facilities allow for the disposal of hazardous chemicals, batteries, inks and fluorescent tubes?

Are SME being permitted to dispose of hazardous wastes through these facilities?

Are any local authorities currently providing storage boxes and mobile collection systems as also suggested in the National Hazardous Waste Management Plan?

Can local authorities legally refuse SME attempting to use civic amenity recycling centres to recycle waste arising from commercial origin?

3. Many practitioners are confused as to how to interpret the law in relation to pharmaceutical wastes. Some of the recent legislation does appear to be contradictory. In the Waste Management Act 1996, Second Schedule, "pharmaceutical, medicinal or veterinary compounds" are clearly identified as hazardous wastes, yet in the recent European Waste Catalogue and Hazardous Waste List (EPA, 2002) the only medicines identified as hazardous are "cytotoxic and cytostatic medicines" (18 02 07) while all other veterinary medicines (18 02 08) are designated non-hazardous. In conversation with the Hazardous Waste Contractors there also appears to be an unwritten rule of thumb that pharmaceutical bottles containing less than 1% of the original compound are permitted in landfill. Much of the recent research suggests that many drugs such as antibiotics are for example persistent and mutagenic in the environment which would suggest that they at least are hazardous.

Are non-chemotherapeutic veterinary medicines regarded as hazardous by the EPA?

If not what is there to prevent them going to landfill?

If they *are* considered hazardous is an empty bottle (<1% of original contents) to be considered hazardous or not? Can it go to landfill if it isn't?

Does the same apply to syringes contaminated with veterinary pharmaceuticals?

4. Are vets legally obliged to inform their clients how best to dispose of pharmaceutical waste prescribed and supplied by their practices?
5. Do vets have to make provision to accept unused pharmaceutical product returned by companion animal and farm clients?
I am aware that the EPA is currently drafting guidelines to farmers on how to dispose of waste pharmaceuticals and chemicals.
What role will vets have to play in this disposal chain?
Will vets have to make provision for the disposal of unused and waste pharmaceuticals returned to them by farmers?
In this event will vets be responsible for the disposal of drug waste only from their own clients and/or only in relation to waste from products that they themselves have prescribed and supplied?
6. Many vets claim that requests for collection of unused or faulty product are met with less than enthusiastic responses from pharmaceutical manufacturers. They are told that it is uneconomical to collect small volumes of product or those reps for the companies are no longer licensed to carry such product.
What are the legal obligations on pharmaceutical manufacturers to accept unused product for disposal?
Are they obliged to make provisions to collect unused product regardless of volume?

Is there any obligation on the wholesalers of these products to make arrangements for such collections?

If it is to become an issue for vets that they must accept large volumes of pharmaceutical bottle empties from farming clients could drug manufacturers be made to have a part to play in the disposal of their own product waste?

7. With regard to clinical waste, most vets are aware that it is illegal for their clinical waste to go to landfill. In relation to the infectious hazard from veterinary clinical waste would the EPA be willing to allow empty i/v fluid sets and drip bags to go to landfill from veterinary clinics? Unlike human medicine the potential infectious risk from these items of veterinary clinical waste in the majority of cases is negligible and the cost to the environment of the processing of these materials particularly in relation to incineration (most of these are made from PVC) is potentially high. If necessary disinfection of these waste items could be carried out prior to their entry into municipal waste.
8. Several practitioners mentioned the issue of needles arising from Brucellosis sampling, and empty and half-empty bottles of tuberculin arising from TB testing carried out on contract for the Department of Agriculture. These materials are supplied by the Department of Agriculture to the practices to carry out this work (involving blood sampling bovines some of whom are brucellosis infected animals and the intra-dermal injection of bovine tuberculin) and hazardous wastes are produced in large volumes in mixed and large animal practices as a result. Practitioners are expected to dispose of these materials at their own expense. Is there any potential obligation on the Department of Agriculture as the producer, supplier and contractor responsible for the generation of this material to contribute to and/or provide for the disposal of this material?

I would greatly appreciate your feedback on these issues at your earliest convenience. If you wish to converse with me personally regarding any of the questions or issues raised you can reach me on my mobile (086) 6013260 or e-mail me at yvonnemcredmond2@eircom.net .

Yours sincerely,

Yvonne Mc Redmond
MVB MRCVS

Appendix VI

Veterinary Practice Hazardous Waste Survey

Cover Letters to

Various Organisations

LETTER TO VETERINARY PRACTITIONERS

Yvonne Mc Redmond
Cloonkeen
Castlebar
Co. Mayo

16th January 2006

RE: Attached survey on “Hazardous Waste Management in Veterinary Practice in Ireland”

Dear veterinary practitioner,

I am a veterinary surgeon currently employed as a public health veterinary inspector with the Department of Agriculture. Two years ago I completed a two year postgraduate diploma course in Environmental Protection with the Institute of Technology in Sligo, a course I had commenced before joining the Department of Agriculture. I am now following up the diploma with a Masters thesis with the same institute. While I am being partly assisted with funding for the project by the Department of Agriculture, the research is independent and has not been commissioned by the Department or any other vested interest group.

The subject of my thesis is “Hazardous Waste Management in Veterinary Practice in Ireland”. As an essential part of this research I am requesting that practitioners complete the attached survey. **The survey is anonymous, and all information supplied will be kept completely confidential.** Your name or that of your practice has been **randomly selected** from a list of veterinary practices obtained from the Golden Pages and the Veterinary Register. Dental practitioners and doctors have participated in similar waste surveys, the findings from which have proved very useful in achieving compliance with waste regulations for their respective professions.

It is my hope that one of the upshots of the survey will be the compilation of independent, impartial and comprehensive guidance notes for veterinary practitioners on how they may best comply with current and future waste and hazardous waste regulations in the most efficient and cost-effective manner.

The survey itself is structured as a series of multiple choice questions. It takes no more than ten minutes to complete from start to finish. I ask that you complete it as honestly and accurately as possible and return it to me in the stamped addressed envelope provided. It is vital to its success that as many practitioners as possible complete the survey so that statistically valid results can be obtained. Should it be the case that you are no longer in practice, I ask also that you return the survey so that it can be sent out to another practitioner.

I thank you in advance for your valuable time and effort.

Yours sincerely,

Yvonne Mc Redmond
MVB MRCVS

LETTER TO VETERINARY IRELAND

Yvonne Mc Redmond
Cloonkeen
Castlebar
Co. Mayo

16th January 2006

RE: Attached survey on “Hazardous Waste Management in Veterinary Practice in Ireland”

Dear sir or madam,

I am a veterinary surgeon currently employed as a public health veterinary inspector with the Department of Agriculture. Before I joined the department I completed a two year postgraduate diploma course in Environmental Protection with the Institute of Technology in Sligo. I am now completing my study in this area with a Masters thesis from the same institute. While I am being partly assisted with funding for the project by the Department of Agriculture, the research is independent and has not been commissioned by the Department or any other vested interest group.

The subject of my thesis is “Hazardous Waste Management in Veterinary Practice in Ireland”. As an essential part of this research I am requesting that veterinary practitioners complete the attached survey. **The survey is anonymous, and all information supplied will be kept completely confidential.** For the first phase of the survey 150 practices have been randomly selected from a database compiled from the Golden Pages and the Veterinary Register. Dental practitioners and doctors have participated in similar waste surveys the findings from which have proved very useful in achieving compliance with waste regulations for their respective professions.

I have enclosed three copies of the survey for your perusal. It is my hope that one of the upshots of the survey will be the compilation of independent, impartial and comprehensive guidance notes for veterinary practitioners on how they may best comply with current and future waste and hazardous waste regulations in the most efficient and cost-effective manner.

I hope that Veterinary Ireland will see some value in the research and encourage its members to take part. I will be happy to make my findings available to the profession through Veterinary Ireland when the thesis is completed in June, 2006.

Yours sincerely,

Yvonne Mc Redmond
MVB MRCVS

LETTER TO LOCAL AUTHORITIES

Yvonne Mc Redmond
Cloonkeen
Castlebar
Co. Mayo

16th January 2006

RE: Attached survey on “Hazardous Waste Management in Veterinary Practice in Ireland”

Dear sir or madam,

I am a veterinary surgeon currently employed as a public health veterinary inspector with the Department of Agriculture. Before I joined the department I completed a two year postgraduate diploma course in Environmental Protection with the Institute of Technology in Sligo. I am now completing my study in this area with a Masters thesis from the same institute. While I am being partly assisted with funding for the project by the Department of Agriculture, the research is independent and has not been commissioned by the Department or any other vested interest group.

The subject of my thesis is “Hazardous Waste Management in Veterinary Practice in Ireland”. The major part of my research is an investigation by survey of hazardous waste management by veterinary practitioners in Ireland. This survey has already been dispatched to a random selection of 150 vets around the country. In addition I am asking members of relevant local authority regulatory bodies to fill in the enclosed survey which concerns the experience of the local authority (if any) of waste management by veterinary practitioners in each local authority area.

Please complete the attached survey at your earliest convenience and return it to me in the S.A.E. provided. I thank you in advance for your time and effort. If you wish to converse with me personally regarding any of the questions or issues raised in the questionnaire you can reach me on my mobile (086) 6013260 or e-mail me at yvonnemcredmond2@eircom.net .

Yours sincerely,

Yvonne Mc Redmond
MVB MRCVS

LETTER TO WASTE MANAGEMENT COMPANIES

Yvonne Mc Redmond
Cloonkeen
Castlebar
Co. Mayo

16th January 2006

RE: Attached survey on “Hazardous Waste Management in Veterinary Practice in Ireland”

Dear sir or madam,

I am a veterinary surgeon currently employed as a public health veterinary inspector with the Department of Agriculture. Before I joined the department I completed a two year postgraduate diploma course in Environmental Protection with the Institute of Technology in Sligo. I am now completing my study in this area with a Masters thesis from the same institute. While I am being partly assisted with funding for the project by the Department of Agriculture, the research is independent and has not been commissioned by the Department or any other vested interest group.

The subject of my thesis is “Hazardous Waste Management in Veterinary Practice in Ireland”. The major part of my research is an investigation by survey of hazardous waste management by veterinary practitioners in Ireland. Your company has been identified as a waste contractor by the respondents to the above survey. I am asking all the waste companies identified to fill in the enclosed questionnaire. I would greatly appreciate your company’s cooperation in this matter as the responses of the waste management companies forms an important part of the validation my veterinary survey.

It is my hope that one of the upshots of the survey will be the compilation of independent, impartial and comprehensive guidance notes for veterinary practitioners on how they may best comply with current and future waste and hazardous waste regulations in the most efficient and cost-effective manner.

Please complete the attached questionnaire at your earliest convenience and return it to me in the S.A.E. provided. I thank you in advance for your time and effort. If you wish to converse with me personally regarding any of the questions or issues raised in the questionnaire you can reach me on my mobile (086) 6013260 or e-mail me at yvonnemcredmond2@eircom.net .

Yours sincerely,

Yvonne Mc Redmond
MVB MRCVS