Article

Survey of euthanasia practices in animal shelters in Canada

Niamh Caffrey, Aboubakar Mounchili, Sandra McConkey, Michael S. Cockram

Abstract — Questionnaires on methods of euthanasia used in Canadian animal shelters were sent to 196 Canadian animal shelters yielding 67 responses. Sodium pentobarbital injection was the only method of euthanasia used by 61% of establishments that euthanized dogs and 53% of the establishments that euthanized cats. Many of these establishments used pre-medication. Sodium pentobarbital was mostly administered intravenously but some establishments also used intracardiac and intraperitoneal routes, and some only used intracardiac administration for cats. T-61 injection was the only method of euthanasia used by 23% of the establishments that euthanized dogs and 35% of the establishments that euthanized cats. All of these establishments used pre-medication, but the percentages of establishments that only used the intravenous route for administration of T-61 in dogs and cats were 45% and 7%, respectively. Further studies on the use of T-61, and the training and provision of counselling services for staff are recommended.

Résumé — Enquête sur les pratiques d'euthanasie dans les refuges pour animaux au Canada. Des questionnaires sur les méthodes d'euthanasie utilisées dans les refuges pour animaux canadiens ont été envoyés à 196 refuges pour animaux canadiens et 67 réponses ont été reçues. L'injection de pentobarbital sodique était la seule méthode d'euthanasie utilisée par 61 % des établissements qui euthanasiaient les chiens et de 53 % des établissements qui euthanasiaient des chats. Plusieurs de ces établissements utilisaient une prémédication. Le pentobarbital sodique était surtout administré par voie intraveineuse mais certains établissements utilisaient aussi les voies intracardiaques et intrapéritonéales et certains utilisaient seulement l'administration intracardiaque pour les chats. L'injection de T-61 était la seule méthode d'euthanasie utilisée par 23 % des établissements qui euthanasiaient des chiens et 35 % des établissements qui euthanasiaient des chats. Tous ces établissements utilisaient une prémédication, mais les pourcentages d'établissements qui utilisaient seulement la voie intraveineuse pour l'administration de T-61 chez les chiens et les chats étaient de 45 % et de 7 %, respectivement. De nouvelles études sur l'usage du T-61 et la formation du personnel ainsi que des services de counseling sont recommandés.

(Traduit par Isabelle Vallières)

Can Vet J 2011;52:55–61

Introduction

The purpose of this study was to determine the methods of euthanasia that were used in Canadian animal shelters and identify whether these were likely to be associated with any animal welfare concerns. The word euthanasia is derived from the Greek "*eu*" meaning "good" and *Thanatos*, "death" and is the act of providing a humane death. A humane death is defined by the Canadian Veterinary Medical Association (CVMA) as being "that which renders the animal unconscious and thus insensitive to pain as rapidly as possible without fear or anxiety" (1). Blackmore listed the following desirable characteristics for a euthanasia method: the restraint of the animal should cause minimal distress; the method should induce immediate and permanent insensibility with minimum distress to the animal; be aesthetically acceptable to the public and to the person administering the procedure; be easily administered by non-veterinary

Sir James Dunn Animal Welfare Centre (Caffrey, Cockram), Department of Health Management (Mounchili), and Department of Biomedical Sciences (McConkey), Atlantic Veterinary College, University of Prince Edward Island, 550 University Avenue, Charlottetown, Prince Edward Island C1A 4P3.

Address all correspondence to Dr. Michael S. Cockram; e-mail: mcockram@upei.ca

Ms. Caffrey completed this project as part of her MSc studies at the University of Edinburgh, Scotland.

Funding was provided by The Sir James Dunn Animal Welfare Centre and the study was initiated by The Canadian Veterinary Medical Association and The Canadian Federation of Humane Societies.

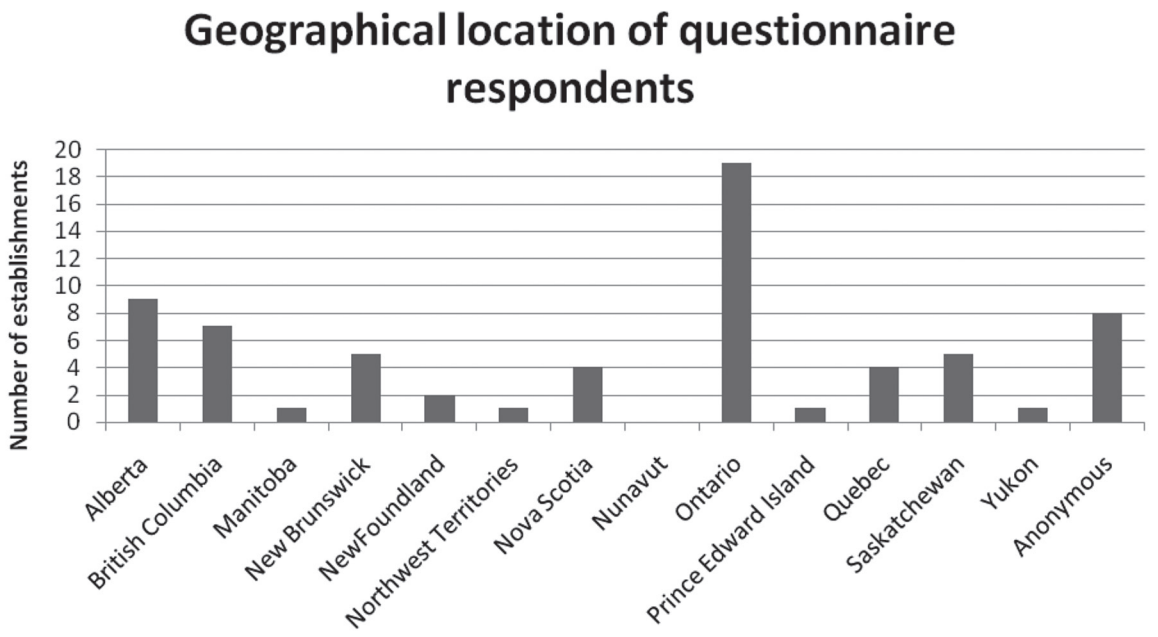

Figure 1. The geographical location of questionnaire respondents.

personnel without extensive training; and have minimal risks to the person administering the procedure (2). A prominent issue affecting the choice of euthanasia method is the availability of controlled drugs to non-veterinarians.

The methods suitable for the euthanasia of dogs and cats were reviewed on behalf of the CVMA in 1978 (3); however, some methods previously recognized as acceptable are now considered to be unacceptable and several other organizations have made recommendations on methods of euthanasia (4–7).

Materials and methods

A 7-page questionnaire was developed following discussions with the CVMA, the Canadian Federation of Humane Societies (CFHS), and a number of veterinarians. Questions included: 1) those requiring numerical answers (for example, number of people employed at the establishment); 2) categorical questions with predefined answers (such as, Question: Do the same people carry out euthanasia all of the time or are duties rotated? Response: either Same people all of the time or Rotated); and 3) open-ended questions for which the respondent was able to answer as they considered appropriate (for example, Please comment on any aspect of euthanasia in the establishment which you would like to expand on or explain. Include personal attitudes towards the euthanasia process, the euthanasia environment in the establishment and the effect of euthanasia on staff). Section 1 of the questionnaire consisted of 5 questions on the type of establishment, 4 questions on the circumstances in which euthanasia was performed, 5 questions on the training and experience of those carrying out euthanasia, 1 question on the use of restraint, and 1 question on the methods used to determine death. Sections 2 and 3 consisted of tables with questions on the methods used for euthanasia for various types of animals. The tables contained lists of potential injectable agents, gaseous agents, and physical methods, potential routes of administration, and categories to indicate if pre-medication was used. Section 4 consisted of 10 questions on opinions related to the methods of euthanasia used.

The study received a certificate of approval (Protocol Number 1002642) from the University of Prince Edward Island, Research Ethics Board.

The original questionnaire was tested on 10 establishments. Selection of the establishments for the pilot study was based on geographical distribution and type of establishment. Five pilot questionnaires were returned within the desired time frame, and the questionnaire was refined based on the responses. The CFHS provided a list of 171 organizations and each organization was sent a questionnaire. Following an Internet search and telephone recruitment, a further 25 animal control facilities (a municipal center or a contractor to a municipality responsible for the enforcement of legislation on animal control and for dealing with social issues arising from animals, such as taking stray dogs to a shelter), and other animal shelters were added to the study. Questionnaires were sent by mail in May 2008 and respondents were asked to return the survey within 6 wk. Included in the package was a letter introducing the authors accompanied by an explanation of the study objectives, assurances of anonymity and contact details for any queries regarding the study. The consent form included with the questionnaire provided contact details of respondents. Participants were made aware that provincial codes would be used to obtain geographical information about respondents.

Results

Of the 196 surveys sent out, 67 completed surveys were returned giving a response rate of 34%. The geographical location of respondents to the questionnaire is shown in Figure 1. Twelve percent of respondents chose to remain anonymous by not supplying their contact details. One completed questionnaire

Table 1. Total intake of animals and the numbers euthanized in the establishments that responded to the questionnaire

Animal	Intake per year	Euthanized per year	Percent of annual intake euthanized
Dog	39 740	7644	19
Cat	101 479	40 790	40
Other	15 809	6149	39
Total	157 028	54 583	35

Table 2. Methods of euthanasia for dogs and cats

Method of euthanasia[a]	Number of establishments that euthanized dogs (%)	Number of establishments that euthanized cats (%)
Sodium pentobarbital	30 (61)	26 (53)
T-61	11 (23)	17 (35)
Carbon monoxide	1 (2)	1 (2)
Gunshot	1 (2)	0 (0)
Sodium pentobarbital or carbon monoxide	1 (2)	1 (2)
Sodium pentobarbital or T-61	4 (8)	3 (6)
Sodium pentobarbital or gunshot	1 (2)	1 (2)
Total	49[b]	49[c]

[a] Methods were not used simultaneously, but selected according to circumstances.
[b] Two establishments did not euthanize dogs, 8 sent dogs to a veterinarian, but did not provide details of the euthanasia methods, 1 establishment did not provide details of the method used for dogs.
[c] Four establishments did not euthanize cats, 6 sent cats to a veterinarian but did not provide details of the euthanasia methods, 1 establishment did not provide details of the method used for cats.

was returned to represent 36 branches of 1 particular society for the prevention of cruelty to animals. This society stated that all of its member branches used the same methods for euthanasia; therefore, responses on that particular questionnaire represented those of 36 establishments. The questionnaire was completed by respondents with the following job descriptions: manager (39%), president (20%), director (15%), animal health/care worker (11%), animal control officer (9%), veterinary technician (5%), and veterinarian (1%). The percentages of respondents by type of establishment were shelter only 45%, shelter and control 33%, shelter and foster 3%, shelter, control, and foster 7%, control only 9%, and foster only 3%. Establishments were categorized as shelters if they accepted homeless animals, as a control facility if they were responsible for animal control within their area, and as a foster service if they did not accept animals at their own premises, but fostered out the animals.

Of the 67 establishments that responded to the survey, 7 establishments stated they did not euthanize animals at all, 20 performed euthanasia at their premises, 24 sent animals to veterinary premises, and 16 establishments undertook euthanasia at their own premises and at a veterinary practice. Of the 60 establishments that undertook euthanasia 2 did not euthanize dogs, 4 did not euthanize cats, and 19 did not euthanize species other than dogs and cats.

Table 1 shows the total numbers of animals taken in by the establishments that responded to the questionnaire and the numbers of animals that were euthanized.

The circumstances in which an establishment would consider euthanasia of an animal were: animals with a nontreatable

Table 3. Number (%) of establishments that euthanized birds, small pet mammals, wildlife, and fish, reptiles, and amphibians by various methods

Method used for euthanasia[a]	Birds	Small pet mammals	Wildlife	Fish, reptiles, and amphibians
Sodium pentobarbital	5 (19)	9 (33)	4 (18)	7 (58)
T-61	15 (57)	13 (48)	10 (46)	2 (17)
Carbon dioxide	1 (4)	1 (4)	1 (4)	0 (0)
Carbon monoxide	1 (4)	2 (7.5)	1 (4.5)	0 (0)
Sodium pentobarbital or T-61	1 (4)	2 (7.5)	2 (9)	2 (17)
Total number of establishments that euthanized each type of animal[b]	26	27	22	12

[a] Methods were not used simultaneously, but selected according to circumstances.
[b] See text for details of other methods used.

life-threatening illness (97% of establishments); safety issues such as aggression (95% of establishments); an animal that develops a disease while in the establishment (57% of establishments); lack of space in the establishment (48% of establishments); treatable illness present on arrival (22% of establishments); and following an owner's request for euthanasia of a healthy animal (9% of establishments). Thirty-five percent and 39% of establishments would not euthanize pregnant animals and newborn animals, respectively.

Forty percent of establishments would not euthanize animals in the presence of another animal. Thirty-five percent of establishments used a designated euthanasia room for euthanasia. A further 28% of establishments used a treatment room, while 17% used a kennel or holding cage. In 26 establishments between 1 and 5 employees were involved in euthanasia, 6 establishments had between 6 and 10 persons, and 4 had more than 10. The remaining 24 establishments used a veterinarian for euthanasia. A veterinarian was the only person who undertook euthanasia in 52% of establishments that euthanized dogs, 44% of establishments that euthanized cats, and 32% of establishments that euthanized other species. Many establishments used combinations of people to undertake euthanasia, for example, 9 establishments (15.5%) used a veterinarian as well as a trained person to euthanize dogs. For staff with no formal qualification in euthanasia the range in length of experience in undertaking euthanasia varied between 5 and 28 y. Twenty-seven establishments did not provide training in euthanasia because euthanasia was undertaken by a veterinarian off the premises. Of the 33 establishments that performed euthanasia on their premises, only 1 establishment did not provide training. This establishment was a limited intake establishment that used either sodium pentobarbital or gunshot for euthanasia. Thirteen establishments provided refresher courses on euthanasia. Fifteen respondents considered that further training in euthanasia was necessary in their establishment. Within the establishments that provided training, 48% of these establishments gave multiple suggestions as to what contributed to best practice when euthanizing an animal. Counselling services were available for staff involved in euthanasia in 54.5% of establishments that performed euthanasia on their premises.

Table 4. Number of establishments that used pre-medication and physical restraint for euthanasia of dogs and cats

	Dogs			Cats		
Method of euthanasia	Pre-medication	Restraint	Both	Pre-medication	Restraint	Both
Sodium pentobarbital	25	26	22	22	22	19
T-61	11	11	11	17	17	17
Carbon monoxide		1			1	
Sodium pentobarbital or carbon monoxide	1	1	1	1	1	1
Sodium pentobarbital or T-61	4	4	4	3	3	3
Sodium pentobarbital or gunshot	1	1	1	1	1	1
Total	42	44	39	44	44	41

Table 5. Percentage of establishments that euthanized each type of animal by method used for physical restraint for euthanasia

Method of restraint	Dogs	Cats	Other
Muzzle	88	4	0
Catch pole	78	21	31
Leash	73	0	35
Extra handlers	67	53	50
Gloves	45	77	92
Blanket	39	53	88
Squeeze cage	10	45	35
Animal tongs	4	23	12
Bag/net	2	38	35
Total	49 establishments	47 establishments	26 establishments

The methods used for euthanizing dogs and cats are shown in Table 2. Table 3 shows the main methods used for euthanasia in other species. Other methods used were as follows: birds — 1 establishment used sodium pentobarbital or carbon dioxide, 1 establishment used sodium pentobarbital or T-61 or isoflurane, and 1 establishment used sodium pentobarbital or T-61 or cervical dislocation; wildlife — 1 establishment used sodium pentobarbital, or T-61, or isoflurane, 1 establishment used sodium pentobarbital or carbon dioxide, or gunshot, and 2 establishments used T-61 or gunshot; fish, reptiles, and amphibians — 1 establishment used sodium pentobarbital or isoflurane.

The use of pre-medication and physical restraint during euthanasia is shown in Tables 4 and 5. A veterinarian used pre-medication in 85% and 84% of establishments that euthanized dogs and cats, respectively. When a trained person who was not a veterinarian performed euthanasia, 100% of establishments reported using pre-medication for both dogs and cats, whereas a person with no formal qualifications used pre-medication in 88% and 100% of establishments, respectively. Pre-medication was used by 100% of establishments euthanizing other species. The number of establishments using the following drugs for pre-medication during euthanasia were as follows: acepromazine only (n = 8), acepromazine and xylazine (n = 4), acepromazine and ketamine (n = 2), acepromazine, ketamine and butorphanol (n = 1), acepromazine and butorphanol (n = 1), acepromazine and hydromorphine (n = 1), ketamine only (n = 1), ketamine and xylazine (n = 9), xylazine only (n = 14), xylazine and butorphanol (n = 1), medetomidine only (n = 2).

Table 6 shows the routes of administration of injectable drugs used for dog and cat euthanasia. Intraperitoneal was the most common route of administration of sodium pentobarbital for birds (60%), small pet mammals (57%), wildlife (50%) and fish, reptiles and amphibians (67% of establishments). In birds, T-61 was administered by the intracardiac route in 38% of establishments and by the intraperitoneal route in 38% of establishments. In small pet mammals and wildlife, T-61 was administered by the intracardiac route (in 76% and 70% of establishments, respectively). In fish, reptiles and amphibians, T-61 was administered by the intracardiac or intraperitoneal route in 68% of establishments.

The number of establishments reporting adverse reactions with drugs used during euthanasia is shown in Table 7.

The judgment by each establishment of the suitability of the methods of euthanasia that they used is shown in Table 8. The respondents were asked to score their satisfaction with the method according to a list of criteria.

The percentages of establishments that used the following methods to determine death when euthanizing animals were as follows: absence of breathing 66%, absence of heart beat 94%, absence of corneal reflex 70%, absence of retinal reflex 55%, absence of response to external stimuli 38%, examination of mucous membranes 6%, and rigor mortis 19%. Forty-seven establishments replied to this question.

Table 9 shows the opinions of 53 respondents who provided information on what they considered to be "best practice" for euthanasia.

Discussion

Even though the respondents to the survey were anonymous, the survey asked sensitive questions on a difficult topic and it is possible that respondents, who were more content with their perception of the likely public impression of their methods, might have been more likely to have responded. The response rate from the questionnaire was comparable with the response rate found in many mail surveys (8,9). The provincial distribution of the respondents to the survey was similar to the human population distribution across Canada by province (10). The questionnaire was completed by people who had a variety of job descriptions, but the detailed questions required that the person answering be familiar with the euthanasia procedures. The percentage of animals accepted by animal shelters and subsequently euthanized in the current survey was very similar to that reported by CFHS in 2004 (11).

There are limitations on the types of drugs that can be used for euthanasia in the absence of a veterinarian (12–15). In 2/3

Table 6. Percentages of establishments[a] that used sodium pentobarbital and/or T-61 for euthanasia of dogs or cats by route of administration[b]

	Dogs					Cats				
	IV				IC	IV				IC
Method of euthanasia	only	+ IC	+ IP	+ IC and IP	only	only	+ IC	+ IP	+ IC and IP	only
Sodium pentobarbital	78	15	0	7	0	52	27	13	4	4
T-61	45	28	0	0	28	7	50	0	0	43
Sodium pentobarbital or T-61[b]	33	33	33	0	0	50	50	0	0	0

IV — intravenous
IC — intracardiac
IP — intraperitoneal
[a] See Table 2 for the number of establishments using each method of euthanasia.
[b] Different methods were not necessarily used on the same animal, but selected according to circumstances.

Table 7. Number of establishments that reported adverse reactions following drug use

Drugs used during euthanasia	Vocalization	Twitching	Excitement	Gasping	Seizures	Vomiting	Slow death
Pre-medication	0	5	2	1	5	5	0
Sodium pentobarbital	7	5	4	5	0	0	2
Pre-medication and sodium pentobarbital	1	0	0	1	0	0	0
Pre-medication and T-61	8	11	2	8	4	1	4

Table 8. Satisfaction scores for the various methods used

Drugs used during euthanasia		Effectiveness of method	Distress caused to animal	Overall speed of method	Amount of restraint	Appearance of method to staff
Sodium pentobarbital	Median	5	4	5	4	4
	Range	2	3	3	3	3
Pre-medication and sodium pentobarbital	Median	4	4	4	4	5
	Range	2	3	3	3	2
Pre-medication and T-61	Median	4	3	3	4	3.5
	Range	3	3	4	4	3

Satisfaction scores
1 — Cause for concern/unacceptable
2 — Dissatisfied
3 — Okay
4 — Satisfied and no concerns
5 — Optimal practice

Table 9. Opinions on best practice for euthanasia

Opinion	Number of establishments
No undue stress to the animals	18
Staff trained and competent	16
Use of veterinary services	14
Dedicated euthanasia room	14
Use of pre-medication	12
Short time between handling and death	6
Explanation to staff of reason for euthanasia	5
Access to controlled drugs	5
Supportive colleagues	4
Use of minimal restraint	4
Availability of suitable equipment	2
Death adequately verified	1

of the establishments that euthanized animals, all or some of the euthanasia was undertaken on veterinary premises and many advocated the use of veterinary services for euthanasia as best practice. Sodium pentobarbital, the drug most commonly used for euthanasia in dogs and cats, is a controlled drug and therefore it is limited to veterinary use. The desire for access to controlled drugs was an issue raised by respondents. Sodium pentobarbital was most commonly administered by the intravenous route, but this requires restraint and occasionally sedation. There is also a risk of discomfort from perivascular injection. Intravenous sodium pentobarbital is considered to be an acceptable method of euthanasia (4) as it rapidly causes loss of consciousness, followed by cessation of respiration and heart activity (16,17). Respondents in this survey rated the use of sodium pentobarbital highly as an effective and quick method of euthanasia that did not cause concerns with restraint or distress to the animal. The use of premedication was considered to be best practice and fewer adverse reactions were reported following the use of premedication than with the use of sodium pentobarbital alone. The various combinations of premedication drugs reported in the survey are consistent with those recommended by Sinclair (18) as suitable for use during euthanasia. Intraperitoneal administration results in slower action compared with intravenous administration (19), but is an alternative route if intravenous administration is not possible. Intracardiac administration of barbiturates is quick

acting (19), but should only be used in animals that have been heavily sedated or anesthetised. It requires skill to ensure that the drug is injected into the heart on the first attempt (18). Most adverse reactions reported are unlikely to occur if intravenous administration is performed rapidly with an adequate dose, but they might occur following intraperitoneal administration. The use of intraperitoneal administration of sodium pentobarbital in cats was likely to have been a consequence of difficulties in the restraint of some cats for intravenous administration (18). Sodium pentobarbital was also used for euthanasia of birds, small pet mammals, wildlife, fish, reptiles and amphibians and its use in these types of animals is considered to be acceptable (6,20,21).

T-61 was used in many establishments for euthanasia of dogs and cats. It is not a federally restricted drug in Canada and therefore can be used by non-veterinarians. T-61 is a combination analgesic, anesthetic and curariform drug. Euthanasia results from central nervous system depression, hypoxia, and circulatory collapse (22). Its use is controversial due to concerns as to whether the curariform action causes respiratory paralysis before the animal losses consciousness from the anesthetic component of the drug (23). Hellebrekers et al (24) found that after the administration of T-61, loss of consciousness and cessation of respiratory activity occurred simultaneously. However, Lumb and Jones reported that after the intravenous administration of T-61 over a 5-second period, respiration stopped at 32 s, the electroencephalogram indicated that unconsciousness occurred after 41 s and the electroencephalogram and electrocardiogram were isoelectric at 65 s (16).

An important finding from this study was that in many establishments, T-61 was not used according to the manufacturer's recommendations. The AVMA guidelines on euthanasia state that intravenous injection is the only acceptable method of administration for T-61 due to questions over the drug's onset of action when administered by other routes (4). The manufacturer of T-61 recommends a slow steady rate of intravenous administration (25). This method of administration is thought to reduce the likelihood of the animal experiencing respiratory paralysis before it becomes unconscious (16). Intrapulmonary or intracardiac administration of T-61 was previously recommended in circumstances where the intravenous route was not practical, but this is no longer recommended (23). The use of pre-medication facilitates slow intravenous injection of T-61 and all establishments that euthanized with T-61 used pre-medication. Although intravenous administration of T-61 was used for the euthanasia of dogs and cats in many establishments, the use of intracardiac administration was also reported by several shelters. As intravenous administration requires skill and adequate restraint of the animal, intracardiac administration might have been attempted by non-veterinarians. Premedication minimizes the possibility of the adverse reactions reported by respondents following the use of T-61. Staff satisfaction with the use of T-61 was rated lower than that of sodium pentobarbital, but this method was not considered to be unsatisfactory.

T-61 was the second most common method of euthanasia after sodium pentobarbital in fish, reptiles, and amphibians, and was the most common method for birds, small pet mammals, and wildlife. Intracardiac administration of T-61 was a common route of administration in birds, small pet mammals and wildlife, and intraperitoneal administration was also a common choice for birds and reptiles, fish, and amphibians. The use of T-61 is considered to be acceptable if it is given intravenously to small mammals and amphibians, but for birds, it might be limited to small birds (6).

Few establishments used non-injectable methods of euthanasia for dogs and cats. Carbon monoxide was used by 2 establishments for the euthanasia of dogs and cats and this required the use of restraint. One of the 2 establishments stated that it planned to stop using this method and that it would be replaced by the use of a veterinary service. Respondents who gave information on why they no longer used carbon monoxide stated that they thought its use as a euthanizing agent was inhumane. The problems with this method are the acceptability of the method to the staff involved, human safety risks (4) and the possibility that animals show distress before they become unconscious (26). In 1 establishment, dogs were euthanized by shooting and in another establishment, dogs and cats were euthanized by either shooting or sodium pentobarbital. Skill and care are required with this method and there are guidelines for euthanasia of dogs and cats by shooting (27). Isoflurane was used in some establishments for birds and wildlife and this is considered to be acceptable for birds (6) reptiles and amphibians (21). One shelter reported the use of ether for euthanasia; however, they did not provide details of which animals were euthanized with this method and they declined to give further information regarding their method. Volatile inhalant anesthetic agents might be irritant or unpleasant during induction. Carbon dioxide was used in 1 establishment for the euthanasia of birds; 1 animal was euthanized at a time in a post fill chamber. The use of carbon dioxide for euthanasia is controversial. Raj et al (28) reviewed evidence that suggested that birds might find carbon dioxide gas unpleasant and it might induce respiratory distress before they lose consciousness.

The quality of euthanasia does not depend solely on the method, but also on the circumstances of euthanasia and the method of restraint (18). Suitable control is vital to minimize pain and distress in animals and to ensure the safety of personnel involved in the task. Drugs such as tranquilizers or sedatives may be used in situations where other methods of restraint could cause distress or injury to an animal. Where the addition of premedication in the food (29) is not successful, recommendations have been made by Sinclair (18) on the use of restraint when euthanizing animals.

The determination of death is an essential aspect of euthanasia, but was only included in best practice recommendations by 1 establishment. A combination of the methods reported by respondents in the survey for verifying death is appropriate (18). The failure of all respondents to answer the question on signs of death used in their establishment and the low percentage use of some signs might indicate the need for further training. Training in euthanasia was provided by all but 1 establishment that undertook euthanasia on their own premises; however, refresher courses in euthanasia were provided by only 41% of these establishments.

The importance of the recommendations on best practice made in the survey concerning staff are supported by previous surveys by Rogelberg et al (30,31) that identified the need for providing staff with a reason for euthanasia, a designated euthanasia room and counselling staff involved in euthanasia. In some establishments, staff with no recognized qualifications undertake euthanasia and many recognized the necessity of refresher courses in euthanasia.

In conclusion, most establishments used an injectable method of euthanasia (administration of sodium pentobarbital was the most common method of euthanasia). At least 36% of establishments used the services of a veterinarian for euthanasia. Very few establishments used physical or gaseous methods of euthanasia. T-61 was a common choice of euthanasia in establishments that performed euthanasia on their premises. Administration of T-61 did not always follow the recommended intravenous route; however, all establishments that used this method used premedication. Further research into the use of T-61 is required. The importance of staff training in euthanasia was highlighted by respondents as necessary for best practice. The provision of support services for staff may also be an area that requires attention. Further discussion of euthanasia practices, veterinary involvement, and drug availability are important issues as are the drafting and adoption of best practice guidelines.

Acknowledgments

The authors thank the respondents for completing and returning the questionnaires and the CFHS for their support and help in providing contact information on their animal shelter membership. CVJ

References

1. Canadian Veterinary Medical Association, (CVMA) 2006. Position Statement, Euthanasia. Available from http://canadianveterinarians.net/ShowText.aspx?ResourceID=34 Last accessed November 15, 2010.
2. Blackmore DK. Euthanasia — not always eu. Aust Vet J 1993;70:409–413.
3. Stonehouse RW, Loew FM, Quine JP, Rowsell JP, Urquhart RG. The euthanasia of dogs and cats: A statement by the humane practices committee of the Canadian Veterinary Medical Association. Can Vet J 1978;19:164–168.
4. American Veterinary Medical Association. AVMA Guidelines on euthanasia. 2007. Available from http://www.avma.org/issues/animal_welfare/euthanasia.pdf Last accessed November 15, 2010.
5. Canadian Council on Animal Care. CCAC Guide, Vol 1, Euthanasia. 1993. Available from http://www.ccac.ca/en/CCAC_Programs/Guidelines_Policies/GUIDES/ENGLISH/V1_93/CHAP/CHXII.HTM Last accessed November 15, 2010.
6. Animal Health and Welfare Panel. Opinion of the scientific panel on animal health and welfare on a request from the commission related to "Aspects of the biology and welfare of animals used for experimental and other scientific purposes". EFSA-Q-2004-105. Adopted by the AHAW panel on 14 November 2005. The EFSA Journal 2005:1–46.
7. Tasker L. World Society for the Protection of Animals. Methods for the euthanasia of dogs and cats: Comparison and recommendations. Available from http://www.icam-coalition.org/downloads/Methods%20for%20the%20euthanasia%20of%20dogs%20and%20cats-%20English.pdf Last accessed November 15, 2010.
8. Asch DA, Jedrziewski MK, Christakis NA. Response rates to mail surveys published in medical journals. J Clin Epidemiol 1997;50:1129–1136.
9. Fleming CM, Bowden M. Web-based surveys as an alternative to traditional mail methods. J Environ Manage 2009;90:284–292.
10. Statistics Canada. Canada's population estimates. 2007. Available from http://www.statcan.ca/Daily/English/070329/d070329b.htm Last accessed November 29, 2010.
11. Canadian Federation of Humane Societies. Animal shelter statistics 2004. Available from http://cfhs.ca/athome/shelter_animal_statistics/ Last accessed November 15, 2010.
12. Department of Justice Canada. Controlled Drugs and Substances Act. Available from http://laws.justice.gc.ca/PDF/Statute/C/C-38.8.pdf Last accessed November 16, 2010.
13. Department of Justice Canada. Narcotic Control Regulations. Available from http://laws-lois.justice.gc.ca/PDF/Regulation/C/C.R.C.,_c._1041.pdf Last accessed November 16, 2010.
14. Department of Justice Canada. Food and Drugs Act. Available from http://laws-lois.justice.gc.ca/PDF/Statute/F/F-27.pdf Last accessed November 16, 2010.
15. Department of Justice Canada. Food and Drug Regulations (C.R.C., c. 870). Available from http://laws.justice.gc.ca/en/ShowTdm/cr/C.R.C.-c.870///en Last accessed November 15, 2010.
16. Lumb WV, Jones EW. Veterinary Anesthesia. 2nd ed. Philadelphia: Lea & Febiger, 1984:631–648.
17. Evans AT, Broadstone R, Stapleton J, Hooks TM, Johnston SM, McNeil JR. Comparison of pentobarbital alone and pentobarbital in combination with lidocaine for euthanasia of dogs. J Am Vet Med Ass 1993;203:664–666.
18. Sinclair L. Euthanasia in the animal shelter. In: Miller L, Zawistowski S, eds. Shelter Medicine for Veterinarians and Staff. Ames, Iowa: Blackwell Publ, 2004:389–409.
19. Herschler RC, Lawrence JR, Schiltz RA. Secobarbital-dibucaine combination as a euthanasia agent for dogs and cats. Vet Med Small Anim Clin 1981;76:1009–1012.
20. Ludders JW. Anesthesia and analgesia in birds. In: Fish RE, Brown MJ, Danneman PJ, Karas AZ, eds. Anesthesia and Analgesia in Laboratory Animals. 2nd ed. Amsterdam: Elsevier, 2008:481–500.
21. Cooper JE. Reptiles, amphibians and fish. In: Mullineaux E, Best D, Cooper JE, eds. BSAVA Manual of Wildlife Casualties. Quedgeley: British Small Animal Veterinary Association, 2003:270–276.
22. Giorgi M, Bertini S. Tanax (R) (T-61): An overview. Pharmacol Res 2000;41:379–383.
23. Barocio LD. Review of literature on use of T-61 as an euthanasic agent. Int J Study Anim Probl 1983;4:336–342.
24. Hellebrekers LJ, Baumans V, Bertens APMG, Hartman W. On the use of T61 for euthanasia of domestic and laboratory-animals — An ethical evaluation. Lab Anim 1990;24:200–204.
25. Intervet Canada. T-61 Product Details. 2008. Available from http://ispah.naccvp.com/view_skin.php?file=index2.html Last accessed November 29, 2010.
26. Chalifoux A, Dallaire A. Physiologic and behavioral-evaluation of CO euthanasia of adult dogs. Am J Vet Res 1983;44:2412–2417.
27. Longair J, Finley GG, Laniel MA, et al. Guidelines for euthanasia of domestic-animals by firearms. Can Vet J 1991;32:724–726.
28. Raj ABM, Sandilands V, Sparks NHC. Review of gaseous methods of killing poultry on-farm for disease control purposes. Vet Rec 2006;159:229–235.
29. Ramsay EC, Wetzel RW. Comparison of five regimens for oral administration of medication to induce sedation in dogs prior to euthanasia. J Am Vet Med Assoc. 1998;213:240–242.
30. Rogelberg SG, DiGiacomo N, Reeve CL, et al. What shelters can do about euthanasia-related stress: An examination of recommendations from those on the front line. J Appl Anim Welf Sci 2007;10:331–347.
31. Rogelberg SG, Reeve CL, Spitzmuller C, et al. Impact of euthanasia rates, euthanasia practices, and human resource practices on employee turnover in animal shelters. J Am Vet Med Assoc 2007;230:713–719.