NORTH UTAH VALLEY ANIMAL SERVICES SPECIAL SERVICE DISTRICT

Animal Euthanasia Methods Comparison

Carbon Monoxide vs Sodium Pentobarbital

A Research Based Report

by

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DIRECTOR

North Utah Valley Animal Services

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EXECUTIVE SUMMARY

The North Utah Valley Animal Services Special Service District (NUVASSD) provides animal sheltering, regulation, care, control, and services for the municipalities that exist within our district boundaries, including Alpine, American Fork, Cedar Fort, Cedar Hills, Eagle Mountain, Highland, Lehi, Lindon, Orem, Pleasant Grove, Saratoga Springs, Vineyard, and unincorporated areas of northern Utah County.

Each year the North Utah Valley Animal Shelter (NUVAS) is tasked with having to euthanize animals, either as a service to the public or as a result of animals that come into the shelter with issues that must be resolved with euthanasia. These issues include injuries or illness that produce pain, suffering, or disability that cannot be alleviated through medical intervention; and/or animal behavioral concerns that pose a significant and dangerous risk to the public.

In April 2021 Tug Gettling, Director of NUVASSD, began an indepth, scientific study of animal euthanasia with the specific intent of determining the optimal method of animal euthanasia and to make recommendations thereto. Five distinct considerations were studied:

- Animal Welfare
- Human Safety and Wellbeing
- Cost
- Public Perception
- Operational Impact

The purpose of this report is to give an account of the findings of the research conducted and ultimately make a recommendation regarding the definitively best method of animal euthanasia. This document is intended to provide information to the public, municipal or governing organizations, decision makers, the NUVAS staff, and the NUVASSSD administrative control board regarding animal euthanasia methods and best practices regarding them. This report is based entirely on relevant, science-based information gathered and reviewed from:

- Empirical reports
- National coalitions
- Government agencies
- Medical professionals
- Research papers and projects
- Institutions of higher education
- Published, peer-reviewed works
- Scientific journals and periodicals
- Veterinary, wildlife, public health, and animal agencies and organizations

A conscious effort was made to assure that the information compiled, examined, and provided herein was not affected by undue bias in any regard, and that all conclusions and recommendations were based solely on the science gathered, studied, and researched.

This report will show that, while both methods of animal euthanasia can be conducted humanely and in compliance with all applicable laws, statutes, and mandates, the method currently considered to be the most effective, most preferred, and most humane is euthanasia by injection of sodium pentobarbital or a derivative thereof.

Detailed recommendations can be found at the end of this report (pages 60 – 61).

The author is soley responsible for the accuracy of the content and the views expressed in this report.

Position Statements

ASSOCIATION OF SHELTER VETERINARIANS

Carbon Monoxide Inhalation as a Method of Euthanasia
Last Reviewed: September 2019

Position
The Association of Shelter Veterinarians believes that the use of carbon monoxide (CO) for individual or mass companion animal euthanasia in shelters is unacceptable due to significant humane, operational, and safety concerns.

Background Information
The Association of Shelter Veterinarians believes that animals selected for euthanasia must be provided with a physically and emotionally humane and dignified death, which is as gentle and rapid as possible. Key considerations that must be addressed in order for the procedure to be humane and dignified include euthanasia methods and agents, the environment, handling techniques, and equipment, as well as the physical and mental safety of personnel performing euthanasia.

The AVMA Guidelines for Euthanasia of Animals (2013) outlines several key points that characterize the process:

- the use of humane techniques to induce the most rapid and painless and distress-free death possible;
- rapid loss of consciousness followed by cardiac or respiratory arrest and the ultimate loss of brain function; and
- minimization of distress prior to loss of consciousness.

Regardless of delivery method, use of CO is unable to reliably meet these criteria and presents unacceptable safety hazards, and is therefore an inhumane method of death for companion animals. This view is shared by the Humane Society of the United States, the World Society for the Protection of Animals, and the Working Party Report to the European Commission, who have all categorized death by carbon monoxide as unacceptable.

Although the AVMA outlines a long list of contingencies under which CO may be acceptable, they clearly state that euthanasia by CO chamber is not recommended for routine euthanasia for cats and dogs and that the preferred method of euthanasia in animal shelters is euthanasia by injection.

Use of carbon monoxide is likely to result in significant distress to animals, does not reliably offer a rapid or certain death, poses a
physical health risk for operators, may exacerbate operator distress, and is a more expensive method of euthanasia than EBI under most circumstances.

Shelters still utilizing CO should transition to EBI to facilitate the humane euthanasia of animals that are deemed unfit for live release. Shelters should research state laws to determine if they can obtain legal access to euthanasia drugs and equipment.

Other options include forming agreements and partnerships with veterinary professionals and/or other humane organizations, or obtaining training and certification for technicians and professionals who are legally authorized to provide EBI on site in shelters. In states where non-veterinary professionals are not authorized to perform EBI -- resulting in the use of CO chambers or a prolonged wait for EBI services -- the ASV supports development of legal pathways by which to train and/or certify professionals to provide timely EBI to animals in shelters.

NATIONAL ANIMAL CARE AND CONTROL ASSOCIATION

Disposition of Animals - Euthanasia
Adopted: September 3, 2014

Guideline Statement
NACA considers the lethal injection of sodium pentobarbital, administered by competent, trained personnel, to be the only method of choice utilized for humane euthanasia of animal shelter dogs and cats. NACA acknowledges that there are agencies legally restricted in their ability to obtain sodium pentobarbital. In such cases the alternative must be to seek out local veterinarians to provide euthanasia services utilizing sodium pentobarbital. NACA condemns the use of carbon monoxide, carbon dioxide, nitrogen, nitrous oxide, argon, or anesthetic gases as well as physical methods such as electrocution, gunshot, and blunt force trauma for animal
shelter euthanasia of dogs and cats.

Basis for Guideline
Sodium pentobarbital meets more of the criteria set by the American Veterinary Medical Association Guidelines on Euthanasia than any other method of euthanasia. Until a more sophisticated method meeting all the criteria are met, it is the responsibility of those performing euthanasia to use the best method now available and to use it with skill, compassion, and consistency.

Guideline Recommendation
Euthanasia should be performed by a minimum of two persons and only by persons who are trained in humane euthanasia procedures and can demonstrate their ability in accordance with methods put forth in training approved by the National Animal Care and Control Association, the Humane Society of the United States, the American Humane Association, the American Society for the Prevention of Cruelty to Animals, The American Veterinary Medical Association, or an accredited educational institution. NACA very strongly urges agencies that are unable to legally obtain sodium pentobarbital, to work diligently towards passing legislation which would allow direct purchase of euthanasia drugs by licensed shelters, and require training and certification of staff.

AMERICAN SOCIETY FOR THE PREVENTION OF CRUELTY TO ANIMALS

Position Statement on Euthanasia
Current as of July 2021

Background
While it cannot be said that the ASPCA is "for" euthanasia, it recognizes the inevitable necessity for euthanasia in certain circumstances. In many areas of the country there are more pets than there are appropriate homes. The ASPCA believes that unwanted pets deserve a dignified, painless death rather than suffer from such cruelties as malnutrition, disease or trauma, outcomes commonly associated with an unwanted and/or uncared-for existence. Similarly, long-term housing of individual dogs and cats in cages without access to exercise or social activities is not an acceptable alternative. Euthanasia must be understood for what it is: a last-step, end-of-the-road option to spare animals further hardship and suffering.

ASPCA Position
The ASPCA recommends the injection of sodium pentobarbital as the preferred agent for euthanasia of shelter animals. Euthanasia should be performed only by skilled professionals who have been trained and certified in administering injectable euthanasia solution. Euthanasia should not be performed in the presence of live animals, and it is essential that the proper steps are taken by the trained staff to verify that death has occurred. Performed properly, euthanasia by injection is the most humane, safest, fastest and least stressful to the animal and is safe for shelter personnel. No forms of drowning, suffocation, electrocution, mechanical stunning or killing are acceptable alternatives. In emergency situations, when no other options are available, trained officials only may carry out euthanasia using firearms. The ASPCA supports the recommendations of the American Veterinary Medical Association Panel on Euthanasia as the very minimum standard to be followed for domestic animals and wildlife.

HUMANE SOCIETY OF THE UNITED STATES

Position Statement on Euthanasia
Last Updated: August 2015

HSUS Condemns the Use of Gas Chambers for Euthanasia of Animals
When shelters find themselves in the position of having to euthanize an animal, it is incumbent upon them to ensure that the death is as humane as possible. The Humane Society of the United States, the Association of Shelter Veterinarians, the National Animal Control Association, and all other national animal welfare organizations agree that direct injection of approved euthanasia drugs (referred to as Euthanasia by Injection, or EBI), by which the animal quickly loses consciousness without experiencing pain or distress, is the most humane method of euthanasia currently available. Lesser alternatives like carbon monoxide or carbon dioxide gas chambers (gas chambers), which can virtually never provide a stress and pain free death, must therefore never be used in shelter settings.

Gas chambers cannot provide humane euthanasia for shelter populations. Often the animals euthanized in shelters are old, young, ill or injured and none of these animals can be humanely euthanized in a gas chamber. Old, ill, injured or otherwise circulatory compromised animals may suffer from medical conditions that delay the effects of gas, causing them to experience distress prior to unconsciousness. Neonatal animals are resistant to hypoxia and can survive much longer without oxygen than adults, making the use of inhalants like carbon monoxide ineffective. Some small mammal species such as rabbits and guinea pigs share this quality, making them inappropriate for gas chamber euthanasia regardless of their age. Even healthy adult dogs and cats will suffer stress just by being placed in the unfamiliar environment of a gas chamber, and may become panicked by

the sights, sounds and smells of the equipment, particularly in the presence of other animals. For these reasons, gas chambers cannot be relied upon to consistently produce a humane euthanasia for shelter animals, and their use cannot be condoned.

Gas Chambers Pose Grave Dangers to Staff: A common fallacy is that the use of gas chambers is safer for staff members than EBI because it avoids direct handing of animals and is more palatable than directly administering a fatal drug. In fact, the opposite is true – the use of gas chambers actually poses greater physical and psychological harm to staff. Staff must still handle, transport and place fractious and fearful animals into the chamber, and as such are at risk of bites and scratches. Even otherwise friendly, tractable animals may react adversely when forced into a small, dark, confined space like a gas chamber. Moreover, there is no evidence that euthanasia-related psychological stress is any less prevalent in caretakers euthanizing with a gas chamber than with EBI; if anything, staff report their stress is greater when the chamber is used instead of EBI. Perhaps most important, the use of the gas chamber equipment itself poses a grave risk to caretakers, as animal care workers have been injured and killed by malfunctioning chambers.

Gas Chambers are More Costly: A gas chamber must be commercially manufactured and properly equipped and maintained or its operation will be painful and inhumane even for healthy adult dogs and cats. Studies have proven that it is actually more expensive to operate a gas chamber within the strict operational parameters required than it is to purchase and use approved euthanasia drugs. For the reasons cited above, when euthanasia must be performed in a shelter setting, EBI is the only acceptable humane method. In states where shelters have the ability to acquire euthanasia drugs directly, all shelters still using a gas chamber should convert to EBI immediately. Where direct licensing is not yet available, The HSUS will partner with the Humane Society Veterinary Medical Association (HSVMA) in an effort to help shelters secure access to euthanasia drugs until a direct licensing measure is passed. The HSUS stands ready to provide necessary training, financial support and other assistance to any shelter committed to converting from use of a gas chamber euthanasia to EBI.

CANADIAN VETERINARY MEDCIAL ASSOCIATION

Position Statement on Euthanasia
Last Revised: July 14, 2014

Position

The Canadian Veterinary Medical Association (CVMA) holds that when animals are euthanized, death must be quick using a method that causes the least possible pain and distress. The most appropriate method of euthanasia may vary depending on animal species, age, weight, temperament, and health status.

Background

1. Euthanasia is the act of inducing the humane death of an animal.
2. Veterinarians have a responsibility to help guide animal owners in making end of life decisions and to ensure that the lives of animals are ended humanely.
    a. Veterinarians should have appropriate procedures and protocols in place to achieve a 'good death' for their patients.
    b. For food animal species and other non-companion animals, euthanasia plans should be developed under veterinary oversight, and include procedures to recognize sick animals, assess fitness for transport, develop end-point criteria and appropriate euthanasia techniques. Whenever possible, veterinarians should perform the euthanasia procedure. Where this is not possible, dedicated staff should be trained to develop the necessary skills required to appropriately euthanize each species and class of animal under their care.
3. Animals must be rendered irreversibly unconscious as rapidly as possible with the least possible pain, fear, and anxiety. The preferred methods used to achieve this are those that affect the brain first, followed quickly by cessation of cardiac and respiratory function.
    a. The experience, training, sensitivity, and compassion of the individual carrying out the procedure are critical.
    b. Handling and movement of animals should be minimized.
        i. Animal restraint should be in accordance with animal welfare and operator safety requirements, and sufficient to facilitate effective euthanasia.
        ii. To minimize animal stress and ensure adequate restraint, sedation should be considered prior to euthanasia whenever appropriate.
        iii. When feasible, sedation of fractious food animals and other non-companion animals is encouraged to minimize fear and risk of injury.
        iv. When restraint is required, euthanasia should follow with minimal delay.
3. The use of neuromuscular blocking agents in horses should be restricted to anesthetized or unconscious animals.

4. The intravenous injection of a concentrated barbiturate with prior sedation is widely considered to be the most humane method for euthanizing companion and many non-domestic animals. It causes a comparatively aesthetic death, is rapid-acting, reliable, and effective. Euthanasia with barbiturates must be done by a licensed veterinarian or registered animal health/veterinary technologist working under the direction and control of a veterinarian. Care must be taken to ensure that animals euthanized with barbiturates are disposed of in a responsible manner since such animals can be a significant source of environmental toxicity. Improper care of animal remains may result in the illness and death of scavenging animals.
5. Veterinarians should assist companion animal owners to assess quality of life for the animal in question to determine the suitability of treatment or euthanasia. Because euthanasia decisions in companion animal practice can be highly emotional and stressful for the animal owner, veterinarians should strive to raise concerns about quality of life early on when animal condition begins to deteriorate and to use sensitivity when discussing end of life planning and euthanasia.
6. The CVMA believes that euthanasia is not desirable as a sole means of population control, but recognizes that euthanasia is still necessary for unwanted animals that cannot be placed in new homes.
    a. The CVMA encourages veterinarians, animal shelters, and governments to work together to ensure that optimal methods of euthanasia are used in all animal shelters, pounds, and animal hospitals.
    b. Some methods currently used by shelters such as gas euthanasia or T61 injection are technically difficult to perform humanely and should be discouraged unless performed by appropriately trained and supervised individuals.
7. Performing euthanasia can be emotionally and psychologically stressful. Veterinarians and their staff should be aware that they may be at risk for traumatic stress (e.g. compassion fatigue of 'burnout') and take preventive measures to mitigate this risk.

WORLD SOCIETY FOR THE PROTECTION OF ANIMALS

Methods for the Euthanasia of Dogs and Cats
Publication Date Unspecified

Inhalation of Carbon Monoxide: Method Not Acceptable

- Slow acting
- Highly variable time taken to lose consciousness and can take up to two minutes at 6% concentration
- Death by hypoxia
- Vocalisations and agitation observed in dogs and this may occur while they are still conscious
- Distressing side effects observed in cats during induction
- Animals < 4 months of age and sick or injured animals may have some resistance to hypoxia caused by exposure to CO
- Requires specially constructed chambers that are diligently maintained and are operated to safeguard animal welfare and human safety
- Requires a pure source of CO such as cylinder gas
- Potential danger to operators either through repeated exposure of low concentrations when operating the chamber or through accidental exposure to a lethal dose
- Sufficient animal welfare and human safety concerns that this method cannot be recommended for euthanasia

Carbon monoxide (CO) Methods of generating carbon monoxide (CO) gas for euthanasia of animals have included chemical interaction arising from combining sulphuric acid and sodium formate and the use of exhaust fumes produced from idling petrol engines (Carding, 1977). Both of these techniques produce irritants that are likely to result in considerable distress to animals and are therefore detrimental to the welfare of dogs and cats (Carding, 1968, 1977; Close et al., 1996; Beaver et al., 2001), and hence their use is not acceptable. Commercially compressed CO delivered from cylinders into specially constructed chambers has been used for the mass euthanasia of dogs and cats. CO combines with haemoglobin in the red blood cells, decreasing the oxygen carrying capacity of the animal's blood. As a result, less oxygen is delivered to the tissues and cells (hypoxia), which leads to unconsciousness, followed by death (Chalifoux and Dallaire, 1983). Although the animal becomes unconscious within 1–2 minutes (variable between individuals), death as confirmed by cessation of heartbeat does not occur until 10–20 minutes after initial exposure to CO at concentrations reaching 6% (Moreland, 1974; Chalifoux and Dallaire, 1983; Dallaire and Chalifoux, 1985). Although the welfare aspects of this method have not been well researched, a few studies have reported that prior to loss of consciousness dogs show signs of anxiety, including moaning vocalisations (Carding, 1968; Chalifoux and Dallaire, 1983; Dallaire and Chalifoux, 1985) and signs of agitation (Moreland, 1974; Chalifoux and Dallaire, 1983). Furthermore, there is some concern that the onset of convulsions (Close et al., 1996) and muscular spasms (Moreland, 1974) may precede loss of consciousness (Chalifoux and Dallaire, 1983; Close et al., 1997). Equally distressing behaviours

have been observed in cats during the initial phase of euthanasia using this method (Simonsen et al., 1981). Use of the tranquiliser ACP prior to euthanasia with CO significantly reduced some of the behavioural and physiological responses of dogs, but sufficient time must be allowed for ACP to reach its maximum effect before exposure to CO (Dallaire and Chalifoux, 1985). In addition to the risks for animal welfare, CO is extremely hazardous for humans because it is highly toxic and difficult to detect. Even chronic low-level exposure is considered a human health hazard and is associated with cardiovascular disease (Beaver et al., 2001). There are several practical limitations associated with this method of euthanasia. Firstly, the construction, diligent maintenance and careful operation of special chambers are essential to reduce the risk to human and animal welfare; and these are likely to be costly. Secondly, use of CO to euthanase certain groups of animals is considered unacceptable (Humane Society of the United States, undated). In particular, animals under four months old (resistant to hypoxia); those with impaired breathing and or low blood pressure (due to systemic disease, injury or old age) will take longer to succumb, causing additional distress prior to death. Use of CO inhalation to euthanase obviously pregnant animals is also discouraged as the unborn young will not be exposed to the gas and will die slowly as a result of suffocation, due to death of the mother (Humane Society of the United States, undated). Moreover, unconscious dogs urinate, defecate and regurgitate (Moreland, 1974) making this aesthetically objectionable for operators and requiring chambers to be thoroughly cleaned, adding to the time of use. Although considered a conditionally acceptable method of euthanasia by the American Veterinary Medicine Association (Beaver et al., 2001) and the Humane Society of the United States for some dogs and cats, the many limitations of CO may make this method less practical, considerably slower and more expensive than lethal injection (Humane Society of the United States, undated). There is also concern over the distressing side effects of exposure to CO (European Food Safety Authority, 2005) while the animal is conscious (Stafford, 2006) and over the significant danger to operators. For these reasons WSPA considers this to be an unacceptable method for the euthanasia of dogs and cats.

UTAH VETERINARY MEDCIAL ASSOCIATION

Position Statement on Senate Bill 197
February 26, 2015

The Utah Veterinary Medical Association strongly opposes SB 197 as it is currently written, out of concern for the welfare of both animals and people involved in the euthanasia at shelters.

It is very important to remember that not all animals want to be held and restrained. This is especially true of feral cats or other cats not used to human interaction. For these animals, the level of restraint required for either an IV or IP injection as would be required by this bill is a very stressful experience.

There are also both dogs and cats that cannot be restrained without creating a danger of serious physical injury to the shelter employees involved in the procedure.

The Utah Veterinary Medical Association believes that all euthanasias performed should be done in accordance with the standards set by the American Veterinary Medical Association's published Guide lines on Euthanasia. This carefully researched document recognizes that euthanasia by injection or gas chamber is humane when done appropriately by well-trained individuals utilizing proper equipment.

We have been actively involved for over the last several legislative sessions in trying to craft legislation that both addresses the welfare concerns of those opposed to the use of gas chambers while recognizing that circumstances exist where gas chambers are the only safe or humane option.

Unfortunately, those efforts have been unsuccessful. SB 197 is far more restrictive than the previous bills and is not in the best interest of either the animals or people affect.

We urge that the committee join us in opposing this legislation.

UTAH VETERINARY MEDCIAL ASSOCIATION LEGISLATIVE COMMITTEE

Position Statement on House Bill 187
January 2016

I am writing on behalf of the Utah Veterinary Medical Association (UVMA) to share our concerns regarding HB0187, Animal Shelter Amendments. This bill, among other things, seeks to ban the use of inhalant euthanasia, commonly called ‘gas chambers’, in animal shelters.

While we agree with the proponents of this bill that animals euthanized at animal shelters must be treated and euthanized in a humane maimer, we feel very strongly that the proposed legislation fails to accomplish this goal and will, in fact, be counter-productive in many cases.

For many animals, such as wild or feral animals that have had little to no contact with humans, the restraint needed to safely administer an injectable anesthetic can be a very stressful, and inhumane, experience for the animal. When performed correctly inhaled euthanasia methods allow humane euthanasia while minimizing direct physical restraint, and thus can be more humane for wild and feral animals than euthanasia by injection.

The legislation also fails to consider, or protect, the safety of shelter employees. In the case of aggressive, or rabid, dogs, cats or wildlife, the act of performing injectable euthanasia can put people in a very dangerous situation, where the risk of severe physical injury, even death, is unacceptably high.

Therefore, we strongly encourage you to amend this bill to allow exceptions to injectable euthanasia when it is determined it is either in the best interest of the animal (i.e. restraint would create undue stress) or for the safety of those performing the procedure.

It is also worth noting that this is an emotional issue and there is a lot of misinformation being spread around about how inhumane inhalant euthanasia is. The American Veterinary Medical Association has developed guidelines, backed up by data, on acceptable methods of euthanasia, including inhalant euthanasia. These guidelines are attached with this document, with the pertinent sections highlighted, in an effort to educate the members of the House of Representatives on the facts involved. The UVMA supports these guidelines and feels that animal shelters and animal control agencies should be allowed to follow them.

I am more than happy to speak with you further concerning this legislation and how we can work together to ensure that euthanasia in shelters can be performed both safely and humanely in all conceivable, and inconceivable, situations.

Respectfully,
Eric K. Hansen DVM
Legislative Committee Chair, Utah Veterinary Medical Association

COLDWATER ANIMAL HOSPITAL
Position Statement on Senate Bill 197
Val Poll, D.V.M.
February 2015

I want to express my concern for the current version of SB 197. I can appreciate the goal to provide a safe and humane method of euthanizing shelter animals. However, limiting this process to the use of sodium pentobarbital puts shelter personnel at serious risk when dealing with aggressive or fractious animals. It also does not account for the extreme stress put upon feral animals. In these cases proper restraint is not possible to give IV or IP injections.

Deviation from the sole use of sodium pentobarbital is allowed in your current version in emergencies. Dealing with feral animals often reaches a state of emergency in a very short time. If a facility does not have other options for euthanasia, animals and personnel are going to get hurt.

There is also an allowance if the officer is off site. One of the most difficult parts of off-site euthanasias is the inability to properly restrain the animal, thus eliminating the ability to give sodium pentobarbital. This same situation exists within the shelter environment with aggressive or feral animals. It would make sense to preserve the option of using other AVMA approved methods of providing humane and safe euthanasias.

A one size fits all approach to this difficult and delicate process will only result in more stress and more harm to those who are charged with this task.

I would recommend working with all of the involved parties, including county shelters and veterinarians, in this decision to develop more workable solution to this challenge.

Sincerely,
Dr. Val Poll, D.V.M.
Coldwater Animal Hospital

UTAH COALITION OF ANIMAL SHELTERS

Position Statement on Methods of Euthanasia
February 2013

INTRODUCTION: The Utah Coalition of Animal Shelters exists as a unified body of animal service professionals to further the animal sheltering and services profession in all of its many facets.

PURPOSE: The purpose of this Position Statement is to provide guidance and recommendations to policy makers, legislators, and other key stakeholders with regard to acceptable, humane, and feasible methods of animal euthanasia in the animal services profession in the state of Utah.

DECLARATIONS: The Utah Coalition of Animal Shelters (UCASH) categorically opposes any legislation regarding animal euthanasia or its methods of administration that are not in agreement with current recommendations of the American Veterinary Medical Association. We further oppose the proposal to restrict euthanasia via carbon monoxide chambers as stated in House Bill 150.

RATIONALE: The American Veterinary Medical Association (AVMA) has created and published the "AVMA Guidelines on Euthanasia" which is based upon a comprehensive, scientific body of empirical and peer-reviewed research. Whereas the AVMA is one of the largest and oldest veterinary associations in the world; and whereas the depth and breadth of their research on euthanasia has yet to be duplicated; and whereas the AVMA is the accrediting body of all 28 schools of veterinary medicine in the United States; and whereas the AVMA represents more than 80,000 veterinarians worldwide; we therefore conclude that the AVMA is the recognized authority on animal care and that they have the expertise requisite to make recommendations regarding animal euthanasia.

The AVMA Guidelines on Euthanasia clearly state "*Recommendations* – Carbon monoxide used for individual or mass euthanasia is acceptable for dogs, cats, and other small mammals…" and they base this recommendation on the following: "*Advantages*: (1) Carbon monoxide induces loss of consciousness without pain and with minimal discernible discomfort. (2) Hypoxemia induced by CO is insidious, so that the animal appears to be unaware. (3) Death occurs rapidly if concentrations of 4 to 6% are used." Consequently UCASH believes that any legislation in opposition to these guidelines would be irresponsible and negligent.

Furthermore, the proposed changes to governmental operations found within HB 150 will have a detrimental financial impact on animal shelters, shelter personnel, cities, counties, municipalities, and taxpayers. The increased financial burden to Utah taxpayers notwithstanding, the end result of HB 150 will ultimately be an increase in the number of animals euthanized every year in Utah due to increased costs which will reduce the rate of adoptions and redemptions in animal shelters throughout the state.

Additionally UCASH does not believe private interest groups or individuals should dictate procedures and operational protocols for animal shelters based on opinion, emotion, and/or bias. As the animal services field involves taxpayer monies, controlled substances, live animals, law enforcement concerns, and emotional issues we believe that professionally conducted and reviewed research coupled with sound and relevant logic should be the required standard prior to the implementation of any operational or other changes in the industry.

RECOMMENDATIONS: Due to the aforementioned reasons UCASH recommends that legislators and policy makers deny the adoption of HB 150 and that any and all attempts to prescribe or impose methods of animal euthanasia that are contrary to AVMA guidelines and/or industry best practices be extinguished.

MOUNTAIN WEST ANIMAL HOSPITAL

N. Isaac Bott, DVM
July 20, 2021

One of the mot difficult aspects of my job as a veterinarian is the task of performing euthanasias. This happens on a daily basis. In my clinic, a sedative is administered and the patient falls asleep before the euthanasia drug is administered. I do this to assure that the process is as smooth and as pain free as possible. Even though euthanasia provides a kind death for suffering patients, the burden of the act weighs heavy on my soul. Everyone tasked with this is impacted in some fashion. My assistants, technicians and other doctors all share in the physical and mental toll that providing this service takes on each of us. Often, we can't wait to take a brief weekend vacation just to experience a day or two without death.

My responsibility is to provide these services in a compassionate fashion and to make sure that the patient's best interests are considered. This must take into account the euthanasia method that is the most humane for each individual patient.

As a board member for the South Utah Valley Animal Shelter, our consensus on how to perform euthanasia takes into account the policies and procedures outlined in the The American Veterinary Medical Association (AVMA) Guidelines for the Euthanasia of Animals. This publication is updated every 10 years or earlier with the latest edition having been published in 2020.

Our decision to utilize CO is based on years of experience and is well supported by science.

The AVMA guidelines state that utilizing CO for animal euthanasia is an acceptable method IF all safety and procedural conditions are met. SUVAS meets, or exceeds, all of these conditions.

The trauma and emotional distress experienced by animal service workers who have the difficult task of animal euthanasia must not be overlooked. Carbon monoxide euthanasia has a far less emotional impact on animal service workers than other methods. The process is quick and humane to both the animals and the workers.

Certainly, our goal is not to have to perform euthanasias. When compared to other shelters across the country, our shelter has a much lower number of animals that are euthanized. We have a great leadership team at the South Utah Valley Animal Shelter. Their service is noble as they work the front lines of our quest to provide all animals a life free of pain and suffering. I proudly stand with them in their efforts.

Cost Comparison

ANIMAL PEOPLE
Comparing Costs of Carbon Monoxide v.s. Sodium Pentobarbital
October 1, 2006

Also in February 2006, American SPCA Northeast Region shelter outreach manager Sandra Monterose told Alicyn Leigh of the Long Island Press that carbon monoxide, as used in Freeport, was less expensive than "injection of sodium pentobarbital with the use of pre-euthanasia anesthetics by a trained professional."

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Friends of the Columbus County Animal Shelter volunteer veterinarian John Stih, of Whiteville, North Carolina, told Deuce Niven of the Fayetteville Observer in May 2006 that gassing is more cost-effective than injection, at $10-$12 per injection.

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Columbus County animal control director Rossie Hayes told Niven that the shelter pays about $130 per month for bottled carbon
monoxide.

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Doug Fakkema does not buy the claims. "As an 18-plus year shelter director, including serving as shelter supervisor at Multnomah County Animal Control in Portland," among the larger shelters in the U.S., "and as a 17-year animal care and control consultant," Fakkema told ANIMAL PEOPLE, "I am familiar with costing out programs. "Fatal Plus [the top brand of sodium pentobarbital] costs $0.18 per milliliter. A syringe and needle costs $0.13, PreMix (ketamine/xylazine) $0.40 per milliliter. With doses calculated, the cost for euthanizing an 80-pound methadrine-fed pit bull would be $1.92 for 4.8 milliliters of PreMix, $0.13 for the syringe and needle, and $1.44 for eight milliliters of Fatal Plus, for a total of $3.49.

AMERICAN HUMANE ASSOCIATION
Cost Analysis Matrix – Doug Fakkema
July 2009

CARBON MONOXIDE Vs EBI

EBI cost per animal = $2.29

CO cost per animal (2 operators) = $4.98
CO cost per animal (2 operators) without tranquilizer = $4.66
CO cost per animal (1 operator) = $3.09
CO cost per animal (1 operator) without tranquilizer = $2.77

NORTH UTAH VALLEY ANIMAL SERVICES
CO vs EBI Cost Comparison
July 2021

- In a two-year period, we euthanized 1799 animals.
- During that same two-year period, we used 7 cylinders of carbon monoxide.
- The total cost of the carbon monoxide was $1168.02
- Dividing the cost of carbon monoxide by the number of animals euthanized we arrive at a cost per animal of $1.29.
- The lowest figures for the cost to euthanize an animal by injection of sodium pentobarbital are $2.29.
- Therefore, the cost to euthanize animals by injection of sodium pentobarbital is $1.00 more, per animal, than using carbon monoxide.

Significant Statements from AVMA

AMERICAN VETERINARY MEDICAL ASSOCIATION
Guidelines for the Euthanasia of Animals
2020 Edition

General Euthanasia Considerations
When euthanasia is the preferred option, the technique employed should result in rapid loss of consciousness followed by cardiac or respiratory arrest and, ultimately, a loss of brain function. In addition, animal handling and the euthanasia technique should minimize distress experienced by the animal prior to loss of consciousness.

By creating and maintaining these Guidelines, the AVMA hopes to ensure that when a veterinarian or other professional intentionally kills an animal under their charge, it is done with respect for the interests of the animal and that the process is as humane as possible (ie, that it minimizes pain and distress to the animal and that death occurs as rapidly as possible).

In evaluating methods of euthanasia, the Panel on Euthanasia (POE) considered the following criteria:
(1) ability to induce loss of consciousness and death with a minimum of pain and distress;
(2) time required to induce loss of consciousness;
(3) reliability;
(4) safety of personnel;
(5) irreversibility;
(6) compatibility with intended animal use and purpose;
(7) documented emotional effect on observers or operators;
(8) compatibility with subsequent evaluation, examination, or use of tissue;
(9) drug availability and human abuse potential;
(10) compatibility with species, age, and health status;
(11) ability to maintain equipment in proper working order;
(12) safety for predators or scavengers should the animal's remains be consumed;
(13) legal requirements; and
(14) environmental impacts of the method or disposition of the animal's remains.

Euthanasia methods are classified in the Guidelines as ACCEPTABLE, ACCEPTABLE WITH CONDITIONS, and UNACCEPTABLE.

ACCEPTABLE methods are those that consistently produce a humane death when used as the sole means of euthanasia.

ACCEPTABLE WITH CONDITIONS methods are those techniques that may require certain conditions to be met to consistently produce humane death, may have greater potential for operator error or safety hazard, are not well documented in the scientific literature, or may require a secondary method to ensure death. Methods acceptable with conditions are equivalent to acceptable methods when all criteria for application of a method can be met.

UNACCEPTABLE techniques are those methods deemed inhumane under any conditions

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Proper handling is vital to minimize pain and distress in animals, to ensure the safety of the person performing euthanasia, and, often, to protect other people and animals. Handling animals that are not accustomed to humans or that are severely injured or otherwise compromised may not be possible without inducing stress, so some latitude in the means of euthanasia is needed in some situations.

Once loss of consciousness occurs (ie, there is no longer an inner qualitative experience) subsequently observed activities, such as convulsions, vocalization, reflex struggling, breath holding, and tachypnea, can be attributed to the second stage of anesthesia, which by definition lasts from loss of consciousness to the onset of a regular breathing pattern.64,65 Thus, events observed following loss of the righting reflex are likely not consciously perceived.

The perception of pain is defined as a conscious experience.

Unconsciousness: Unconsciousness, defined as loss of individual awareness. This occurs when the brain's ability to integrate information is blocked or disrupted. Onset of unconsciousness is associated with loss of the righting reflex. An unconscious animal is therefore recumbent and, by definition, unable to perceive pain; however, unconscious animals may respond to noxious stimulation with spinally mediated involuntary movements depending on the degree of CNS depression present.

Consequently, the choice of a euthanasia agent or method is less critical if it is to be used on an animal that is anesthetized or unconscious, provided that the animal does not regain consciousness prior to death.

When struggling during capture or restraint may cause pain, injury, or anxiety to the animal or danger to the operator, the use of tranquilizers, analgesics, and/or anesthetics may be necessary. A method of administration should be chosen that causes the least distress in the animal for which euthanasia must be performed.

In addition to ensuring good care of animals during euthanasia and considering the psychological well-being of human participants, the physical safety of personnel handling the animals and performing euthanasia needs to be protected.

Euthanizing agents cause death by 3 basic mechanisms:
(1) direct depression of neurons necessary for life function,
(2) hypoxia, and
(3) physical disruption of brain activity.
The euthanasia process should minimize or eliminate pain, anxiety, and distress prior to loss of consciousness. As loss of consciousness resulting from these mechanisms can occur at different rates, the suitability of a particular agent or method will depend on whether an animal experiences distress prior to loss of consciousness.

Ideally, euthanasia methods should result in rapid loss of consciousness, followed by cardiac or respiratory arrest and the subsequent loss of brain function. Loss of consciousness should precede loss of muscle movement.

Depending on the speed of onset of the particular agent or method used, release of inhibition of motor activity may be observed accompanied by vocalization and muscle contraction similar to that seen in the initial stages of anesthesia. Although distressing to observers, these responses do not appear to be purposeful. Once ataxia and loss of righting reflex occur, subsequent observed motor activity, such as convulsions, vocalization, and reflex struggling, can be attributed to the second stage of anesthesia, which by definition lasts from the loss of consciousness to the onset of a regular breathing pattern.

Hypoxia is commonly achieved by exposing animals to high concentrations of gases that displace oxygen (O2) such as…exposure to carbon monoxide (CO) to block uptake of O2 by RBCs.

As with other euthanasia methods, some animals may exhibit motor activity or convulsions following loss of consciousness due to hypoxia; however, this is reflex activity and is not consciously perceived by the animal.

In summary, the cerebral cortex or equivalent structure(s) and associated subcortical structures must be functional for pain to be perceived. If the cerebral cortex is nonfunctional because of neuronal depression, hypoxia, or physical disruption, pain is not experienced. Reflex motor activity that may occur following loss of consciousness, although distressing to observers, is not perceived by the animal as pain or distress.

Regardless of the euthanasia method chosen, animal remains must be handled appropriately and in accord with state and local law. Regulations apply not only to the disposition of the animal's remains (eg, burial, incineration, rendering), but also to the management of chemical residues (eg, pharmaceuticals [including but not limited to barbiturates, such as pentobarbital] and other residues, such as lead) that may adversely affect scavengers or result in the adulteration of rendered products used for animal feed. Use of pentobarbital invokes legal responsibilities for veterinarians, animal shelters, and animal owners to properly dispose of animal remains after death. Animal remains containing pentobarbital are potentially poisonous for scavenging wildlife, including birds (eg, bald and golden eagles, vultures, hawk species, gulls, crows, ravens), carnivorous

mammals (eg, bears, coyotes, martens, fishers, foxes, lynxes, bobcats, cougars), and domestic dogs. Federal laws protecting many of these species apply to secondary poisoning from animal remains containing pentobarbital.

Carbon Monoxide
Inhaled vapors and gases require a critical concentration within the alveoli and blood for effect; thus, all inhaled methods have the potential to adversely affect animal welfare because onset of unconsciousness is not immediate.

While overt behavioral signs of distress have been reported in some studies, others have not consistently found these effects. Through preference and approach-avoidance testing, all inhaled agents currently used for euthanasia have been identified as being aversive to varying degrees. Aversion is a measure of preference, and while aversion does not necessarily imply that the experience is painful, forcing animals into aversive situations creates distress.

Despite evidence of distress and aversion, inhaled anesthetics continue to be administered because the benefits associated with their use greatly outweigh any distress and/or aversion they may cause.

The suitability of any particular inhaled agent for euthanasia therefore depends largely on distress and/ or pain experienced prior to loss of consciousness. Distress can be caused by handling, specific agent properties, or method of administration, such that a 1-size-fits-all approach cannot be easily applied. Suffering can be conceptualized as the product of severity, incidence, and duration. As a general rule, a gentle death that takes longer is preferable to a rapid, but more distressing death; however, in some species and under some circumstances, the most humane and pragmatic option may be exposure to an aversive agent or condition that results in rapid unconsciousness with few or no outward signs of distress.

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The following contingencies are common to all inhaled euthanasia agents:
(1) Time to unconsciousness with inhaled agents is dependent on the displacement rate, container volume, and concentration. An understanding of the principles governing delivery of gases or vapors into enclosed spaces is necessary for appropriate application of both prefill and gradual displacement methods. The desired final concentration will be achieved more quickly by using a greater displacement rate.

(2) Loss of consciousness will be more rapid if animals are initially exposed to a high concentration of the agent. However, for many agents and species, forced exposure to high concentrations can be aversive and distressing, such that gradual exposure may be the most pragmatic and humane option.

(3) Inhaled agents must be supplied in purified form without contaminants or adulterants, typically from a commercially supplied source, cylinder, or tank, such that an effective displacement rate and/or concentration can be readily quantified. The direct application of products of combustion or sublimation is not acceptable due to unreliable or undesirable composition and/or displacement rate.

(4) The equipment used to deliver and maintain inhaled agents must be in good working order and in compliance with state and federal regulations. Leaky or faulty equipment may lead to slow, distressful death and may be hazardous to other animals and to personnel.

(5) Most inhaled agents are hazardous to animal workers because of the risk of explosions (eg, ether, CO), narcosis (eg, halocarbon anesthetics, nitrous oxide [N2O], CO2, asphyxiating gases), hypoxia (eg, asphyxiating gases, CO), addiction or physical abuse (eg, N2O, halocarbon anesthetics), or health effects resulting from chronic exposure (eg, N2O, CO, possibly halocarbon anesthetics).

(6) In sick or depressed animals where ventilation is decreased, agitation during induction is more likely because the rise in alveolar gas concentration is delayed. A similar delayed rise in alveolar gas concentration can be observed in excited animals having increased cardiac output. Suitable premedication or noninhaled methods of euthanasia should be considered for such animals.

(7) Neonatal animals appear to be resistant to hypoxia, and because all inhaled agents ultimately cause hypoxia, neonatal animals take longer to die than adults. Inhaled agents can be used alone in unweaned animals to induce loss of consciousness, but prolonged exposure time or a secondary method may be required to kill the unconscious animal.

(8) Reptiles, amphibians, and diving birds and mammals have a great capacity for holding their breath and for anaerobic metabolism. Therefore, induction of anesthesia and time to loss of consciousness when inhaled agents are used may be greatly

prolonged. Noninhaled methods of euthanasia should be considered for these species and a secondary method is required to kill the unconscious animal.

(9) Rapid gas flows can produce noise or cold drafts leading to animal fright and escape behaviors. If high flows are required, equipment should be designed to minimize noise and gas streams blowing directly on the animals.

(10) When possible, inhaled agents should be administered under conditions where animals are most comfortable (eg, for rodents, in a darkened home cage; for pigs, in small groups). If animals need to be combined, they should be of the same species and compatible cohorts, and, if needed, restrained or separated so that they will not hurt themselves or others. Chambers should not be overloaded and need to be kept clean to minimize odors that might cause distress in animals subsequently euthanized.

(11) Because some inhaled agents may be lighter or heavier than air, layering or loss of agent may permit animals to avoid exposure. Mixing can be maximized by ensuring incoming gas or vapor flow rates are sufficient. Chambers and containers should be as leak free as possible.

(12) Death must be verified following administration of inhaled agents. This can be done either by examination of individual animals or by adherence to validated exposure processes proven to result in death. If an animal is not dead, exposure must be repeated or followed with another method of euthanasia

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Carbon monoxide is a colorless, odorless gas that is nonflammable and nonexplosive at concentrations < 12%. Carbon monoxide is a cumulative poison that produces fatal hypoxemia; it readily combines with hemoglobin and blocks uptake of O2 by erythrocytes by forming carboxyhemoglobin. Precisely because it is insidious, difficult to detect, and highly toxic even at low concentrations, the lethal properties of CO have long been recognized.

Advantages—
(1) Carbon monoxide induces loss of consciousness without pain and with minimal discernible discomfort, depending on species.
(2) Hypoxemia induced by CO is insidious.
(3) Death occurs rapidly if concentrations of 4% to 6% are used.

Disadvantages—
(1) Carbon monoxide is an aversive agent for laboratory rodents and the same may be true for other species.
(2) Safeguards must be taken to prevent and monitor exposure of personnel.
(3) Electrical equipment exposed to CO (eg, lights and fans) must be spark free and explosion proof.

General recommendations—
Carbon monoxide is ACCEPTABLE WITH CONDITIONS for euthanasia, provided all of the following contingencies are met:
(1) Personnel using CO must be instructed thoroughly in its use and must understand its hazards and limitations.
(2) The CO chamber must be of the highest-quality construction and should allow for separation of individual animals. If animals need to be combined, they should be of the same species, and, if needed, restrained or separated so that they will not hurt themselves or others. Chambers should not be overloaded and need to be kept clean to minimize odors that might distress animals that are subsequently euthanized.
(3) The CO source and chamber must be located in a well-ventilated environment, preferably out-of-doors.
(4) The chamber must be well lighted and must allow personnel direct observation of animals.
(5) The CO flow rate should be adequate to rapidly achieve a uniform CO concentration of at least 6% after animals are placed in the chamber, except for those species (eg, neonatal pigs) where it has been shown that less agitation occurs with a gradual rise in CO concentration.
(6) If the chamber is inside a room, CO monitors must be placed in the room to warn personnel of hazardous concentrations.
(7) It is essential that CO use be in compliance with state and federal occupational health and safety regulations.
(8) Carbon monoxide must be supplied in a precisely regulated and purified form without contaminants or adulterants, typically from a commercially supplied cylinder or tank. The direct application of products of combustion or sublimation is not acceptable due to unreliable or undesirable composition and/or displacement rate. As gas displacement rate is critical to the humane application of CO, an appropriate pressure-reducing regulator and flow meter combination or equivalent equipment with demonstrated capability for generating the recommended displacement rate for the size container being utilized is absolutely necessary.

Sodium Pentobarbital

When it is being determined whether a particular drug and route of administration are appropriate for euthanasia, consideration needs to be given to the species involved, the pharmacodynamics of the chemical agent, degree of physical or chemical restraint required, potential hazards to personnel, consequences of intended or unintended consumption of the animal's remains by humans and other animals, and potential hazards to the environment from chemical residues. Many noninhaled euthanasia agents can induce a state of unconsciousness during which minimal vital functions are evident but from which some animals may recover. Therefore, as for any euthanasia method, death must be confirmed prior to final disposition of the animal's remains.

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Animals euthanized by chemical means must never enter the human food chain and should be disposed of in accord with local, state, and federal laws. Disposal of euthanized animals has become increasingly problematic because most rendering facilities will no longer take animals euthanized with agents that pose residue hazards (eg, barbiturates). The potential for ingestion of euthanasia agents is an important consideration in the euthanasia of animals that are disposed of in outdoor settings where scavenging by other animals is possible or when euthanized animals are fed to zoo and exotic animals. Veterinarians and laypersons have been fined for causing accidental deaths of endangered birds that ingested animal remains that were poorly buried. Environmental warnings must now be included on animal euthanasia drugs approved by the FDA Center for Veterinary Medicine.

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The use of injectable euthanasia agents is one of the most rapid and reliable methods of performing euthanasia. It is usually the most desirable method when it can be performed without causing fear or distress in the animal. When appropriately administered, acceptable injectable euthanasia agents result in smooth loss of consciousness prior to cessation of cardiac and/or respiratory function, minimizing pain and distress to the animal. However, heightened awareness for personnel safety is imperative when using injectable euthanasia agents because needle stick injuries involving these drugs have been shown to result in adverse effects (41.6% of the time); 17% of these adverse effects were systemic and severe. Intravenous injections deliver euthanasia agents directly into the vascular system, allowing for rapid distribution of the agent to the brain or neural centers, resulting in rapid loss of consciousness (for some invertebrates with closed circulatory systems, intrahemolymph injection is considered analogous to IV injection). When the restraint necessary for giving an animal an IV injection is likely to impart added distress to the animal or pose undue risk to the operator, sedation, anesthesia, or an acceptable alternate route or method of administration should be used. Aggressive or fearful animals should be sedated prior to restraint for IV administration of the euthanasia agent.

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Barbiturates depress the CNS in descending order, beginning with the cerebral cortex, with loss of consciousness progressing to anesthesia. With an overdose, deep anesthesia progresses to apnea due to depression of the respiratory center, and this is followed by cardiac arrest. All barbituric acid derivatives used for anesthesia are ACCEPTABLE for euthanasia when administered IV. There is a rapid onset of action, and loss of consciousness induced by barbiturates results in minimal or transient pain associated with venipuncture. Desirable barbiturates are those that are potent, nonirritating, long acting, stable in solution, and inexpensive. Sodium pentobarbital best fits these criteria and is most widely used, although others such as secobarbital are also acceptable. More research into the efficacy, speed of action, and nociceptive responses of nonvascular routes of barbiturate euthanasia solutions is needed before changes in recommendations for these alternate routes can be made.

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Advantages—

(1) A primary advantage of barbiturates is speed of action. This effect depends on the dose, concentration, route, and rate of the injection.
(2) Barbiturates induce euthanasia smoothly, with minimal discomfort for the animal.
(3) Barbiturates are less expensive than many other euthanasia agents.
(4) Food and Drug Administration–approved barbiturate-based euthanasia solutions are readily available.

Disadvantages—

(1) Intravenous injection is necessary for best results and this requires trained personnel.
(2) Each animal must be appropriately restrained.
(3) Current federal drug regulations require strict accounting for barbiturates, and these must be used under the supervision of personnel registered with the US DEA.
(4) An aesthetically objectionable terminal gasp may occur in unconscious animals.
(5) Some animals may go through an excitatory phase that may be distressing to observers.

(6) These drugs persist in the animal's remains and may cause sedation or even death of animals that consume the body.
(7) Tissue artifacts (eg, splenomegaly) may occur in some species euthanized with barbiturates.

General recommendations—
The advantages of using barbiturates for euthanasia in dogs and cats far outweigh the disadvantages. Intravenous injection of a barbituric acid derivative is the preferred method for euthanasia of dogs, cats, other small animals, and horses. Barbiturates are also acceptable for all other species of animals if circumstances permit their use. Intraperitoneal or intracoelomic injection may be used in situations when an IV injection would be distressful, dangerous, or difficult due to small patient size. Intracardiac (in mammals and birds), IM, intrahepatic, and intrarenal injections must only be used if the animal is unconscious or anesthetized.

Methods of Euthanasia: Companion Animals
Methods acceptable with conditions are equivalent to acceptable methods when all criteria for application of a method can be met.

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Intravenous injection of a barbituric acid derivative is the preferred method for euthanasia of dogs, cats, and other small companion animals…When IV access would be distressful, dangerous, or impractical…barbiturates and barbituric acid derivatives may be administered IP.

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Carbon monoxide can be used effectively for euthanasia when required conditions for administration can be met. These conditions can be challenging and costly to meet on a practical basis, and there is substantial risk to personnel (hypoxia) if safety precautions are not observed. Consequently, CO is ACCEPTABLE WITH CONDITIONS for use in institutional situations where appropriately designed and maintained equipment and trained and monitored personnel are available to administer it, but it is not recommended for routine euthanasia of cats and dogs. It may be considered in unusual or rare circumstances, such as natural disasters and large-scale disease outbreaks. Alternate methods with fewer conditions and disadvantages are recommended for companion animals where feasible.

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Altricial neonatal and preweanling mammals are relatively resistant to euthanasia methods that rely on hypoxia as their mode of action. It is also difficult, if not impossible, to gain venous access. Therefore, IP injection of pentobarbital is the recommended method of euthanasia in preweanling dogs, cats, and small mammals.

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Animal Control, Sheltering, and Rescue Facilities: The preferred method of euthanasia in these facilities is injection of a barbiturate or barbituric acid derivative with appropriate animal handling. When euthanizing animals that are well socialized without pre-euthanasia sedation or anesthesia, appropriate handling usually involves 2 trained people. One individual restrains the animal and the other administers the euthanasia agent. When euthanizing distressed, dangerous, or fractious animals, a sedative or anesthetic should be administered prior to attempting euthanasia. When the necessary restraint can be performed safely (appropriate handling techniques and equipment must be used), a pre-euthanasia sedative or anesthetic can be delivered IM or PO. After administration of the sedative or anesthetic, the animal is released so that it can return to a comfortable low-stress location (eg, dimly lighted cage or area) while the drug takes effect. Because of the diversity of animals received by shelters, technicians performing euthanasia must have a good understanding of animal behavior and restraint, the proper use of equipment, and the variety of euthanasia drugs available and their effects.

SMALL ANIMAL EUTHANASIA: UPDATES ON CLINICAL PRACTICE
Common and Alternative Routes of Euthanasia Solution Administration: Kathleen Cooney, DVM, MS, CHPV, CCFP
2019

Barbiturates: These agents are widely recognized as best practice because they are rapid acting, can be administered through various routes, and have a high percentage of reliability and irreversibility when given properly.

They are considered super potent anesthetics, acting on various inhibitory pathways so effectively that the time to death is expected in less than 1 minute when properly dosed directly into the venous system.

Desirable barbiturates are those that are potent, nonirritating, stable in solution, and inexpensive. Sodium pentobarbital best fits these criteria and is most widely used, although others such as secobarbital are also acceptable. Their biggest pitfall remains the contamination of the body following death. Barbiturate-laden carcasses remain a tangible threat when ingested by other living animals or when there is concern of soil contamination.

SMALL ANIMAL EUTHANASIA: UPDATES ON CLINICAL PRACTICE
Historical Perspective of Euthanasia in Veterinary Medicine: Kathleen Cooney, DVM, MS, CHPV, CCFP
2019

Noninhalant drug administration is our main form of euthanasia in traditional veterinary hospitals and really has been since the discovery and availability of barbiturates.

Barbiturates, the category of drug we use most commonly today, were the clear frontrunner in superior euthanasia experiences for both the pet and witnesses.

Deemed the gentlest of the "poisons," barbiturate overdoses lead to rapid unconsciousness, cessation of breathing, and cardiac arrest. Unconsciousness before cardiac arrest was a guarantee so veterinarians could be certain awareness of death was nonexistent for the dying animal. This class of drug met all of the 14 criteria of method selection, save for a few, and even then, proper storage of barbiturates and disposal of the body was all it took to keep them on the top of the pack.

HUMANE SOCIETY OF THE UNITED STATES
Euthanasia Training Manual: Rebecca H. Rhoades, DVM
2002

Sodium pentobarbital meets more of the AVMA criteria than any other euthanasia method. When administered properly, sodium pentobarbital is capable of causing death quickly and painlessly and may be used consistently and reliably with many species.

Its use requires close contact with each animal…it also takes a considerable toll on the human emotions.

All the disadvantages of sodium pentobarbital are against the people who administer it, while all the advantages are in favor of the animals. If there has to be a flaw in the way that a euthanasia method works, it seems appropriate that the animals should have the benefits while the humans should tolerate the deficiencies.

It is our responsibility to use the best method now available to us and to use it with skill, compassion, and consistency.

Euthanizing animals via compassionate handling and injection of sodium pentobarbital with the use of pre-euthanasia anesthetics when necessary is the most humane method available for animal shelters.

Carbon monoxide (CO), when delivered by a properly manufactured and equipped chamber, may be a conditionally acceptable method of euthanasia for some animals. The many limitations of CO make the method less practical, considerabley slower, and more expensive than lethal injection.

HUMANE SOCIETY VETERINARY MEDICAL ASSOCIATION

Euthanasia Via Gas Chambers: Michael Blackwell, DVM, MPH
October 22, 2014

The "conditions" for use of a gas chamber in a shelter setting generally cannot be met for two reasons:

1. the status of the animals, and
2. the inability to ensure administration of appropriate doses of the gases.

To the animals entering a shelter, it is a strange and unfamiliar environment that can be perceived as threatening. Thus, most animals in a shelter are not in a state of calm and relaxation that would be normal for them, for example, in a home environment or their natural habitat. In addition, many are physically ill or have been injured. Whether due to mental stress or physical abnormality, most animals in the shelter are compromised in ways that calls into question their ability to uptake gases at the proper rate to meet the "conditions" for a humane death. In these compromised states, the uptake and distribution of gases is not predictable. It is safe to assume that all wildlife is in a serious state of mental stress when presented to the shelter.

Any gas that is inhaled must reach a certain concentration in the lungs at a controlled rate before it can be effective in achieving a humane euthanasia. When multiple animals are placed in a gas chamber it is close to impossible for each one to receive the proper dose at the proper rate. One's placement inside the chamber will determine, in part, how much gas and at what rate it is received. It is a haphazard euthanasia experience that can be prolonged, painful, and ineffective. In stark contrast, euthanasia by injection of approved drugs can be done with a precision that ensures proper dosing, resulting in a humane death.

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As expanded upon in the manual, pre-euthanasia drugs can be critical to a humane death. "Ideally, every animal scheduled for euthanasia could be gently restrained for direct IV or IP injection of sodium pentobarbital. However, in reality not every animal can be safely handled with gentle physical restraint, and in some cases animals are so unsocialized or fearful that attempts at physical handling would sharply increase their level of stress. For those animals, pre-euthanasia drugs should be administered to render them unconscious before the lethal injection of sodium pentobarbital. Availability of the proper pre-euthanasia drugs and proper training regarding their use are therefore integral to the success of any euthanasia protocol."

COMPARISON OF SODIUM PENTOBARBITAL AND CARBON MONOXIDE AS EUTHANASIA AGENTS

Doug Fakkema, Consultant – American Humane Association
Date Undetermined

Under relatively high concentrations of CO, a non-aquatic mammal will quickly lose consciousness. The concentration should be 6% and time to unconsciousness less than a minute. When delivered properly, carbon monoxide gas does not "sear" the lungs or cause conscious choking or gasping. On the contrary, CO from a bottled and pressurized source is breathed in with little sensation (taste or otherwise). Red blood cells have a high attraction for CO. When breathed in, CO immediately binds itself tightly to the red blood cell. Once bound up with CO, the red blood cell cannot carry its usual passenger, oxygen and the result is a rapid reduction of oxygen to the tissues and brain. Hypoxia (reduced oxygen -- do not confuse with suffocation or asphyxia) sets in within seconds and the animal feels sleepy and soon falls asleep, then unconscious then dies.

COMPENDIUM: CONTINUING EDUCATION FOR VETERINARIANS

An Education in Euthanasia
Robert J. Neunzig, DVM, DABVP
Compendium Editorial Board Member
December 2007

As veterinarians, we are often asked about many aspects of animal care and needs. When responding, it is important to rely on science as well as personal experience and not on emotional perceptions that may not be based on scientific or practical reality. One area in which this is certainly true is euthanasia of animals. Veterinarians are no strangers to euthanasia. In our practices, we euthanize animals for a variety of reasons nearly every day. Sadly, however, when it comes to euthanasia in animal shelters, most of us are quite naïve. I hope that this editorial will introduce veterinarians to an area of euthanasia in which most have minimal training and/or personal experience: carbon monoxide euthanasia in the shelter setting.

Animal shelter euthanasia has a long and, in many cases, unpleasant past. Animals have been euthanized by many horrific methods that, fortunately, are no longer allowed or tolerated in modern animal shelters. Still, there are places in the United States where euthanasia is not practiced to the standards that compassionate people would desire. For this reason, it is important that veterinarians become aware of the challenges and differences of animal shelter euthanasia compared with hospital euthanasia. However, I caution readers to be sure that when researching animal shelter euthanasia, they are looking at today's more regulated, more humane euthanasia procedures and not at sources that sell the horrific past as today's problems.

To ensure the most humane euthanasia for a broad variety of animal types, ages, medical conditions, and temperaments as well as a safe environment for animal shelter personnel, we should insist that all acceptable types of euthanasia be performed in accordance with the AVMA guidelines on euthanasia. I also submit that despite what one might perceive or read, euthanasia via lethal injection is not always the most humane method of euthanasia. There are those who advocate that all animal shelters be limited to lethal injection only and that all other types of euthanasia be banned in the shelter setting. Based on my observations of over 20 years' experience working with a local animal control department, I am convinced that embracing this philosophy would not guarantee the most humane method of euthanasia for all shelter animals.

One must recognize that there is a great difference between euthanizing a beloved pet in a quiet room with people the pet knows and trusts and euthanizing animals that are feral or poorly socialized or that have lived with limited handling. There is also a big difference between highly trained doctors euthanizing individual pets and euthanizing large numbers of animals at one time, often with limited personnel who may also have limited training. These differences create many challenges that must be overcome if humane euthanasia is to be accomplished.

Some of these challenges can be addressed through the use of carbon monoxide euthanasia. I recently had the opportunity to witness this procedure and to compare it with lethal injection. The following are a few of my observations:

Sometimes, the less handling, the better and safer. My first experience of observing carbon monoxide euthanasia involved a very large, very aggressive, and dangerous dog. Using a long catchpole, the animal shelter staff placed a noose over the dog's head and walked the dog into the carbon monoxide chamber. The dog did not panic. It walked into the chamber, the carbon monoxide was introduced, and within 30 to 45 seconds, the dog was unconscious. It died a few moments later. My postmortem examination revealed no elimination of urine, feces, or anal sac secretions or any form of struggle. The animal truly died with very little added stress.

There is security in the pack. Poorly socialized or just frightened animals will often remain calm if left in small groups. I participated in euthanizing a group of unruly cats by a variety of means. We snared and gave intraperitoneal injections to one group, as they were too wild to safely receive an intravenous injection. Many of these animals took more than 30 minutes to die, probably as a result of the catecholamine release while they were being caught. Others were injected with a sedative just so they could be handled. We took a group of these cats and placed them in a carbon monoxide chamber. As soon as the cats were in the chamber cart, they huddled together. We placed about five cats in a large cart, and, interestingly, once together they settled down and seemed to relax. Just like the dog, they were unconscious within 30 to 45 seconds of receiving the bottled carbon monoxide and died a few minutes later. My postmortem examination of these cats found them to be in the exact places they were in when wheeled into the chamber. Like the dog, there was no urine spray, bowel or anal sac evacuation, or indication that these animals had tried to escape or had experienced anything less than a peaceful death. With these intractable cats, there was no question that carbon monoxide was the most humane method of euthanasia that day. We saw this same kind of group relaxation when euthanizing dogs in small numbers.

Vocalization is not necessarily synonymous with pain. According to the AVMA guidelines on euthanasia as well as texts on anesthesia, once an animal is unconscious, it feels no pain. This is an important point because with carbon monoxide as well as lethal injection euthanasia, animals often vocalize even though they are unconscious. For the untrained person, this can be very disturbing.

Lethal injection does not always mean intravenous injection. Unfortunately, because many shelter animals are nervous or poorly socialized and may have badly matted coats or difficult veins, trying to hit a vein in these animals is often much harder than in private practice. The difficulty in being able to predictably hit a vein often makes it necessary to rely on other methods, such as intraperitoneal or intracardiac (after sedation) injection. Because these methods take much longer to induce unconsciousness than either intravenous injection or carbon monoxide, they could be considered more stressful to the animal.

Today, the method of euthanasia in animal shelters across the United States has become quite controversial, and much of the rhetoric has an agenda to severely limit the method of euthanasia to lethal injection. Sadly, most proponents of this agenda

perceive each animal sitting quietly while it receives an intravenous injection. This kind of thinking is quite naïve and will ultimately result in many animals dying with greater stress.

I would encourage my colleagues to learn about their local animal shelter's euthanasia and general operating procedures. I would further encourage them to review the AVMA guidelines on euthanasia. Finally, as unpleasant as it might be, I would encourage anyone planning to comment on animal shelter euthanasia to actually witness such euthanasia first. I can assure you that it will not be a nice day, but it will be a real education.

THE HUMANE SOCIETY OF THE UNITED STATES
Euthanasia of Dogs and Cats with Carbon Monoxide
1985

Euthanasia by Carbon Monoxide

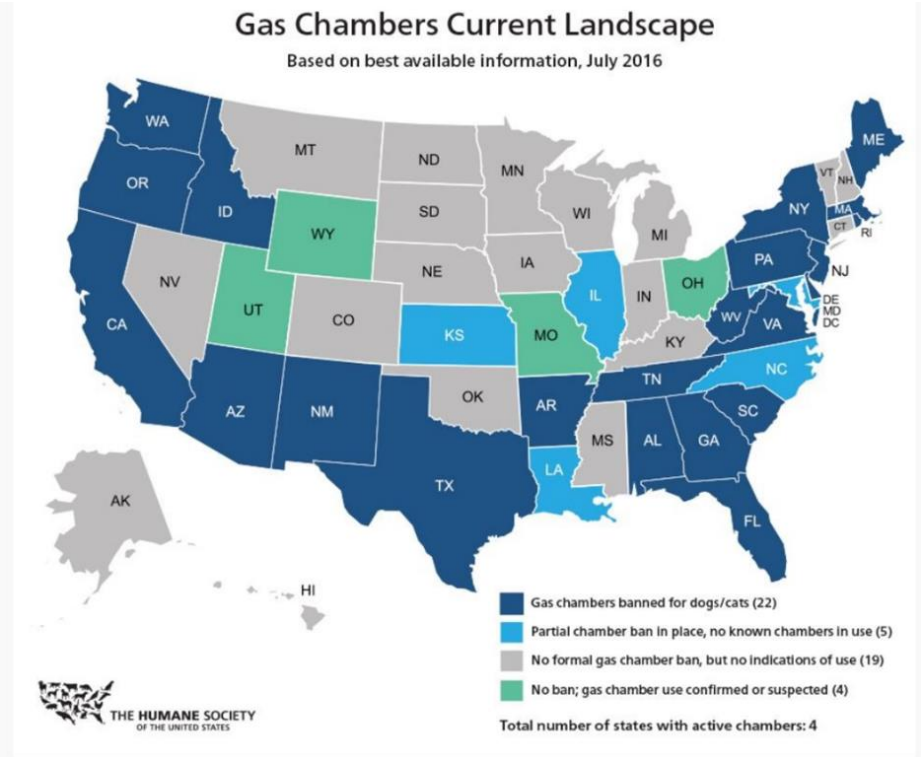
When an adult animal is exposed to an atmosphere with an approximate 5% concentration of carbon monoxide, its breathing brings the gas into contact with the red blood cells. Carbon monoxide is 200 times more soluble than oxygen in the red blood cell. The carbon monoxide easily attaches itself to the hemoglobin molecule in the red blood cell, greatly reducing the cell's capability to carry oxygen.

Due to oxygen deprivation, unconsciousness occurs within 45-60 seconds, and death occurs within 2-4 minutes. Studies show that concentrations of carbon monoxide higher than 5% do not expedite unconsciousness and are not necessary.

The majority of medical experts advise that this is a painless experience. This is based largely on human exposure cases that indicate a lack of awareness of the onset of the effects of the gas. These individuals reach unconsciousness, but upon recovery do not recall suffering any pain or distress prior to losing consciousness.

Because of the psychological impact on the personnel, it is important that personnel comprehend fully the process of an animal's physical reaction to exposure to carbon monoxide.

It should be noted that carbon monoxide causes involuntary muscular movements including vocalization as the animal is passing through what is called Stage II of anesthesia. At this point the animal is already unconscious. The first of these stages is analgesia. The majority of veterinary experts feel that any reaction by the animal occurs after this stage and there is a negligible possibility of pain perception. The latter stages of anesthesia and total unconsciousness further substantiate this statement.



NORTH CAROLINA RESPONSIBLE ANIMAL OWNERS ALLIANCE

Understanding Shelter Euthanasia
Date Undetermined

MYTH: Gas is pumped in and the animals die slowly and painfully of suffocation.
FACT: They do not suffocate, they do not cry out "in pain". What they do is quickly lapse into unconsciousness as they do with sodium pentobarbital. Carbon monoxide is odorless and tasteless; in a properly designed chamber it results in unconsciousness in less than 12 seconds. There is no sensation of "gasping" for their last breath. Carbon monoxide binds with the hemoglobin on the red blood cells preventing transportation of oxygen to the brain and carbon dioxide away from the brain cells.

From the AVMA Guidelines on Euthanasia:
"Advantages –

(1) Carbon monoxide induces loss of consciousness without pain and with minimal discernible discomfort.
(2) Hypoxemia induced by CO is insidious, so that the animal appears to be unaware.
(3) Death occurs rapidly if concentrations of 4 to 6% are used.

MYTH: Animals panic and try to claw their way out. They cry and howl.
FACT: Vocalization is not necessarily synonymous with pain. According to the AVMA guidelines on euthanasia as well as texts on anesthesia, once an animal is unconscious, it feels no pain. This is an important point because with carbon monoxide as well as lethal injection euthanasia, animals often vocalize even though they are unconscious. For the untrained person, this can be very disturbing.

MYTH: Euthanasia by injection is painless and far more humane.
FACT: A false assumption is that injection is painless. Needles hurt. Most activists think of cats and dogs in comparison to their beloved pets. These are NOT what make up the majority of animals euthanized. Most of the animals have little to no training or socialization, or are aggressive by nature, or are feral with no desire to be even close to, let alone handled by, any human. This often requires other control devices such as squeeze cages, gloves, catch poles, nets, dart guns, injectable sedatives to be administered just so the animal can be restrained for the lethal material to be administered. The level of anxiety and emotional stress for an animal fearful of being handled is actually much greater during the injection process than if the animal were calmly walked into a chamber.

TEXAS DEPARTMENT OF STATE HEALTH SERVICES

Alternative Euthanasia Methods – Wendy Blount, DVM
May 2017

Carbon monoxide euthanasia is considered unacceptable by HSUS when:

- In states where shelters can legally attain pentobarbital
- For euthanasia of animals who are
  - Geriatric
  - Under the age of four months;
  - Sick or injured; or
  - Pregnant
- Debilitated animals may have poor circulation, delaying the effects of CO, causing distress.
- Juvenile animals may not have the lung capacity to inhale enough CO to be effective quickly.
- It is likely that the pregnant mother will die from exposure to CO before the unborn puppies/kittens, who will die by suffocation, an unacceptable method.

Sound of gas rushing in can frighten dogs and especially cats.

Just like re-dosing of pentobarbital (sometimes multiple redoses) is necessary to achieve death, redosing gas is sometimes necessary.

Re-dosing with sodium pentobarbital is achieved almost always while the patient is unconscious. – If the patient is not unconscious, he/she can usually be rendered unconscious very quickly.

Redosing of CO is only after the entire CO cycle has been finished (30 minutes), and those that are not successfully killed have begun or completed the recovery process.

PHYSIOLOGIC MEASURES OF ANIMAL STRESS DURING TRANSITIONAL STATES OF CONSCIOUSNESS

Robert E. Meyer - College of Veterinary Medicine, Mississippi State University
August 7, 2015

Unconsciousness, whether induced by anesthesia or methods associated with euthanasia, humane slaughter, and depopulation methods, is the singular result of three potential basic mechanisms: (1) direct pharmaceutical effect on the central nervous system; (2) hypoxia; and (3) physical disruption of brain activity; death subsequently follows as the circulatory and respiratory centers fail, or as hypoxia or reduced pH render intracellular processes nonfunctional. However, as loss of consciousness occurs at substantially different rates with various methods, the suitability of any particular agent or method depends largely on whether pain or distress is experienced prior to loss of consciousness.

Stress and the resulting responses have been divided into three phases. Eustress results when harmless stimuli initiate adaptive responses that are beneficial to the animal. Neutral stress results when the animal's response to stimuli causes neither harmful nor beneficial effects to the animal. Distress results when an animal's response to stimuli interferes with its well-being and comfort. Distress may be created by conditions experienced prior to loss of consciousness (e.g., transport conditions, environment, or restraint), or by conditions under which methods are applied (e.g., gradual displacement application of gas/vapor or immersion into a high gas/vapor concentration).

It is important to note stress responses to agents or conditions may be highly variable between phyla (e.g., avian vs. mammalian species), between species within the same phyla, and even within species.

Distress may manifest behaviorally (e.g., overt escape behaviors, approach-avoidance preferences [aversion]) or physiologically (e.g., movement, vocalization, changes in electroencephalographic activity, heart rate, sympathetic nervous system [SNS] activity, hypothalamic-pituitary axis [HPA] activity), such that a one-size-fits-all approach cannot be easily applied to evaluate humaneness of methods or determine specific species applications.

While methods to assess pain and distress have come a long way since 1847, we still lack simple, effective, and incontrovertible means to objectively evaluate the animal experience during the transition to unconsciousness. The purpose of this review is to discuss methods of evaluating stress in animals using physiologic methods, with emphasis on the transition between the conscious and unconscious states.

Pain is defined as a conscious perception. Pain is quite subjective in the sense that individuals can differ in their perceptions of intensity as well as in their physical and behavioral responses. The International Association for the Study of Pain (IASP) describes pain as: "An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. Activity induced in the nociceptor and nociceptive pathways by a noxious stimulus is not pain, which is always a psychological state, even though we may well appreciate that pain most often has a proximate physical cause."

Based on mammalian models, the perception of pain requires nerve impulses from peripheral nociceptors to reach an awake, functioning cerebral cortex and associated subcortical brain structures. Impulses from peripheral nociceptors are conducted by primary afferent fibers to either the spinal cord or the brainstem and two general sets of neural networks. Reflex withdrawal and flexion in response to nociceptive input is mediated at the spinal level, while ascending nociceptive pathways carry impulses to the reticular formation, hypothalamus, thalamus, and cerebral cortex (somatosensory cortex and limbic system) for conscious sensory processing and spatial localization. This distinction is important, in that movements observed in response to nociception can be due to spinally-mediated reflex activity (unconscious), cerebral cortical and subcortical processing (conscious), or a combination of the two.

In humans, onset of anesthetic-induced unconsciousness has been functionally defined by loss of appropriate response to verbal command; in animals, loss of consciousness is functionally defined by loss of the righting reflex (LORR), also called loss of position (LOP). This definition, introduced with the discovery of general anesthesia over 160 years ago, is still useful because it is an easily observable, integrated whole-animal response which is applicable to a wide variety of species.

Generalized seizures, while unpleasant to watch, are associated with complete loss of awareness and consciousness.

Emerging evidence now suggests that, in unconscious anesthetized animals, movement in response to noxious stimulation is due to spinally mediated reflex activity and abolished primarily by means of anesthetic action in the spinal cord, rather than the cerebral cortex. Human and animal studies confirm that amnesia is produced, and conscious awareness is blocked, at less than half the anesthetic concentration required to abolish physical movement…

Once consciousness is lost, subsequent activities, such as seizures, vocalization, reflex struggling, breath holding, and tachypnea, can be attributed to the "excitement" phase or anesthesia stage 2, which by definition lasts from loss of consciousness to the onset of a regular breathing pattern. Thus, vocalization and non-purposeful movements observed following LORR/LOP are not necessarily signs of conscious perception by an animal.

While heart rate and the ECG are often reported as conservative estimates of time of death, neither heart rate nor ECG provide information as to the state of consciousness... responses to systemic stressors associated with immediate survival, such as hypoxia and hypercapnia, are likely relayed from brainstem nuclei and are not associated with higher order CNS processing and conscious experiences.

The usefulness of LORR/LOP as an easily observable proxy for loss of animal consciousness was recently reinforced when a reduction in alpha: Delta brain wave ratios was found to coincide with LOP in chickens.

That cortisol, lactate, and norepinephrine levels were similar with both physical and inhaled methods illustrates the difficulty in differentiating conscious from unconscious distress where interpretation is complicated by continued exposure to the inhaled agent during the transitional period between loss of consciousness and death.

AMERICAN JOURNAL OF VETERINARY RESEARCH
Physiologic and Behavioral Evaluation of CO Euthanasia of Adult Dogs: A. Chalifoux, A. Dallaire
December 1984

Based on these observations, a precise time could not be set for unconsciousness. A gray zone, during which vocalization and agitation occurred for approximately 20 to 25 s, was 3 to 8 s in 10 dogs. These behavioral manifestations could still occur in the conscious phase.

CANADIAN VETERINARY JOURNAL
Survey of Euthanasia Practices in nimal Shelters in Canada
January 2011

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.

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

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.

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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 and the possibility that animals show distress before they become unconscious.

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The quality of euthanasia does not depend solely on the method, but also on the circumstances of euthanasia and the method of restraint. 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.

THE STANDARD EXAMINER
Weber County's Animal Gas Chamber a Rarely Used Relic
August 23, 2017

Over the years, shelter managers have preferred keeping access to the gas chamber, said Lt. Nathan Hutchinson of the Weber County Sheriff's Office, which is responsible for the shelter. "Sometimes they were breaking needles off and having to poke the animal again," Hutchinson said.

TRIBUNE BUSINESS NEWS
Euthanasia Debate: Walker, J.D. McClatchley
February 2014

In the letter of clarification issued on Feb. 26, 2013, the AVMA stated: "In the 2013 Guidelines, euthanasia by intravenous injection of an approved euthanasia agent remains the preferred method for euthanasia of dogs, cats, and other small companion animals. Gas chambers are not recommended for routine euthanasia of cats and dogs in shelters and animal control operations. The guidelines state that 'alternate methods with fewer conditions and disadvantages are recommended for companion animals where feasible.' "

In her call to rally, advocate Angela Wade-Allred cited information on the dangers to staffers using carbon monoxide gas at shelters. She reported in 2009, a shelter worker was put in the emergency room when a gas build-up caused the door of the Lincoln County shelter to explode open. In 2008, an explosion occurred in a gas chamber at Iredell County, she reported. However, lethal injection poses problems to staffers as well. The AVMA manual reports, "Heightened awareness for personnel safety is imperative when using injectable euthanasia agents because needle-stick injuries involving these drugs have been shown to result in adverse effects (41.6 percent of the time); 17 percent of these adverse effects were systemic and severe." Richard Wells, Randolph County manager, said he is aware of one incident at the county animal shelter when two shelter technicians were seriously injured while trying to euthanize an animal by lethal injection. The animal became difficult to control. The syringe broke and deadly chemicals were thrown into the technicians' faces.

Cooper said, in her experience, there is a risk to every method used. She said, in her mind, it should be about what is best for the animal. The county uses both methods, she said. It depends on the circumstances with each animal.

Albourn said, while she firmly believes EBI is the best method to use, some animal advocates go too far. They are using old pictures and videos that expose methods that are no longer in use. Such tactics do little to further the cause of animal welfare, she said.

THE ASSOCIATION OF SHELTER VETERINARIANS
Guidelines for Standards of Care in Animal Shelters
2010

The use of carbon monoxide as a method of euthanizing dogs and cats in shelters is unacceptable due to multiple humane, operational and safety concerns (ASV position statement on euthanasia, 2010; NACA 2010). As mentioned previously, an acceptable method of euthanasia must be quick and painless, and should not cause distress. Any gas that is inhaled must reach a certain concentration in the lungs before it can be effective (AVMA 2007). The high gas flow rates necessary to achieve the recommended concentration of 6% can result in noise levels that frighten animals. Placing multiple animals in a chamber may frighten and distress the animals and dilute the effective concentration of carbon monoxide that each animal receives, creating a haphazard euthanasia experience that can be prolonged, painful and ineffective. Agents inducing convulsions prior to loss of consciousness are unacceptable for euthanasia (AVMA 2007). Carbon monoxide stimulates motor centers in the brain and loss of consciousness may be accompanied by convulsions and muscular spasms (AVMA 2007). One 1983 study of the effects of a 6% concentration of carbon monoxide on dogs could not establish the precise time that loss of consciousness occurred, and dogs were observed to be vocalizing and agitated (Chalifoux 1983). Carbon monoxide is extremely hazardous to human health because it is toxic, odorless and tasteless; it also has the potential to cause an explosion at high concentrations (AVMA 2007; NIOSH 2004). The death of at least one shelter worker using carbon monoxide has been documented (Rhoades 2002; Gilbert 2000; HSUS 2009b; NIOSH 2004). Chronic exposure to low levels of carbon monoxide can also cause serious human health problems (AVMA 2007).

CANADIAN JOURNAL OF COMPARATIVE MEDICINE
Premedication of Dogs with Acepromazine or Pentazocine Before Euthanasia with Carbon Monoxide
March 22, 1984

Euthanasia of unwanted or sick animals should always be done in a humane manner. This study involving two groups of 12 dogs evaluated a two-step method of euthanasia using first acepromazine or pentazocine then inhalation of carbon monoxide. During the experiment, behavioral reactions (anxiety, agitation, vocalization and sphincter relaxation) and physiological parameters (electroencephalogram, electrocardiogram, arterial blood pressure, respiratory and heart rates and serum cortisol) were monitored. The results showed that both drugs modified many behavioral reactions and physiological changes associated with administration of carbon monoxide. Acepromazine and pentazocine reduced by 25% and 20% respectively the number of dogs that showed vocalization and agitation. In acepromazine premedicated dogs, the duration of these signs was significantly diminished and sphincter relaxation did not occur in more than 50% of cases. Furthermore, with the use of acepromazine, no significant peaks or drastic drops were noticed in the heart and respiratory rates and in the arterial blood pressure. These manifestations are usually related to stress. In light of these results, it is recommended to premedicate dogs with acepromazine before submitting them to euthanasia by carbon monoxide inhalation.

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Certain results obtained during this phase of our research project corroborate those obtained in the first part of our work evaluating CO euthanasia without premedication. For instance, in dogs premedicated with acepromazine, the preexperimental manipulations were shown, by an increase of the serum cortisol levels, to be more stressful to the animal than the effect of CO itself.

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Acepromazine did not modify the secretion rate of cortisol. Similar serum cortisol levels were obtained when CO alone was used. This part of the experiment confirms again the marked influence of the preexperimental handling of the dogs on serum cortisol levels.

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After pretreatment with either drugs followed by CO inhalation, the respiratory rate gradually decreased showing no peak or sharp drops. When CO alone was used, significant variations (increases and decreases) were found in many behavioral manifestations and physiological parameters. These findings could indicate an acute stress or a functional exhaustion of organs.

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In view of the present study, it is recommended that a two-step method be used for dogs submitted to euthanasia by CO inhalation. The method favored would be i) pretreatment of dogs with acepromazine and ii) inhalation of CO. Acepromazine reduced the number of dogs showing vocalization and agitation, and shortened the duration of these signs. Acepromazine also prevented the precipitous fall in heart rate and arterial blood pressure. A secondary advantage of acepromazine is its disponibility.

THE HUMANE SOCIETY OF THE UNITED STATES

The Present Status of Euthanasia by Nonanesthetis Gases
Harry C. Rowsell: Professor – Faculty of Medicine, University of Ottawa
Date Undetermined

Although the nonanesthetic gases are widely used and have been acclaimed by numerous animal welfare agencies such as the American Humane Association (carbon monoxide, nitrogen), the Universities Federation for Animal Welfare and some affiliates of the Canadian Federation of Humane Societies, controversy is developing concerning their acceptability.

These nonanesthetic gases for euthanasia require additional research before they can be accepted as fulfilling the criteria of a humane method for euthanasia. Furthermore, they should not be used on newborn puppies or kittens, for these animals have been accustomed to low oxygen levels in the uterus and are resistant to hypoxic conditions.

CORNELL UNIVERSITY COLLEGE OF VETERINARY MEDICINE

Facts About Euthanasia: Dr. Laura Eirmann
Date Undetermined

The euthanasia solution is usually a barbiturate- the same class of drugs used for general anesthesia. At a much higher dose, this solution provides not only the same effects as general anesthesia (loss of consciousness, loss of pain sensation), but suppresses the cardiovascular and respiratory systems. As the solution is injected, the animal loses consciousness and within minutes the heart and lungs stop functioning. Since the pet is not conscious, they do not feel anything. Most times, the animal passes away so smoothly, that it is difficult to tell… Many owners who chose to stay with their pets are surprised how quickly and easily the pet is put to rest.

UNITED STATES FISH AND WILDLIFE SERVICE

Secondary Pentobarbital Poisoning of Wildlife: Betsy Krueger, DVM, Kirsten Krueger, Ph.D.
Date Undetermined

Pentobarbital-euthanized Carcasses are Poisonous to Scavenging Animals! Euthanasia by sodium pentobarbital injection is a humane way to end the life of a suffering animal, and is recommended for many species by the AVMA Panel on Euthanasia.1 Ironically, this compassionate act can sometimes have the unintended consequence of causing the premature death of other animals. Each year a number of bald and golden eagles, other wildlife, and domestic dogs are intoxicated or killed after ingestion of pentobarbital residues in the tissue of exposed euthanized carcasses. Exposure of these carcasses is almost always the result of improper disposal. Eagle and other animal deaths have been reported in 16 different states throughout the US as well as in Canada. In recent years at least 50 eagle poisoning incidents have been documented, accounting for the poisoning of 139 eagles in these cases alone. These birds had scavenged carcasses of euthanized farm animals or pet horses left out in the field, or small animal carcasses that were left unburied or otherwise exposed at landfills.

When an animal is euthanized via pentobarbital injection, the drug is quickly distributed throughout its body. Well-vascularized organs such as the liver will have especially high concentrations of pentobarbital, but other tissues will also contain residues. When a scavenger feeds on the carcass, the degree of intoxication will depend on the amount and type of tissue ingested. A lethal dose for a bird would generally be much lower than the amount administered to euthanize the source carcass. In fact, large animal carcasses may contain enough accessible residues to kill at least two tiger-sized mammals.

There are several federal statutes that may be violated in these cases, including the Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act (EPA), and the Endangered Species Act (ESA). MBTA protects virtually all wild avian species, parts thereof, eggs and nests, and excludes only a few introduced species. EPA protects bald and golden eagles, parts thereof, eggs and nests. ESA protects all threatened and endangered plant and animal species as well as critical habitat areas.

Criminal penalties can run as high as $250,000 per individual, or $500,000 per organization under MBTA and EPA, and may include imprisonment for up to 2 years. The acts also provide for forfeiture of vehicles and equipment under some circumstances. In civil cases maximum fines range from $500 (for “any” violation) to $25,000 (for a “knowing” violation) under ESA and up to $5000 for any violation of EPA.

TEXAS DEPARTMENT OF STATE HEALTH SERVICES

Pentobarbital Euthanasia: Wendy Blount, DVM
May 2017

Pentobarbital:

- Ideal euthanasia solution must stop the brain prior to stopping the heart
- The brain is the destination of the ideal euthanasia solution

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Time to unconsciousness:

- 1 – 3 minutes when injected IV
- 5 minutes when injected IP

Time to respiratory arrest:

- 1-3 minutes when injected IV
- 5-7 minutes when injected IP

Time to cardiac arrest:

- 3-5 minutes when injected IV
- Usually 12-15 minutes, but up to 30 minutes when injected IP

Safeguarding Pentobarbital:

- Euthanasia solution has been used to commit suicide and murder
- Be extremely careful to keep this drug locked up, as you would a gun
- Euth techs and veterinarians know how to kill with this drug
- All they need is motive and access
- There is also potential for abuse, or monetary gain by selling on black market
- Secondary poisoning of pet and wildlife can occur

WORLD SOCIETY FOR THE PROTECTION OF ANIMALS

Methods for the Euthanasia of Dogs and Cats: Comparison and Recommendations
1985

Recommended Method: Intravenous (IV) injection of 20% Pentobarbitone solution

- Regarded as 'best practice'
- Rapid acting
- Rapid loss of consciousness, followed by cardiac arrest
- May be used in combination with a pre-euthanasia drug if required for fearful, fractious or aggressive animals
- No distressing side effects
- Requires training
- Relatively cheap

Not Acceptable Method: Inhalation of Carbon Monoxide

- Slow acting
- Highly variable time taken to lose consciousness and can take up to two minutes at 6% concentration
- Death by hypoxia
- Vocalisations and agitation observed in dogs and this may occur while they are still conscious
- Distressing side effects observed in cats during induction
- Animals less than 4 months of age and sick or injured animals may have some resistance to hypoxia caused by exposure to CO
- Requires specially constructed chambers that are diligently maintained and are operated to safeguard animal welfare and human safety
- Requires a pure source of CO such as cylinder gas
- Potential danger to operators either through repeated exposure of low concentrations when operating the chamber or through accidental exposure to a lethal dose
- Sufficient animal welfare and human safety concerns that this method cannot be recommended for euthanasia

Recommended: Barbiturates

Barbiturates act by depressing the central nervous system, starting with the cerebral cortex, which causes rapid loss of consciousness progressing to anaesthesia (Beaver et al., 2001). Their efficacy as anaesthetic agents free from distressing side effects is widely recognised. With sufficient dosages (overdose) barbiturates induce respiratory and cardiac arrest by depressing the centres within the central nervous system that control these life-maintaining functions.

For euthanasia of dogs and cats, barbiturates that have been specifically formulated as euthanasia agents are preferred. The intravenous injection of 20% Pentobarbitone solution is regarded as the most humane method of euthanasia for dogs and cats (Reilly, 1993; Close et al., 1997; Beaver et al., 2001; European Food Safety Authority, 2005) (see Annex 2). Dogs and cats are simply 'put to sleep'; there is no audible or other expression of pain. In some individuals a terminal gasp may occur when the animal is unconscious and although this may distress some observers, it is not an expression of pain or discomfort, merely a reflex action. Pentobarbitone is easy to use, relatively cheap and safe for the operator (provided that it is not misused, e.g. deliberately self-injected).

When the restraint necessary for giving an intravenous injection would distress an animal or pose undue risk to the operator then prior sedation or anaesthesia (pages 13–14) or other accepted alternative routes of administration should be employed (Beaver et al., 2001).

In an emergency situation the drug can be injected directly into the peritoneal cavity (intraperitoneal). The time taken for the animal to lose consciousness and die (15–30 minutes) is longer than if the drug is given intravenously (a few seconds). A higher dose of Pentobarbitone is required for intraperitoneal euthanasia (Grier and Schaffer, 1990; Sinclair, 2004) and it can cause irritation to the peritoneum, but this can be avoided if the drug is combined with a local anaesthetic.

There are no published reports on the use of intraperitoneal injection in dogs; nevertheless Sinclair (2004) provides anecdotal accounts that dogs struggle more than cats; repeatedly attempting to right themselves during the induction phase. For this reason intraperitoneal injection may be unsuitable for larger animals.

While most cats, kittens and puppies appear to advance more smoothly to unconsciousness than adult dogs, they should be closely monitored, and confined to a warm, dark, quiet place to facilitate distress-free induction. The combination of Pentobarbitone and Phenytoin (a cardiotoxic anticonvulsant drug) may be unsuitable for intraperitoneal injection, because of concerns over the differential absorption rates of the two compounds (Sinclair, 2004). The effects of Phenytoin on the heart may occur before the Pentobarbitone component has caused unconsciousness (Fakkema, 1999 cited by Sinclair, 2004).

The technique for intrahepatic injection of Pentobarbitone has been reported by Grier and Schaffer (1990). When correctly administered, its action is considerably faster in comparison to injection via the intraperitoneal route, with cardiac standstill being reported within 11–14 minutes. However, performing accurate intrahepatic injection is technically difficult and may cause animals discomfort (Sinclair, 2004). Administration outside of the target organ (the liver) is associated with excitement, which may also be distressing to the operator (Grier and Schaffer, 1990).

Injection of 20% Pentobarbitone directly into the heart (intracardiac) may be suitable in collapsed, unconscious animals. However, this requires skill and knowledge of anatomy because failure to inject into the correct place will cause pain. It should only be used by experienced technicians in an emergency.

It may be appropriate to administer liquid form of a suitable concentration of Pentobarbitone orally (by mouth) to neonatal puppies and kittens (within the first few hours/days of life) for euthanasia, as intravenous access is difficult. The time taken for effect is longer than if administered intravenously.

It should be noted that the time taken for oral administration of Pentobarbitone to reach its maximum effect is prolonged (30–90 minutes) and highly variable between individuals given the same dose (Ramsay and Wetzel, 1998). In addition to the lengthy induction time, other undesirable side effects may make this method unsuitable for routine use, for instance some dogs may struggle prior to becoming fully sedated (Ramsay and Wetzel, 1998).

Oral administration of Pentobarbitone for euthanasia of juvenile or adult dogs and cats is unsuitable. It may, however, be used to produce sedation or light anaesthesia to precede intravenous injection of Pentobarbitone for the euthanasia of fractious or aggressive animals (Ramsay and Wetzel, 1998; Sinclair, 2004).

Some euthanasia products have been formulated to use barbiturates combined with a local anaesthetic agent or Phenytoin. The pharmacological differences are inconsequential when injected intravenously but such compounds may be more easily obtained in some countries.

WSPA considers the use of intravenous Pentobarbitone for euthanasia of dogs and cats as 'best practice' (Annex 1, Annex 2) and its use is strongly recommended provided that it is legally permissible and operators have been given appropriate training. However, suitable barbiturates are not always available and in these circumstances WSPA urges veterinary authorities, animal welfare organisations and governments to strive to make these drugs legally and easily available to the relevant professionals.

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Not Acceptable: Carbon Monoxide

Methods of generating carbon monoxide (CO) gas for euthanasia of animals have included chemical interaction arising from combining sulphuric acid and sodium formate and the use of exhaust fumes produced from idling petrol engines (Carding, 1977). Both of these techniques produce irritants that are likely to result in considerable distress to animals and are therefore detrimental to the welfare of dogs and cats (Carding, 1968, 1977; Close et al., 1996; Beaver et al., 2001), and hence their use is not acceptable. Commercially compressed CO delivered from cylinders into specially constructed chambers has been used for the mass euthanasia of dogs and cats.

CO combines with haemoglobin in the red blood cells, decreasing the oxygen carrying capacity of the animal's blood. As a result, less oxygen is delivered to the tissues and cells (hypoxia), which leads to unconsciousness, followed by death (Chalifoux and Dallaire, 1983). Although the animal becomes unconscious within 1–2 minutes (variable between individuals), death as confirmed by cessation of heartbeat does not occur until 10–20 minutes after initial exposure to CO at concentrations reaching 6% (Moreland, 1974; Chalifoux and Dallaire, 1983; Dallaire and Chalifoux, 1985). Although the welfare aspects of this method have not been well researched, a few studies have reported that prior to loss of consciousness dogs show signs of anxiety, including moaning vocalisations (Carding, 1968; Chalifoux and Dallaire, 1983; Dallaire and Chalifoux, 1985) and signs of agitation (Moreland, 1974; Chalifoux and Dallaire, 1983). Furthermore, there is some concern that the onset of convulsions (Close et al., 1996) and muscular spasms (Moreland, 1974) may precede loss of consciousness (Chalifoux and Dallaire, 1983; Close et al., 1997). Equally distressing behaviours have been observed in cats during the initial phase of euthanasia using this method (Simonsen et al., 1981).

Use of the tranquiliser ACP prior to euthanasia with CO significantly reduced some of the behavioural and physiological responses of dogs, but sufficient time must be allowed for ACP to reach its maximum effect before exposure to CO (Dallaire and Chalifoux, 1985).

In addition to the risks for animal welfare, CO is extremely hazardous for humans because it is highly toxic and difficult to detect. Even chronic low level exposure is considered a human health hazard and is associated with cardiovascular disease (Beaver et al., 2001).

There are several practical limitations associated with this method of euthanasia. Firstly, the construction, diligent maintenance and careful operation of special chambers are essential to reduce the risk to human and animal welfare; and these are likely to be costly. Secondly, use of CO to euthanase certain groups of animals is considered unacceptable (Humane Society of the United States, undated). In particular, animals under four months old (resistant to hypoxia); those with impaired breathing and or low blood pressure (due to systemic disease, injury or old age) will take longer to succumb, causing additional distress prior to death. Use of CO inhalation to euthanase obviously pregnant animals is also discouraged as the unborn young will not be exposed to the gas and will die slowly as a result of suffocation, due to death of the mother (Humane Society of the United States, undated). Moreover, unconscious dogs urinate, defecate and regurgitate (Moreland, 1974) making this aesthetically objectionable for operators and requiring chambers to be thoroughly cleaned, adding to the time of use.

Although considered a conditionally acceptable method of euthanasia by the American Veterinary Medicine Association (Beaver et al., 2001) and the Humane Society of the United States for some dogs and cats, the many limitations of CO may make this method less practical, considerably slower and more expensive than lethal injection (Humane Society of the United States, undated). There is also concern over the distressing side effects of exposure to CO (European Food Safety Authority, 2005) while the animal is conscious (Stafford, 2006) and over the significant danger to operators. For these reasons WSPA considers this to be an unacceptable method for the euthanasia of dogs and cats.

SAFETY HAZARDS REGARDING SODIUM PENTOBARBITAL

JOURNAL OF AMERICAN VETERINARY ASSOCIATION

Survey of occupational hazards in Minnesota veterinary practices in 2012
January 2016

Needlestick or sharps injuries were common, with 636 (77%) respondents reporting having sustained at least 1 injury at some point in their careers and 344 (41%) reporting having sustained at least 1 injury within the past 12 months (Table 2). Furthermore, 88% of veterinarians, 91% of veterinary technicians, and 68% of office staff reported recapping needles after use. Veterinary technicians were significantly ($P < 0.001$) more likely than veterinarians to report having been trained to recap needles at school or work (71% vs 52%, respectively).

In veterinary medicine, personnel are at risk for animal-related injuries, needlestick or sharps injuries, acquiring infectious diseases, and exposure to… harmful chemicals…

AMERICAN VETERINARY MEDICAL ASSOCIATION

Guidelines for the Euthanasia of Animals
2020 Edition

Human safety is of utmost importance, and appropriate safety equipment, protocols, and knowledge must be available before animals are handled. Advance preparation includes protocols and supplies for addressing personnel injury due to animal handling or exposure to drugs and equipment used during the process.

Heightened awareness for personnel safety is imperative when using injectable euthanasia agents because needle-stick injuries involving these drugs have been shown to result in adverse effects (41.6 percent of the time); 17 percent of these adverse effects were systemic and severe.

VORTECH PHARMACEUTICALS

Material Safety Data Sheet: Fatal Plus Solution (active ingredient - sodium pentobarbital)
May 28, 2015

This product is a controlled substance. The main health hazard associated with overexposure during normal occupational use and handling is irritation of contaminated tissues. This product may be toxic if swallowed or inhaled.

Ingestion of this product may cause adverse gastrointestinal, cardiovascular, liver, central nervous system and reproductive effects. Syptoms include: drowsiness, headache, mental depression, dizziness, confusion, lack of muscular control, impaired judgment and sedation. In cases of severe overdoses, this product may cause respiratory and cardiovascular suppression, coma, and death due to respiratory and circulatory failure.

This product MUST NOT enter drains or waterways.

This product is toxic to wildlife. Birds and mammals feeding on animals treated with this product may be killed.

CANADIAN VETERINARY JOURNAL

A Survey of Needle Handling Practices and Needlestick Injuries in Veterinary Technicians
December 2009

A survey of veterinary technicians identified that needlestick injuries [NSI] are very common, with 210/226 (93%) technicians reporting at least one needlestick injury over the course of their career. One hundred sixty-seven (74%) had experienced a needlestick injury during the preceding year. Exposure to animal blood and various drugs was common.

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Needlestick injuries were very common, with 210 (93%) of technicians reporting having experienced an NSI in the past.

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One hundred and thirty-three (59%) technicians reported being exposed to animal blood one or more times during their career as the result of a NSI, with 92 (41%) having been exposed to sedatives, 87 (39%) to antimicrobials, 80 (35%) to vaccines, 68 (30%) to anesthetic agents, and 29 (13%) to euthanasia agents.

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NSIs can be associated with adverse effects through physical trauma, exposure to non-bloodborne infectious agents and exposure to drugs. Adverse effects that have been reported in veterinary personnel and animal owners include severe local inflammation, abscess formation, joint infection, localized necrosis, skin slough, local nerve damage, brucellosis, severe allergic reaction, psychedelic experience, bronchial and laryngeal spasm, chronic granulomatous reaction, ischemic necrosis requiring finger amputation, miscarriage, and blastomycosis (5,10–13). Severe reactions, including death, have been reported in association with inadvertent injection of tilmicosin.

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The high rates of exposure to antimicrobials, sedatives, anesthetic agents, and euthanasia agents were concerning because of the potential problems from the direct effects of these drugs or allergic reactions.

CANADIAN VETERINARY JOURNAL

Needlestick Injuries in Veterinary Medicine
August 2008

Despite the absence of bloodborne pathogens such as HIV and hepatitis viruses, there are a variety of potential concerns in veterinary medicine. It is plausible that infections could occur from inoculation of bloodborne pathogens (certain arboviruses), organisms from the animal's skin (Staphylococcus spp., Pseudomonas spp.), organisms from fine-needle aspirates (Blastomyces, Pasteurella spp., Staphylococcus spp., Streptococcus spp.) or modified live vaccines. Physical trauma can be significant, especially from large-bore needles or severe laceration that results from animal movement during injection or blood collection. Injection of substances such as vaccines, antimicrobials, chemotherapeutics, euthanasia solutions, and anesthetics also pose potential risks ranging from local irritation to systemic reactions.

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Similar results were reported in an Australian study, where 71% of veterinary technicians reported needlestick injuries (16). Two-thirds of individuals who experienced a needlestick reported injection of substances, including antimicrobials (13%), euthanasia agents (11%), sedatives (9%), vaccines (8%), and anesthetics (8%).

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A study of female veterinarians reported adverse effects in 16% of needlesticks…Severe reactions included severe local inflammation, abscess formation, joint infection, localized necrosis, skin slough, local nerve damage, brucellosis, severe allergic reaction, psychedelic experience, bronchial and laryngeal spasm, and miscarriage. Anthelmintics, euthanasia agents, and anesthetics were more commonly associated with adverse effects.

OCCUPATIONAL MEDICINE, VOLUME 47, NO. 8

Needlestick Injuries Among Female Veterinarians: Frequency, Syringe Contents and Side Effects
1997

Among the 2,532 survey respondents, 1,620 reported one or more needlesticks after graduation from veterinary college (64.0% of all respondents). A total of 2,663 stick events were reported, although the descriptions of each puncture event varied in quality/completeness, probably due in large part to their retrospective nature. Substances most often injected include vaccines, antibiotics, anaesthetics and animal blood. Of the 438 sticks resulting in at least one side-effect (16.4% of all sticks), 337 were classified as mild and localized at the site of injection (12.7% of all sticks, —77% of sticks producing a side-effect), with 18 characterized as severe and systemic (0.7% of all sticks, —4% of sticks producing a side-effect). One accidental self-injection

of a prostaglandin compound resulted in a spontaneous abortion, heightening awareness that occupational needlesticks may also represent a serious human reproductive health hazard.

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It may be postulated that veterinarians are at higher risk of needlestick injury than other health care workers because they treat patients that are often uncooperative and difficult to communicate with.

SAFETY HAZARDS REGARDING CARBON MONOXIDE

THECHATTANOOGAN.COM

Humane Society Worker Accidentally Gassed to Death
March 31, 2000

Chattanooga Police are investigating what appears to be the accidental death of a Humane Society worker, who was found dead at the entrance to the animal shelter's gas chamber. The victim was identified as Vernon W. Dove Jr., 39. The chamber, which is located in a courtyard of the facility at 212 N. Highland Park, uses carbon monoxide to kill animals. Apparently, Mr. Dove, who had gassed a dog late Tuesday afternoon, neglected to vent the carbon monoxide out of the chamber before opening its door. The worker was overcome by the gas and was found lying dead, partially in the chamber. Mr. Dove had gone to Bakewell earlier to pick up a dog which had bitten its owner and was putting the dog to sleep, so that rabies testing could be performed. The investigation by Detective Charles Dudley indicates that perhaps the worker was distracted from following proper procedure because he was hurrying to pick up his children at school. The employee was last heard from just after 5 p.m. as he was enroute back from Bakewell. He was found by other Humane Society workers who returned to the shelter around 8 p.m.

ST. LOUISE POST-DISPATCH

Incident at Animal Gas Chamber Not Expected to Speed Change
July 14, 1997

St. Clair County probably will not speed its move toward euthanizing animals by injection, despite an incident last week in which the county's veterinarian was overcome during a test of the county's animal gas chamber. "The animal rights folks may think it's a big deal and a reason to speed things up," said county board chairman John Baricevic. "I think there are other issues more important." Baricevic said Dr. Tom Amlung was running a test of the chamber for state officials at the animal shelter in South Belleville on Thursday afternoon and prematurely opened the chamber door. "He got a whiff of gas and passed out," Baricevic said. Amlung was treated at a hospital and released. Baricevic said Amlung was back at work that same day. "Anytime an employee is injured, anytime you have procedures that aren't followed, it's important," Baricevic said. "In the big picture, I don't consider it a major event." Some St. Clair County residents have been pushing to replace the gas chamber with lethal injection. They argue that the chamber is inhumane. Baricevic said smaller animals currently were being destroyed by injection, while larger animals were still being gassed. Gradually, he said, he expects most if not all animals to be destroyed by injection. Amlung could not be reached for comment.

WBTV

Malfunctioning Chamber Door Injures Animal Shelter Worker
November 20, 2009

LINCOLNTON, NC (WBTV) - A malfunction with a chamber door at the Lincoln County Animal Services caused minor injuries to an employee Tuesday morning.

Some media agencies reported an explosion occurring at the shelter. Lincoln County Animal Services Director Jack Kerley told WBTV this was not true. Kerley said CO2 became too high inside a chamber used to euthanize animals and it caused a malfunction. The chamber door flung open striking a shelter worker in the ribs. The worker was rushed to Carolinas Medical Center-Lincoln where he was treated for bruised ribs. The worker returned to work Monday afternoon and is expected to be fine Kerley said.

The equipment will be repaired and should be working again by Wednesday afternoon.

SALISBURY POST

Blast at Statesville Shelter Wasn’t What Internet Tales Make It Out to Be

December 1, 2009

The director of Iredell Animal Services said Internet accounts of a carbon monoxide gas chamber explosion at the Statesville shelter last summer are greatly exaggerated.

“We did have a flashback,” said Chris Royal. “It was like a spark went around the top of the chamber. We called the fire department for safety reasons, and then it was all over the Internet and everywhere that our chamber blew up.”

Royal said the incident was caused by a malfunctioning, non-explosive fan, which has since been replaced.

A July 22, 2008, WSOC TV online account described the incident as “a small explosion” and said it was quickly under control. The following day, the Statesville Record and Landmark account described the incident as “an electrical malfunction.” Royal is quoted in the article as saying Technician Angela Hartness, who was operating the chamber at the time, described it as “a kind of explosion …

“There was a ‘kaboom, kaboom,’ and then there was like a bolt of lightning.”

Royal told the Post the 10 dogs inside the chamber were already dead when the incident occurred.

Even now, she said, various animal Web sites report the incident as being much more serious.

Royal said the Iredell County manager and assistant manager replied to some of the Web sites saying their accounts were not true. “But you can’t stop it,” she said. “I’ve even had people calling from New York telling me that we are barbaric, and that they weren’t moving here if we still use the gas chamber.”

The Web site for the N.C. Coalition for Humane Euthanasia includes a posting reading, “Do you know an animal shelter employee who may have been exposed to carbon monoxide while working with a gas chamber? Shelter employees, community service workers, inmates, or relatives of those individuals can call North Carolina Department of Labor to report possible hazards: 1-800-625-2267.”

Michelle King, a board member for the coalition, which she has said is not an activist group, brought up the safety hazards carbon monoxide gas chambers pose for animal shelter staff at a Jan. 15 meeting with N.C. Sen. Andrew Brock.

Royal said it’s stressful enough for animal shelter employees to euthanize unwanted cats and dogs. “To have these groups constantly badgering us just adds more stress.”

What people don’t realize, Royal said, “is the dogs that normally come to the shelter, they’re not your little ‘Fluffy’ and ‘Fu Fu’ like are in everyone’s home.”

Though some owners have surrendered pets due to losing their homes to foreclosure or simply not having enough money to provide for them, she said the majority are strays. “And I’d say 95 percent of our cats are feral.”

Iredell Animal Services uses both the carbon monoxide gas chamber and lethal injection methods of euthanasia, and Royal said she believes animal shelters should be able to continue to use both.

The Iredell animal shelter uses lethal injection to euthanize cats and dogs that are under 16 weeks of age, pregnant and seriously sick or injured. This practice will soon be required across the state under new euthanasia rules set by the N.C. Department of Agriculture and Consumer Services.

“We may not agree with everything the Agriculture Department has passed,” she said, “but those rules are better than what these animal activists are trying to pass in Raleigh is the way I look at it.”

House Bill 6 now being considered in the N.C. General Assembly would ban the carbon monoxide chamber method of euthanasia altogether, while House Bill 27 would only allow it to be used for feral animals.

Royal said she believes the lethal injection method is just as hard emotionally if not harder on staff as the carbon monoxide gas chamber. “It’s hard to hold, in the case of Iredell County,” she said, “over 6,000 animals a year in your arms while they die. These animal activists, evidently, they don’t realize that.”

When it comes to aggressive or feral animals, Royal said she believes the carbon monoxide gas chamber method is safer for staff. “And their safety is what I have to think about,” she said.

“I told them in Raleigh the way I felt,” she said. “There’s no one that loves animals more than we do. It’s stressful. You have to detach yourself from the animals.

“When I went to euthanasia class, I had one down there that followed me everywhere I went, and I had to euthanize it. But you’ve got to realize that they are better off than they are living out being feral and starving to death.

“It’s pitiful. … What we need are more responsible pet owners.”

Royal said opponents of the carbon monoxide gas chamber always bring up the crying and howling sounds of the animals being euthanized. “But they’re already unconscious if they howl,” she said. “It’s the carbon monoxide going through their bodies.
“It’s not a reaction that happens when they’re awake.”

In 2008, Iredell Animal Services euthanized 2,549 dogs and 3,608 cats. Their bodies were buried at the county landfill.

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
Carbon Monoxide Poisoning Fact Sheet
Current

Carbon monoxide (CO) is a poisonous, colorless, odorless and tasteless gas. So, you can inhale carbon monoxide right along with gases that you can smell and not even know that CO is present.

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Carbon monoxide is harmful when breathed because it displaces oxygen in the blood and deprives the heart, brain and other vital organs of oxygen. Large amounts of CO can overcome you in minutes without warning — causing you to lose consciousness and suffocate.

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Symptoms can vary widely from person to person. CO poisoning may occur sooner in those most susceptible: young children, the elderly, people with lung or heart disease, people at high altitudes, or those who already have elevated CO blood levels, such as smokers. Also, CO poisoning poses a special risk to fetuses. CO poisoning can be reversed if caught in time. But even if you recover, acute poisoning may result in permanent damage to the parts of your body that require a lot of oxygen such as the heart and brain. Significant reproductive risk is also linked to CO.

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
Carbon Monoxide Poisoning Quick Card
Current

Carbon monoxide (CO) is a colorless, odorless, toxic gas which interferes with the oxygen-carrying capacity of blood. CO is non-irritating and can overcome persons without warning. Many people die from CO poisoning…

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Severe carbon monoxide poisoning causes neurological damage, illness, coma and death.

PRAXAIR
Carbon Monoxide Safety Data Sheet
October 17, 2016

Signal word (GHS-US) : DANGER
Hazard statements (GHS-US) : H220 - EXTREMELY FLAMMABLE GAS
H280 - CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED
H331 - TOXIC IF INHALED
H360 - MAY DAMAGE FERTILITY OR THE UNBORN CHILD
H372 - CAUSES DAMAGE TO ORGANS (CENTRAL NERVOUS SYSTEM) THROUGH PROLONGED OR REPEATED EXPOSURE

CGA-HG04 - MAY FORM EXPLOSIVE MIXTURES WITH AIR
CGA-HG10 - ASPHYXIATING EVEN WITH ADEQUATE OXYGEN
Precautionary statements (GHS-US) : P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from Heat, Open flames, Sparks, Hot surfaces. - No smoking
P260 - Do not breathe gas
P271+P403 - Use and store only outdoors or in a well-ventilated place
P280 - Wear protective clothing, protective gloves, eye protection, face protection
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely

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EXTREMELY FLAMMABLE GAS. Carbon monoxide cannot be detected by odor. May form explosive mixtures with air. Toxic, flammable gas may spread.

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only non-sparking tools. Use only explosion-proof equipment… High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents.

NORTHERN CLINICS OF ISTANBUL

Epidemiology, Pathophysiology, Clinical Evaluation, and Treatment of Carbon Monoxide Poisoning in Child, Infant, and Fetus
May 10, 2017

CO is a colorless, odorless, tasteless, non-irritating gas present in the environment even when there is no fire or smoke. It has been reported to be the most frequent cause of fatal poisoning, with an incidence rate of 31%... In cases of poisoning by industrial chemicals, CO is the most common (11%) after inhalation of thinner (31%)… In the USA, third most frequent cause of accidental death is CO poisoning, most of which (57%) were due to inhalation of exhaust gases.

CO gas is readily absorbed and is unchanged by the lungs. After absorption, it largely (90%) binds to hemoglobin… Cardiac injury has been associated with hypoxia in human and animal studies, and it has been reported that neurological and perivascular injuries were hypoxic as result of oxidative stress (reoxygenation) secondary to CO exposure. Damage to central nervous system (CNS) as result of hypoxia may lead to cardiovascular insufficiency, and effect of high doses of CO on smooth muscle may result in hypotension.

Symptoms of acute poisoning: Fatigue, severe headache, dizziness, nausea, vomiting, chest pain, palpitations, exertional dyspnea, attention deficit, imbalance, numbness, seizures, coma, respiratory arrest.

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

Health Hazard Evaluation Report
May 2004

The CO gas chambers are a potentially serious hazard for the employees… The death associated with the use of a similar chamber in Tennessee and the CO levels measured by NIOSH in this investigation indicate that the use of home-made uncontrolled gas chambers for animal euthanasia is not acceptable.

The NIOSH investigator concluded that the use of homemade CO chambers, such as the one investigated here, presents an unacceptable health risk to animal shelter employees.

Regulation of euthanasia in animal shelters varies nationwide, but is often covered by a city, county, or state licensing agency. These agencies often incorporate policies of recognized animal welfare agencies for guidelines for acceptable euthanasia methods. Three such agencies are the American Veterinary Medical Association (AVMA), the Humane Society of the United States (HSUS), and the National Animal Control Association (NACA). These groups agree that injection of sodium pentobarbital is the preferred euthanasia method, but also allow for the use of CO euthanasia chambers.

The Panel on Euthanasia convened by AVMA3 declared that the use of injectable agents is the most desirable euthanasia method for companion animals, but also stated that it is acceptable to use CO for individual animal or mass euthanasia for dogs, cats, and other small mammals. HSUS policies state that the use of CO, when delivered by a commercially manufactured and equipped chamber, is an acceptable method of euthanasia for some animals.4 NACA acknowledges that there are agencies legally restricted in their ability to obtain sodium pentobarbital, and in such cases, if CO is the euthanasia method of choice, the shelter must use CO specifically designated for use in euthanasia.

Occupational safety and health concerns associated with the use of CO euthanasia chambers heightened in 2000, when a 39-yearold Animal Humane Officer died while operating a homemade concrete block chamber in a Chattanooga, Tennessee shelter. He was an experienced operator of the chamber; he had used it for approximately 10 years. As part of the investigation of this fatality, the Tennessee Occupational Safety and Health Administration (TOSHA) determined that the animal control officer was exposed to CO in excess of 70,000 parts of CO per million parts of air (ppm), which is rapidly fatal.

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The initial symptoms of CO poisoning may include headache, dizziness, drowsiness, or nausea. Symptoms may advance to vomiting, loss of consciousness, and collapse if prolonged or high exposures are encountered. If the exposure level is high, loss of consciousness may occur without other symptoms. Coma or death may occur if high exposures continue.5,6,7, 8, 9, 10 The display of symptoms varies widely from individual to individual and may occur sooner in susceptible individuals such as young or aged people, people with preexisting lung or heart disease, or those living at high altitudes.

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OSHA requires an employer to furnish employees a place of employment that is free from recognized hazards that are causing or are likely to cause death or serious physical harm.

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Certain HSUS and AMVA recommended standards for animal euthanasia impact on occupational exposure. HSUS lists the following minimum requirements and conditions for the use of CO chambers for euthanasia… The… chamber must be well-lit, and equipped with view-ports, a regulator (which maintains the gas concentration), and flow-meter (which measures the gas concentration).

The chamber should achieve a minimum of 4%-6% gas (the concentration should never be above 10%, a level at which CO may become explosive) within 20 seconds. The animals must be unconscious within 45-60 seconds, and death must occur within two to four minutes.

AVMA recommendations are very similar to those of HSUS, with the following differences… AVMA does not specify the use of a regulator and flow meter for gas delivery to the chamber, but rather states: “The CO flow rate should be adequate to rapidly achieve a uniform CO concentration of at least 6% after animals are placed in the chamber.”

Staff Safety: AVMA wording about staff training differs in that they recommend that personnel using CO be instructed thoroughly in its use and understand its hazards and limitations. AVMA adds the following safety information: “Safeguards must be taken to prevent exposure of personnel. Any electrical equipment exposed to CO (eg, lights and fans) must be explosion proof.”

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Other findings…There was no way to tell if the CO concentration within the chamber was appropriate for humane euthanasia of the animals.

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Conclusions: Environmental sampling during staged euthanasia at this animal shelter indicated an unacceptable risk of exposure to excessive levels of CO.

Recommendations: The following recommendations are based on the findings of this investigation and are intended to reduce the health hazard for employees… Continue the use of lethal injection instead of CO for animal euthanasia.

EUTHANASIA GUIDELINES: THE GAS CHAMBER DEBATE

Gail Golab, DVM, Director of AVMA Animal Welfare Division
February 2013

Techniques that are 'acceptable with conditions' may have a greater potential for operator error or safety hazard, are not well documented in the scientific literature, or may require a secondary method to ensure death.

CO vs EBI daily operating safety
Possibility of catastrophic event
Suicide
Threat from animal rights groups to safety of employees and their families
Noticeably absent from those who oppose CO is the health and safety of those who conduct animal euthanasia

AMERICAN HUMANE ASSOCIATION

Humane Euthanasia of Shelter Animals Fact Sheet
Current

Euthanasia by Injection (EBI) is the safest way for humans to euthanize shelter animals.

- Carbon monoxide poses a danger to humans because it is colorless, tasteless, odorless, and highly explosive. A gas chamber must be constantly checked and maintained to ensure that there are no cracks in the structure or failing seals. When carbon monoxide is released in a confined area, it can cause asphyxiation, kidney damage, or induced coma.

- The gas chamber jeopardizes the safety of shelter workers. In 2009, gas build-up caused the door of the Lincoln County, North Carolina shelter to explode open; the incident put an animal control officer in the emergency room. In 2008, an explosion in the Iredell County, North Carolina Animal Services' gas chamber revealed that, contrary to recommendations, the equipment in the vicinity of the chamber was not explosion proof. A shelter worker was in the room at the time and other personnel were nearby. In 2000, a shelter worker in Tennessee was asphyxiated to death while operating a faulty gas chamber. And in 1997 a shelter veterinarian in Illinois was severely injured while operating a gas chamber. In contrast, there are no documented reports of any shelter worker being killed from an accidental injection of sodium pentobarbital.

- The American Veterinary Medical Association (AVMA) 2013 Guidelines on Euthanasia state: "Leaky or faulty equipment may lead to slow, distressful death and may be hazardous to other animals and to personnel." It also states, "The advantages of using barbiturates for euthanasia in dogs and cats far outweigh the disadvantages. Intravenous injection of a barbituric acid derivative is the preferred method for euthanasia of dogs, cats, other small animals, and horses.

It is dangerous to put aggressive and/or wild animals in the gas chamber.

- Sedation methods utilized with EBI are safer for shelter staff in cases of highly aggressive and wild animals, and more humane for those animals. It is much safer to sedate and then inject an aggressive animal instead of dragging it frantically into a gas chamber. Many common restraint methods do not require shelter workers to handle the animal themselves if the animal is deemed dangerous. These include: Restraint poles, squeeze gates/cages, and syringe poles. Shelter workers can then anesthetize the animal with an intramuscular injection of pre-euthanasia drugs, and then administer Sodium Pentobarbital once the animal is unconscious.

TEXAS DEPARTMENT OF STATE HEALTH SERVICES

Alternative Euthanasia Methods – Wendy Blount, DVM
May 2017

Carbon Monoxide Risk to Staff

- CO is of greater risk to staff than pentobarbital
- Staff should administer CO only with informed consent of danger
- CO is highly toxic and is odorless, colorless and tasteless
- The leading cause of accidental poisoning in the US
- Chronic low level exposure can cause:
    - Memory loss and brain damage

    - Breathing problems
    - Muscle weakness
    - Heart problems
    - Low infant birth weight
- OSHA Requirements should be maintained
- Shelter workers have died at the hands of faulty CO chambers
    - Vernon W. Dove Jr., 39, inadvertently entered the "lethal room" at the Humane Education Society of Chattanooga • He died on March 28, 2000
    - In 2008, an explosion in the Iredell County, North Carolina Animal Services' gas chamber revealed that, contrary to recommendations, the equipment in the vicinity of the chamber was not explosion proof. A shelter worker was in the room at the time and other personnel were nearby; 10 dogs died in the explosion
    - In 1997 a shelter veterinarian in Illinois was severely injured while operating a gas chamber.

UNIVERSITY OF CALIFORNIA, SAN FRANSISCO: SCHOOL OF MEDICINE

Guy Shochat, MD, Associate Clinical Professor of Emergency Medicine
December 2020

Pathophysiology
CO toxicity causes impaired oxygen delivery and utilization at the cellular level. CO affects several different sites within the body but has its most profound impact on the organs (eg, brain, heart) with the highest oxygen requirement.

Cellular hypoxia from CO toxicity is caused by impedance of oxygen delivery. CO reversibly binds hemoglobin, resulting in relative functional anemia. Because it binds hemoglobin 230-270 times more avidly than oxygen, even small concentrations can result in significant levels of carboxyhemoglobin (HbCO).

An ambient CO level of 100 ppm produces an HbCO of 16% at equilibration, which is enough to produce clinical symptoms. Binding of CO to hemoglobin causes an increased binding of oxygen molecules at the three other oxygen-binding sites, resulting in a leftward shift in the oxyhemoglobin dissociation curve and decreasing the availability of oxygen to the already hypoxic tissues.

CO binds to cardiac myoglobin with an even greater affinity than to hemoglobin; the resulting myocardial depression and hypotension exacerbates the tissue hypoxia. Decrease in oxygen delivery is insufficient, however, to explain the extent of the CO toxicity. Clinical status often does not correlate well with HbCO level, leading some to postulate an additional impairment of cellular respiration.

CO can produce direct cellular changes involving immunological or inflammatory damage by a variety of mechanisms, including the following [3]:

- Binding to intracellular proteins (myoglobin, cytochrome a,a_3)
- Nitric oxide generation leading to peroxynitrite production
- Lipid peroxidation by neutrophils
- Mitochondrial oxidative stress
- Apoptosis
- Immune-mediated injury
- Delayed inflammation

Studies have indicated that CO may cause brain lipid peroxidation and leukocyte-mediated inflammatory changes in the brain, a process that may be inhibited by hyperbaric oxygen therapy. Following severe intoxication, patients display central nervous system (CNS) pathology, including white matter demyelination. This leads to edema and focal areas of necrosis, typically of the bilateral globus pallidus. Interestingly, the pallidus lesions, as well as the other lesions, are watershed area tissues with relatively low oxygen demand, suggesting elements of hypoperfusion and hypoxia. [8]

Studies have demonstrated release of nitric oxide free radicals (implicated in the pathophysiology of atherosclerosis) from platelet and vascular endothelium, following exposure to CO concentrations of 100 ppm. One study suggests a direct toxicity of CO on myocardium that is separate from the effect of hypoxia. [9]

HbCO levels often do not reflect the clinical picture, yet symptoms typically begin with headaches at levels around 10%. Levels of 50-70% may result in seizure, coma, and fatality.

HUMAN WELLBEING

JOURNAL OF AMERICAN VETERINARY MEDICAL ASSOCIATION

A systematic Review of the Effects of Euthanasia and Occupational Stress in Personnel Working with Animals in Animal Shelters, Veterinary Clinics, and Biomedical Research Facilities
November 15, 2015

Personnel directly engaged in euthanasia reported significantly higher levels of work stress and lower levels of job satisfaction, which may have resulted in higher employee turnover, psychological distress, and other stress-related conditions.

Results of this review suggested a high incidence of occupational stress and euthanasia-related strain in animal care personnel.

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Individuals working in veterinary clinics, animal shelters, and research facilities perceive the euthanasia of animals for the relief of suffering or for human convenience (eg, controlling overpopulation and working within financial constraints, or within prescribed laboratory management parameters) as one of the main causes of occupational stress.

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The most intriguing study identified in this review was that of Rohlf and Bennett, which suggested that perpetration-induced traumatic stress is a possibility in workers who perform euthanasia. This was the only study in which participants were enrolled from across multiple occupational settings (including animal shelters, veterinary clinics and biomedical research facilities), for which the results indicated that the mean level of reported stress as measured with the IES-R (Impact of Event Scale—Revised) did not vary across occupations; however, the reasons for euthanasia were different between the fields evaluated. Related to this, a commonly reported contributor to occupational stress is that of societal opinion and the stigma associated with those who engage in "dirty work" (ie, the euthanasia of animals). Individuals who work in tainted occupations become acutely aware of public perception and the stigma associated with what they do. A number of studies suggest that social supports are an instrumental coping resource in animal-related work. This stigma can create or further compound internal conflict and identity-threatening circumstances and potentially lead to adverse influences on employee well-being.

This stigma can create or further compound internal conflict and identity-threatening circumstances and potentially lead to adverse influences on employee well-being.

JOURNAL OF AMERICAN VETERINARY MEDICAL ASSOCIATION

Euthanasia-related Strain and Coping Strategies in Animal Shelter Employees
July 1, 2009

Euthanizing animals is a major stressor for many animal shelter workers.

SOCIETY AND ANIMALS

Perpetration-induced Traumatic Stress in Persons Who Euthanize Nonhuman Animals in Surgeries, Animal Shelters, and Laboratories
February 2005

The sample included 148 animal workers: veterinarians, veterinary nurses, and research and animal shelter staff…

Half the sample perceived animal death—particularly euthanasia—as one of the least desirable jobs…

Those who reported high levels of concern about animal death reported higher levels of euthanasia-related stress.

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Many individuals enter particular occupations because of their love of nonhuman animals. Few, however, are adequately prepared for the fact that one of their duties may be to kill these animals. Arluke (1994) calls this the "caring-killing paradox." On the one hand, many people who work with nonhuman animals care deeply for them. On the other, they may be required to kill those same animals on a regular basis (Arkow, 1985; Arluke, 1991, 1992; Chang & Hart, 2002; Rollin, 1986; White & Shawhan, 1996). Those who work with animals perceive killing animals for the purpose of euthanasia (relief of suffering) or human convenience (unwanted companion animals, animals on the farm, or in the laboratory) one of the primary causes of occupational stress…

Veterinary staff and animal shelter workers, who enter these occupations specifically to save or care for animals, may experience moral stress. In addition, Arluke (1992) reported that some interviewees drawn from research laboratories—including graduate students—experienced guilt and uneasiness over the euthanasia or convenience killing of laboratory animals. In such contexts, it is possible that moral stress is influenced by an individual's level of involvement with animals (Herzog, 2002) or with their level of concern about animal death—particularly if those persons are required to participate actively in performing euthanasia as part of their occupational duties.

…preliminary evidence suggests that people who look after animals and, as part of their occupation, are required to euthanize them should be regarded as an at-risk population for post-traumatic stress (PTS). A variety of physical and psychological difficulties have been reported in such workers: unresolved grief, high blood pressure, depression, and substance abuse.

Previous studies also have reported animal workers describing various other PTS symptoms including nightmares, emotional numbing, and recurrent, distressing recollections of the event. Sleep disturbances, an increased startle response, difficulty concentrating, and irritability also have been reported (Arluke, 1992; White & Shawhan). In other contexts, people who experience PTS, as a result of actively participating in traumatic events, are said to have perpetration-induced traumatic stress (PITS) (MacNair, 2002). PITS has been identified in war veterans who have killed people in combat (MacNair) and in police officers who have shot criminals in the line of duty (Loo, 1986). PITS is similar to PTS, in that persisting emotional distress is caused by either an isolated traumatic event or a cluster of traumatic events (American Psychiatric Association, 1995). It differs from PTS, however, in that individuals with PITS are exposed to traumatic events and actively participate in them.

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The contexts most likely to result in traumatic stress are those in which employees enter the profession because of a perceived affinity with animals. In addition, traumatic stress may be likely in contexts in which employees may develop an attachment toward an animal who later is killed (Arluke, 1994) and also, perhaps, in those contexts in which euthanasia is performed for human convenience rather than because the animal is sick or suffering.

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Almost all participants (70.1%) indicated aversive work conditions—the smells and mess associated with nonhuman animal work and the risk of personal injury from zoonosis, animal bites, and scratches—as being one of the worst aspects associated with their job. The second most commonly identified "worst aspect of the job," listed by 49.3% of participants, was dealing with client/owner difficulties. This included problems regarding non-compliance or negligent clients/owners. Of the sample, 45.3% listed participation in animal euthanasia as the third worst aspect of the job. Concern about animal suffering was identified by 31.8% of the sample.

INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH
The Impact of Caring and Killing on Physiological and Psychometric Measures of Stress in Animal Shelter Employees: A Pilot Study
December 9, 2020

Animal shelter employees are in a unique position where they care for, and later kill, the same animals…

The data suggest that the process of killing may be physiologically stressful to the person, and higher levels of animal contact in a euthanasia context may be associated with burnout and traumatic stress, but that the act of euthanasia is not a unique predictor of overall occupational distress.

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Occupational stress is thought to be an important contributor to animal control officers, along with others in protective service occupations (e.g., police officers), having the highest workplace suicide rate, excluding military personnel, at 5.3 per 1 million people. One hypothesized cause for such a high suicide rate in animal control workers is the caring–killing paradox. Animal shelter employees primarily enter the job because of their love of animals. However, the reality of their job is often more bleak than expected. The contradiction between job expectations and the reality of having to kill can lead to moral stress. Moral stress occurs when a person engages in, bears witness to, fails to prevent, or learns about acts that transgress that individual's moral code…the first empirical evaluation of moral injury in animal shelter employees, Andrukonis and Protopopova (2020) found that moral injury was likely present in animal shelter employees and was significantly higher in individuals who euthanize. Further, Reeve and colleagues (2005) found that animal shelter employees directly involved in euthanasia reported significantly higher levels of work stress, stress-related somatic complaints, and lower levels of work satisfaction compared to animal shelter employees not involved in euthanasia. This supports the argument that actual killing is an important precursor of occupational stress in animal-care employees. Participation in euthanasia activities has also been associated with higher

incidence of burnout. In a 2015 survey of animal shelter managers, Anderson et al. found that nearly 75% of managers strongly believed that participating in euthanasia activities contributed to burnout. While common in animal shelter employees, burnout has been reported in a variety of animal-care careers. Burnout, defined by three dimensions: exhaustion, cynicism, and inefficacy, is the result of chronic emotional and interpersonal stressors. The reported high incidence of burnout in animal-care employees is not surprising given the emotional pull related to both caring for and killing animals. Exposure to euthanasia has also been correlated with higher incidence of compassion fatigue.

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The overall aim of these studies was to evaluate the physiological and psychometric correlates of caring and killing in animal-care work. Experiment 1 found that increased contact with animals prior to killing predicted higher burnout and traumatic stress and that killing caused an increase in heart rate and a decrease in heart rate variability. Experiment 2 found that jobs with greater euthanasia frequency did not predict any of the psychometric or physiological measures, suggesting that killing may not be the biggest unique predictor of occupational stress.

JOURNAL OF APPLIED SOCIAL PSYCHOLOGY
The Caring-Killing Paradox: Euthanasia-Related Strain Among Animal Shelter Workers
2005

Results indicate that perceived euthanasia-related strain is prevalent among shelter employees and is associated with increased levels of general job stress, work-to-family conflict, somatic complaints, and substance use; and with lower levels of job satisfaction.

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Most typically, the job of performing euthanasia on unwanted animals falls in the hands of animal-shelter workers. Though no large-scale effort has been made to investigate this population, numerous ethnographic investigations and media reports have suggested that individuals performing animal euthanasia are at increased risk of emotional mismanagement, physical ailments such as high blood pressure and ulcers, unresolvcd grief, depression, as well as substance abuse and even suicide.

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…shelter workers, most of whom enter the occupation because they want to help animals, are faced with a daily contradiction between their ideal occupational selves (i.e., protectors of animals) and the reality of having to kill healthy but unwanted animals. The effects of this stressor are likely to be amplified given the social stigma attached to the killing of companion animals.

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The current study shows evidence that animal euthanasia is an important source of job strain for animal-shelter employees. First, when asked, most employees reported feeling strain as a result of their involvement with euthanasia. The prevalence of these euthanasia related strain perceptions supports the suggestion by prior qualitative studies that euthanasia is a significant stressor for animal-shelter employees.

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Most notably, those who are directly involved in euthanasia reported significantly higher levels of work stress, stress related somatic complaints, and work-to-family conflict, and lower levels of satisfaction with the work that they actually do.

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Taken as a whole, these results…indicate that among individuals for whom conducting animal euthanasia is part of their job, it is a salient, unique source of work stress that has a negative impact on their well-being.

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The findings demonstrate that euthanasia-related work is significantly related to a number of well-being outcomes of accepted importance in applied psychology. Further, the comparative analyses between those who are and those who are not subjected to euthanasia-related activities at work show substantial differences in various indicators of well-being.

Dirty work involves tasks that are stigmatized owing to characteristics that the public finds disgusting, degrading, or objectionable. Conservation of resources theory suggests such experiences should induce strain and decreased work satisfaction; social identity theory suggests such work should lead to strong psychological investment in the work, among other outcomes. Integrating these two perspectives, this study hypothesizes and presents quantitative evidence from 499 animal-shelter workers, demonstrating how dirty-work engagement relates to higher levels of strain, job involvement, and reluctance to discuss work while negatively influencing work satisfaction.

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People employed in a vast array of occupations engage in 'dirty work'. These workers – morticians, telemarketers, sanitation workers, personal injury attorneys, exotic dancers, and many others – do work that society perceives as 'disgusting' or 'degrading' (Hughes, 1962) or objectionable (e.g. Ashforth et al., 2007). Some dirty-work occupations are of relatively low prestige (e.g. correctional officers) while others are of relatively high prestige (e.g. firefighters) (Ashforth et al., 2007). Uniting these occupations at the theoretical level is their physical, social, or moral taint (Ashforth et al., 2007) and associated stigmatization by the public (Ashforth and Kreiner, 1999). As outlined by Ashforth and Kreiner (1999), physical taint arises from contact with 'dirty' subjects (e.g. death, garbage, excrement, etc.) or from work performed in highly dangerous or harmful conditions, social taint arises from contact with stigmatized populations (e.g. prisoners, psychiatric patients, the poor, etc.) or from work that places the worker in a highly servile relationship with others, and moral taint arises from performing work of a morally dubious nature or work that employs morally questionable tactics (e.g. debt collection, issuing bail bonds). Given the stigma associated with tainted occupations, engaging in dirty work is a complex, identity-threatening circumstance with potentially harmful influences on employee well-being yet multifaceted implications for job attitudes (Kreiner et al., 2006). Most dirty-work research has taken an occupational perspective, focusing on theoretical advancement of issues related to stigma and stigmatization at work (e.g. Ashforth and Kreiner, 1999; Paetzold et al., 2008) or on the qualitative experience of dirty work and strategies employed by those who conduct dirty work (e.g. Ashforth et al., 2007; Bolton, 2005; Dick, 2005; Guerrier and Adib, 2003).

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To investigate dirty-work and dirty-task involvement, we chose to focus on animal-shelter workers because they perform a variety of tasks, some of which are 'dirtier' and therefore carry more stigma than others. For example, caring for animals does not necessarily present itself as a stigmatized activity. Some of the tasks (e.g. cleaning out cages, tending to hurt animals, etc.), however, contain some elements of what could be considered dirty work. We argue that one task in particular, animal euthanasia, stands apart from others in terms of its dirtiness. This is a central dirty task that some animal-shelter workers must perform, despite joining the field out of an affinity for animals (Rohlf and Bennett, 2005; Rollin, 1986). Euthanasia is a stigmatized task with both a moral and physical taint (owing to its proximity to death). The euthanasia process has two main steps. First, an animal is selected for euthanasia, based upon criteria often including the animal's health, available kennel space, behavior, age, and breed. Second, the animal is euthanized using an injection of sodium pentobarbital (e.g. American Veterinary Medical Association, 1993), after which the animal's body is disposed of. The euthanasia process generally requires two people. One person holds the animal in a prescribed manner such that the employees are safe and the animal is secure. The holder will try to comfort the animal through gentle strokes and soothing talk, positioning the animal so that the second employee can effectively inject the sodium pentobarbital. Within 10 seconds, the animal's respiration stops. A series of procedures assure that the animal is dead (e.g. touching the cornea). Euthanizing animals is, therefore, a physical act, a technical act, an emotional act, and an act putting the employee in direct contact with death. Consistent with the dirty work job typology provided by Ashforth and Kreiner (1999), this close contact with death places this task squarely into the dirty work domain.

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In conclusion, this study suggests that because dirty-task employees deal with stigmatized tasks themselves – in this case, the euthanasia of cared-for animals – and experience the associated public stigma (e.g. White and Shawhan, 1996), they may experience higher strain than non-dirty task employees within the same organization. We also further integrate propositions derived from Hobfoll's (1989) conservation of resources model, and Tajfel's (1982) social identity theory and hence extend the array of theoretical frameworks that have been applied to the study of dirty work. Taken together, those who conduct dirty work appear to be highly involved yet highly stressed and dissatisfied workers.

JOURNAL OF AMERICAN VETERINARY MEDICAL ASSOCIATION
Coping with Euthanasia: A Case Study of Shelter Culture
April 1, 1991

Findings from this study help to explain the apparent contradiction that "animal people" can kill animals. Workers adapted to the kill shelter by clinging to a sense of themselves as animal people engaged in a mission larger than merely killing animals. By seeing their acts as a type of crusade for animals and against an ignorant public, their killing was given moral if not political meaning. By claiming for themselves the stance of combatants of pet overpopulation and providers of humane death, workers placed their killing in a dignified and medical category of euthanasia. In the middle of the death they brought about, they had the noble function of being the last ones who could make a difference in the animals' lives-whether it was to get them into good homes or to make their final days comfortable and loving. At the same time, each shelter worker could oppose euthanasia while actually orchestrating it. No one liked or wanted to do it, and everyone agreed that there was no other alternative to the situation they faced. All of these efforts allowed them to feel that they acted in accordance with their consciences. It was a group that struggled to maintain its conscience and it did this successfully. Of course, shelter culture did not erase all the moral stress of euthanasia. In some cases, it failed to even provide enough equanimity to remain on the job. Components of this culture, such as seeing " successes" in adoption efforts, helped allay conflict, but workers also realized that the larger problem of overpopulation would not diminish. Although many reasons commonly are advanced for turnover among shelter workers-low pay, hard work, little advancement-one that must be added to the list is the failure of their culture to lessen sufficiently the moral stress they feel.

FRONTIERS IN VETERINARY SCIENCE
Laboratory Animal Welfare Meets Human Welfare: A Cross-Sectional Study of Professional Quality of Life, Including Compassion Fatigue in Laboratory Animal Personnel
March 2020

Surprisingly, personnel who euthanized animals more frequently (e.g., daily vs. monthly) did not consistently report higher levels of compassion fatigue; there was no association between these two factors. Previously, more frequent euthanasia was identified as a risk factor for veterinary, animal control, and related professionals. However, euthanasia in the laboratory may be characteristically different from euthanasia in an animal shelter or hospital. Typically, decisions about when to euthanize research animals is clearly standardized and determined before animals even arrive. For many projects, euthanasia is the expected, necessary outcome of the project and conducted after the animal has made a contribution to research. This is contrary to animal shelters or hospitals, where workers may feel as if they have “failed” the animal for not getting it adopted or healing it; additionally, the difficult choice of euthanasia must be uniquely made for each individual animal. This is especially apparent in a study showing higher employee turnover at shelters when euthanasia was performed for reasons not related to behavior or health. The predictability and perceived necessity of euthanasia may be a key factor in mitigating the negative emotional impact on personnel even when it occurs at high frequencies. Although euthanasia frequency was not related to compassion fatigue severity, this study did find that personnel with less control over euthanasia, reported having higher compassion fatigue. Therefore, it may be important for laboratory animal personnel to be able to make the decision concerning whether they are the one to euthanize the animals they have cared for. For some personnel, it may either be particularly distressing to euthanize an animal they have formed a close relationship with or they may specifically want to say goodbye and give that animal a final comforting presence during their last moments. It is also possible that during a particularly tough week, they may need to simply take a break from this stressful procedure. Previous research in human healthcare workers has shown that understanding, predicting, and having control over difficult work situations has a significant direct relationship with perceived stress and that seems to hold true for euthanasia in laboratory animal personnel. Finally, in this study, personnel using physical euthanasia methods (vs. not using physical methods) also reported higher burnout. Physical methods of euthanasia include cervical dislocation, penetrating captive bolt, and blunt force trauma. Although these methods are approved under certain circumstances by the American Veterinary Medical Association (AVMA) and other laboratory animal regulatory agencies, there has been discussion on what are truly the best ways to give a “good death” to an animal. Many individuals anecdotally report that physical methods are more traumatic to administer than inhalant or injectable methods. For example, decapitation or captive bolt euthanasia often result in a lot of blood and gore. Furthermore, physical methods often result in muscles twitching involuntarily, even though the animal is immediately unconscious. Thus, these hands-on methods may cause personnel to feel more personal responsibility for the animal’s death and can be more physically taxing to administer. Finally, even if these methods are approved by regulatory bodies and AVMA, if personnel do not believe they are humane this may influence levels of compassion fatigue. Of note, although not directly addressed in this survey, an commonly suggested strategy for combatting euthanasia stress in laboratory animal personnel that is efforts to memorialize or acknowledge the animals in research. Overall though, these results indicate the importance of considering the effects of different euthanasia methods on personnel.

The stress associated with having to care for animals they subsequently euthanize puts animal shelter workers at a high risk for compassion fatigue, burnout, and even suicide.

This suggests that although job satisfaction is greater in shelters with more positive outcomes, trauma may also be greater. A t-test revealed that employees who euthanize have higher moral injury scores compared with those who do not ($t(152) = –2.96$, $p = 0.0036$). A second multivariate regression model found that deciding which animal to euthanize predicted increased secondary traumatic stress ($r(151) = –0.058$, $p = 0.016$). Overall, the data show that Live Release Rate and decisions surrounding euthanasia play a role in occupational trauma.

Municipal shelter employees ($n = 98$) had a lower median Impact of Event Scale - Revised score (median = 18, IQR = 21) than private shelter employees (median = 20, IQR = 17). Municipal shelter employees had a lower median compassion satisfaction score (median = 40, IQR = 9.75) compared with private shelter employees (median = 42, IQR = 8).

Municipal shelter employees also had a lower median secondary traumatic stress score (median = 20, IQR = 10) than private shelter employees (median = 25, IQR = 9.5).

Open-admission shelters employees had a lower mean burnout score (mean = 25.63, SD = 6.95) compared with limited-admission shelter employees (mean = 28.1, SD = 6.19). Open-admission shelter employees had a lower median secondary traumatic stress score (median = 20, IQR = 9.75) than limited-admission shelter employees (median = 25, IQR = 11). Limited-admission shelter employees (median = 0.925, IQR = 0.1025) also had a significantly higher LRR compared with open-admission shelter employees (median = 0.73, IQR = 0.26).

Employees who performed euthanasia ($n = 100$) had a lower median MIES score (median = 35, IQR = 16.75 than those who did not (median = 44, IQR = 17).

There was a significant relationship between secondary traumatic stress score and animal-specific euthanasia-related decisions ($r(151) = –0.058$, $p = 0.016$). Secondary traumatic stress was higher in individuals who made the selection of animals for euthanasia “always” and “most of the time.”

A high burnout score suggests that employees no longer feel like their work is worthwhile. The positive relationship between LRR and burnout indicates that those working in high LRR shelters feel increased hopelessness in their work. Although no empirical data yet exists, it has been suggested that higher LRR correlates with a longer length of stay for some animals (Protopopova & Gunter, 2017). Previous research on owned pets found that human attachment to them increased with time (Bagley & Gonsman, 2005). This may also hold true for animal shelter employees and the animals for which they care. As length of stay increases, staff may form a greater attachment with those individuals. It has also been suggested that greater length of stay is associated with behavioral deterioration in animals (Donaldson, 2000). The combination of greater attachment and witnessing behavioral deterioration may lead to increased burnout.

The participants, overall, had a median IES-R score of 18 (range: 0–82). A score of 24 or more indicates that PTSD is a clinical concern and a score of 33 or more indicates the best probable cutoff for a PTSD diagnosis. The majority of participants did not score high enough to indicate PTSD. However, 57 participants scored above the clinical concern cutoff and 31 scored above the probable diagnosis cutoff. This means that more than one-third of participants may have clinical symptoms for PTSD and approximately one-fifth may have a diagnosis of PTSD.

Thus, the likelihood that an animal shelter employee has PTSD is nearly five times higher than the national lifetime prevalence and nearly 10 times higher than the yearly prevalence. In fact, the only psychometric measure significantly correlated with months on the job was the IES-R, suggesting higher likelihood of PTSD symptoms with more months on the job.

Although the situations are extremely different, animal shelter employees are also asked to kill in situations where they may not agree with the decision. All animal shelter employees are exposed to euthanasia, but those who perform euthanasia have

the added stress of physically ending a life. Because the MIES asks questions about perceived and actual moral transgressions, animal shelter employees who actively euthanize are more likely to have experienced both.

JOURNAL OF APPLIED ANIMAL WELFARE SCIENCE

What Shelters Can Do About Euthanasia-Related Stress: An Examination of Recommendations From Those on the Front Line
2007

Euthanizing nonhuman animals is a physical act, a technical act, an emotional act, and—by its very nature—an act putting the animal care employee in direct contact with death. Euthanasia is not an acute trauma that emerges suddenly at some point in time (as is often the case for police officers, firefighters, and physicians). Instead, euthanasia combines the regularity and predictability of a daily hassle with the potential intensity of acute trauma.

The animal sheltering community in the United States has acknowledged the potentially disturbing psychological ramifications of euthanasia work (Rollin, 1986; Smith, 1984). Articles in the popular press (McDiarmid, 2000; "Shelter Workers," 2000) have also discussed how shelter employees with euthanasia responsibilities are an at-risk population for a variety of psychological, emotional, and physical ailments:

1. High blood pressure
2. Ulcers
3. Unresolved grief
4. Depression
5. Substance abuse, and
6. Suicide

In the most comprehensive study to date…the researchers found a pattern of differences in stress and well being between those employees who were directly involved with euthanasia and those who were not directly involved. Those animal care employees who were directly involved in euthanasia reported significantly higher levels of work stress, stress-related somatic complaints, work–family conflict, and lower levels of satisfaction with the work they actually did compared to their colleagues who did not perform euthanasia. These results provided a quantitative confirmation of prior qualitative studies (Arluke, 1994).

WELLBEING INTERNATIONAL STUDIES REPOSITORY

The Psychology of Euthanizing Animals: The Emotional Components
1981

Emotional conflicts arise in significant part from the dilemma that the same public which is responsible for the problem of unwanted animals also has a markedly negative perception of euthanasia, and by extension, of those who perform euthanasia.

It is evident that individuals are emotionally affected by euthanizing animals.

Equally obvious is the fact that euthanasia technicians feel somewhat alienated from others in the larger community who do not euthanize animals. They feel that they cannot discuss their occupation in social settings and receive positive responses from those who are not in the field of animal care and control (Smith, 1980). Consequently, many find it necessary to create clever and evasive responses to inquiries about their job or tend to restrict their socialization to other animal control personnel.

Unfortunately, the technician may also feel isolated from other animal control personnel because they also may not be sympathetic to the role of the technician. An additional source of frustration for some is that they find it difficult to discuss their jobs or their feelings with family members. This means that the traditional support of groups that most individuals use to help them through emotionally stressful periods may not be available for euthanasia technicians·.

HUMAN SOCIETY OF THE UNITED STATES

Compassion Fatigue in the Animal Care Community
2006

Many people enter the animal-care profession because they want to help animals; however, most are not completely cognizant of the emotional demands and/or consequences of their chosen profession (White 1998).

…euthanasia workers have difficulty working through the normal grieving process because animal deaths are so prevalent and never ending.

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As validated by current data collection and earlier reporting, there is little doubt that compassion fatigue is pervasive in animal shelters and the animal-control community. We must also make room for the possibility that compassion fatigue in the animal-care community is a by-product of multiple high-risk exposures. These exposures are thought to be high risk because animal-care workers are exposed to them constantly and repeatedly. This, in turn, increases the compassion fatigue. Examples of high-risk exposure include:

- Public perception that the work is low level and "not noble"
- Budget cuts
- Physical environment: space, noise, and lighting
- Co-workers
- Volume of animals

Perhaps the most prevalent high-risk factor in animal shelters is the sheer number of animals entering the facilities. The volume of animals produces an almost impossible level of work and, accordingly, leads to unattainable goals. Let us compare a social worker or counselor, who may spend one hour per patient, working five days a week for six hours a day, and see thirty patients a week. The animal-care professional "sees" hundreds of "cases" per week. Some of these cases—lost animals reunited with their owners, injured animals made well and placed for adoption—end happily and productively. However, many (in some cases, the majority) of these cases are resolved by destruction of the "patient," via euthanasia, even after days or weeks of effort by the workers themselves.

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Research on compassion fatigue in many helping professions reveals that workers in shelters and animal control are at higher risk for compassion fatigue than are other caregivers.

SUICIDE

JOURNAL OF AMERICAN VETERINARY MEDICAL ASSOCIATION

Suicides and Deaths of Undetermined Intent Among Veterinary Professionals from 2003 Through 2014
September 1, 2019

Results suggested higher Standard Mortality Ratios for suicide among veterinarians might be attributable to pentobarbital access. Improving administrative controls for pentobarbital might be a promising suicide prevention strategy among veterinarians…

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Death and death-related injury variables were summarized for veterinary professionals by occupational group…There were few differences in the distributions of these variables among the 3 groups; however, veterinarians were more likely to have death characterized as suicide (instead of undetermined intent) than were decedents of the other 2 groups. Additionally, although self-poisoning was the most common mechanism of death for all groups, veterinarians were more likely to have poisoning with pentobarbital than decedents of the other 2 occupational groups and were less likely than veterinary technicians or technologists to have poisoning with opioids.

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Given the findings regarding pentobarbital and the unique status of this drug in the veterinary industry (ie, that pentobarbital poisoning is a suicide method unlikely to be accessible to individuals outside of the veterinary industry), several follow-up analyses were added to the investigation. First, SMRs for suicide were calculated as previously described, except that records of decedents who had pentobarbital poisoning listed as a mechanism of death were excluded; when these records were removed from the analysis, the SMRs for suicide of male and female veterinarians were no longer significantly different from those for the general population.

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To the authors' knowledge, the study reported here was the most comprehensive investigation of suicide among US veterinarians to date and the first to examine deaths by suicide among veterinary technicians or technologists and veterinary assistants or laboratory animal caretakers. Calculation of SMRs revealed that veterinarians and veterinary technicians or

technologists had significantly higher rates of death by suicide, compared with findings for the general population, whereas veterinary assistants or laboratory animal caretakers did not.

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The most notable difference between veterinarians and the other veterinary occupational groups was that veterinarians were significantly more likely to have used pentobarbital as a suicide method. Research has found that veterinarians who die by suicide are particularly likely to use self-poisoning as a method and that the use of barbiturates is the most common form of self-poisoning among veterinarians who die by suicide. This is in contrast to findings for members of the general US male population, for whom firearms are the most common suicide method overall; < 10% of this population use self-poisoning as a suicide method. Among the general US female population, self-poisoning is slightly more common than firearms as a suicide method. The authors are unaware of any previous studies in which pentobarbital was isolated as a specific barbiturate used for suicide by veterinarians, and although it has been assumed veterinarians have a high suicide risk because of their access to certain lethal means such as pentobarbital, we believe the present study was the first to provide evidence supporting this possibility. After the records of decedents for whom pentobarbital poisoning was indicated as a mechanism of death were removed from the dataset, the SMRs for male and female veterinarians no longer indicated a difference in suicide rates, compared with the general population. This provided compelling evidence that access to pentobarbital might explain the high risk of suicide among veterinarians, and this has critical implications for prevention efforts.

THE VETERINARY RECORD

Veterinary Surgeons and Suicide: Influences, Opportunities, and Research Directions
January 12, 2008

Several studies have found that members of some occupations are at greatly increased risk of suicide (Agerbo and others 2007), with reports of an elevated risk for health care professionals including doctors (Hawton and others 2001, Schernhammer and Colditz 2004), pharmacists (Kelly and Bunting 1998), dentists (Alexander 2001) and nurses (Hawton and Vislisel 1999). On the basis of proportional mortality ratios (PMRs) in England and Wales (Kelly and Bunting 1998, Mellanby 2005) and Scotland (Stark and others 2006), and similar estimates in the USA (Miller and Beaumont 1995), Australia (Jones-Fairnie and others 2008), and Norway (Hem and others 2005), veterinary surgeons appear to be at particularly high risk, around four times more likely to die of suicide than the general population and around twice as likely than other health care professionals.

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Access to means of suicide: Suicidal impulses are often brief and, at the point at which a person feels hopeless and suicidal, ready access to means of suicide may be the key factor that influences the translation of suicidal thoughts into an actual suicide act (Hawton 2007). Access to lethal means has a strong influence on the suicide rate; for example, decreases in the rate have been associated with changes to non-toxic domestic gas from coal gas, the use of catalytic converters in cars, smaller over-the-counter pack sizes of paracetamol, and the installation of barriers on high bridges (Hawton 2007). Veterinary surgeons have ready access to medicines, as they are typically stored in practice premises, and knowledge of medicines for self-poisoning, which together offer a possible contributory factor for their high suicide rate. Deliberate self-poisoning is the most common method of suicide by both male and female veterinarians, accounting for 76 and 89 per cent of suicides, respectively, compared with 20 and 46 per cent, respectively, of suicides in the general population (Kelly and Bunting 1998). Veterinary surgeons and pharmacists have the highest proportions of suicides using this method for all occupational groups; medical practitioners also have an increased risk of this specific method of suicide (Kelly and Bunting 1998).

SOCIETY OF OCCUPATIONAL MEDICINE

Sytematic Review of the Prevalence of Suicide in Veterinary Surgeons
June 30, 2010

In all but one of the 15 studies presenting risk of suicide in veterinary surgeons with a comparison population, an elevated risk was found. The better quality studies with the lowest risk of bias indicated that in the UK, the rate of suicide in the veterinary profession was at least three times the general population rate. Studies of the methods of suicide veterinary surgeons use suggest that self-poisoning and firearms are particularly common. There appears to be an elevated risk of suicide for veterinary surgeons in several countries. Access to means of suicide influences the methods used and may contribute to increased risk.

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The two most common methods of suicide used by veterinary populations were poisoning and firearms. Three studies showed that firearms were the most common method of suicide…In five studies, self-poisoning was the most common method of suicide…

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In the majority of studies that reported methods of suicide, poisoning and firearms were the most common.

AUSTRALIAN VETERINARY JOURNAL
Suicide in Australian Veterinarians
April 2008

The estimated suicide rates for Western Australian and Victorian veterinarians were respectively 4.0 times and 3.8 times the age standardised rate for suicide in the respective state adult populations…The major method of suicide was poisoning by drugs, which involved injectable barbiturates.

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The major method of suicide was poisoning by injectable barbiturates which may be attributed to the easy access veterinarians have to these drugs, and this is consistent with the methods reported from studies of suicide in veterinarians and medical doctors overseas. There is a clear contrast to the major methods of suicide in the general population…

THE BRITISH JOURNAL OF PSYCHIATRY
Suicide by Occupation: Systematic Review and Meta-Analysis
2013

Numerous studies have found that certain occupations such as medical professionals (including doctors, nurses, veterinarians), farmers and police are at elevated risk of suicide compared with the general employed population. This could be explained by access to lethal means through work…

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Access to lethal suicide methods through work may also explain some of the observed results, particularly the higher risk of suicide in ISCO categories containing farmers, police, military and medical professionals than other occupations. An investigation of the methods used in suicide by occupational groups conducted in New Zealand found that farmers were more likely to use firearms as a method to take their own life, whereas health professionals were more likely to overdose on drugs.

JOURNAL OF AMERICAN VETERINARY MEDICAL ASSOCIATION
Suicide Among veterinarians in the United States from 1979 Through 2015
January 1, 2019

Results of the study indicated that Proportionate Mortality Ratios (PMR) for suicide of female as well as male veterinarians were higher than for the general population.

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A higher-than-expected number of deaths from suicide among veterinarians has been described in multiple studies from Australia, Norway, and the United Kingdom. In 1982, investigations of deaths due to any cause for US veterinarians who died during the years 1947 through 1977 found that the PMR for suicide among white male veterinarians was 1.7 times that of the general US population. Another study of male and female veterinarians in California who died during 1960 through 1992 determined the PMR for suicide among California veterinarians was 2.6 times that of the general population.

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Veterinarians had a higher PMR for suicide, compared with the general US population. Male veterinarians were 2.1 (95% CI, 1.87 to 2.32) times and female veterinarians were 3.5 (95% CI, 2.73 to 4.39) times as likely as the general US population to die by suicide. The PMRs for all occupational characteristics were > 1.0, although not all were significant. Both male and female veterinarians who worked in any clinical position or specialized in companion animals were significantly ($P < 0.01$ for both comparisons) more likely to die by suicide than was the general US population.

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Among all decedents, the most common methods of suicide were the use of firearms (180/398 [45%]) and pharmaceuticals (154 [39%]…

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In the present study, the use of firearms was the most common method of suicide. However, 154 of 398 (39%) decedents used poisoning with pharmaceuticals as a method of suicide, a proportion more than twice that for suicide decedents in the general US population as reported by other sources. A higher percentage of suicide deaths by poisoning, compared with the general

population, is consistent with findings in several international studies of suicide among veterinarians. Veterinarians have access to pharmaceutical products such as injectable barbiturates, narcotics, sedatives, and tranquilizers, and they receive extensive training on the pharmacokinetics and pharmacodynamics of these products. Multiple studies have found that persons at risk for suicide usually choose methods that are accessible and familiar. Furthermore, a New Zealand study of suicides by occupation indicated that decedents in some health-care professions (nurses, doctors, and pharmacists) with access to pharmaceutical products were more likely to use poisoning methods than were other occupational groups. Research has indicated a potential association between suicide deaths among veterinarians and access to and knowledge of lethal pharmaceutical products. Applying administrative controls to limit and control access to potentially lethal pharmaceutical products might reduce the number of veterinarian suicides caused by pharmaceutical poisoning.

THE ROYAL AUSTRALIAN AND NEW ZEALAND COLLEGE OF PSYCHIATRISTS

Suicide by Occupation: Does Access to Means Increase the Risk?
July 19. 2009

Access to means may be less important in some circumstances than in others, perhaps because of the presence of other factors that confer protection.

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Ease of access to means, however, did appear to have affected the methods chosen, with several health-related occupational groups being more likely to use poisoning than the rest of the employed population.

BMC PSYCHIATRY

Access to Means of Suicide, Occupation and the Risk of Suicide: a National Study Over 12 Years of Coronial Data
2017

Availability of lethal means is a significant risk factor for suicide. This study investigated whether occupations with greater access to lethal means had higher suicide rates than those without access, and further, whether this relationship differed for females versus males… Persons in occupations with access to firearms, medicines or drugs, and carbon monoxide more frequently used these methods to end their lives than those without access to means. Females employed in occupations with access to means had suicide rates that were 3.02 times greater (95% CI 2.60 to 3.50, $p < 0.001$) than those employed in occupations without access. Males in occupations with access had suicide rates that were 1.24 times greater than those without access (95% CI 1.16 to 1.33, $p < 0.001$)… Work-related access to means is a risk factor for suicide in the employed population, but is associated with a greater risk for females than males. The findings of this study suggest the importance of controlling access to lethal methods in occupations where these are readily available.

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Our results suggest that occupational access to means is an important risk factor for suicide. Those occupations characterized by greater access and familiarity with potentially lethal suicide methods had overall higher suicide rates than those without.

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The findings of this study suggest the importance of controlling access to lethal methods in occupations where these are readily available, and where there is evidence that these are particularly utilised by those who die by suicide.

CENTERS FOR DISEASE CONTROL AND PREVENTION

Press Release: New Study Finds Higher than Expected Number of Suicide Deaths Among U.S. Veterinarians
December 20, 2018

Veterinarians in the U.S. are at an increased risk of suicide, a trend that has spanned more than three decades, according to a new CDC study published in the Journal of the American Veterinary Medical Association.

The study is the first to show increased suicide mortality among female veterinarians. Female veterinarians were 3.5 times as likely, and male veterinarians were 2.1 times as likely, to die from suicide as the general population. Seventy-five percent of the veterinarians who died by suicide worked in a small animal practice.

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As in the general population, firearms were the most commonly used method of suicide among veterinarians. However, 37 percent of suicide deaths among veterinarians were caused by pharmaceutical poisoning, which is 2.5 times higher than

pharmaceutical poisoning among the general U.S. population. Sixty-four percent of deaths among women and 32 percent of suicide deaths among men in the veterinary profession were from this type of poisoning.

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Suicide is seldom caused by a single factor. Some factors specific to the veterinary profession may include…Access to euthanasia solution used for animals and the training to calculate a dose that could also be lethal in people.

CENTERS FOR DISEASE CONTROL AND PREVENTION

Suicide Risk for Veterinarians and Veterinary Technicians
September 4, 2019
A new study, "Suicides and deaths of undetermined intent among veterinary professionals from 2003 through 2014" sheds new light on the issue of suicide among veterinary professions. It is known that veterinarians in the United States and abroad have a higher suicide risk compared with the general population. This new study confirms the increased rated of suicide with stronger statistical methods and introduces new data.

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The study:

- Confirmed (using stronger statistical methods than previous studies of suicide among veterinarians) that suicide is more likely among veterinarians than among the general population — 1.6 times more likely for male veterinarians and 2.4 times more likely for female veterinarians.

- Identified, for the first time, a higher likelihood of suicide among veterinary technicians and technologists than among the general population — 5.0 times more likely for males and 2.3 times more likely for females. The results for male veterinary technicians and technologists should be viewed with caution because fewer than 20 deaths were identified, which makes the estimates less reliable. Veterinary assistants and laboratory animal caretakers did not have higher likelihood of suicide.

- Found that poisoning was the most common cause of death among veterinarians. Pentobarbital, a euthanasia solution, was the drug most commonly used. Most pentobarbital poisonings occurred at home.

- Found that when veterinarians who died from pentobarbital poisoning were excluded from the analysis, the likelihood of male and female veterinarians dying from suicide was not different than that of the general population. This indicates that training on euthanasia procedures **and** access to pentobarbital are some of the key factors contributing to the problem of suicide among veterinarians. This finding was not true for veterinary technicians and technologists who more often died from opioid poisoning compared with veterinarians.

- Found that veterinarians were significantly less likely than veterinary technicians and technologists to have a history of a suicide attempt before the fatal incident. Nearly 30% of all decedents had disclosed their suicidal intent before their deaths, 55% had a history of mental health treatment, and 42% were undergoing mental health or substance abuse treatment at their time of death.

Based on the research findings, it will be important to ensure suicide prevention activities are aimed at veterinary technicians as well as veterinarians. In addition, the results indicate the higher likelihood for suicide among veterinarians compared with the general population might be attributable to pentobarbital access. Improving administrative controls for accessing pentobarbital could be a promising suicide prevention strategy among veterinarians. It is important to consider how to control access to pentobarbital without hindering veterinarians' daily job functions. Requiring a second person's signature when accessing the drug could have a preventive effect for suicide among veterinarians, while still allowing routine access for clinical purposes. Increased administrative controls could also make it more difficult for a veterinarian to take pentobarbital out of the clinic, given that most pentobarbital-related suicides occurred at home.

VETERINARY INFORMATION NETWORK

Veterinarian Access to Euthanasia Drug Scrutinized: Ross Kelly
July 7, 2020

It had never crossed Dr. Sarah Morton's mind that her close workmate, a bright and principled young veterinarian, would use the euthanasia drug pentobarbital to take her own life.

So when the seemingly unthinkable happened last August, she was shell-shocked.

"It affected the practice like nothing else," Morton, a companion animal practitioner based in Queensland, Australia, said in a telephone interview. "It really floored the entire team, and our clients, for at least three months."…

Another veterinarian, Dr. Jane Donald, tells of a colleague taking her own life inside the clinic where Donald works in the state of South Australia. She, too, had given herself a lethal injection of a solution containing pentobarbital…

Donald said it was the fourth time in her 20-year career that she had lost a veterinarian colleague to suicide.

In the U.S., all states recommend pentobarbital as the top method of animal euthanasia, and some states legislate it as the only method, according to research by the American Veterinary Medical Association. Other, less commonly used methods allowed by some states include carbon monoxide chambers.

Debate about pentobarbital access is intensifying as academic studies increasingly show that the drug is one of the most common mechanisms — if not the most common mechanism — for suicide among veterinarians.

Multiple studies indicate that veterinarians are far more likely than the average person to take their own lives. One of the latest, conducted last year by the U.S. Centers for Disease Control and Prevention, found that male veterinarians were 2.1 times as likely to die by suicide as the general U.S. population. For female veterinarians, the proportion was higher still, at 3.5 times. Myriad reasons have been offered to explain that unsettling discrepancy. Stressors mentioned in a CDC survey of 11,627 U.S. practitioners published in 2015 included long hours, distress associated with euthanizing animals, guilt over making surgical mistakes, copping abuse from clients and worrying about high levels of student debt.

A large number of drugs in veterinary practice potentially could be used to the same effect as pentobarbital, the AVA noted in its submission to the TGA. "However, there is no doubt that pentobarbital is the only one of these that is widely recognized as a means of suiciding," the AVA said…

Still, in a recent study of suicides involving U.S. veterinarians between 2003 and 2014, among 73 cases, poisoning was the cause of death for 47%, followed by firearms, at 40%. Among those who had taken poison, 53% used pentobarbital.

One of that study's authors, Tracey Witte, an associate professor at Auburn University's Department of Psychological Sciences in Alabama, believes there is a strong link between veterinary suicide and access to pentobarbital. For one, she points out that while veterinary technicians also are more likely to die of suicide than the general population, they are far less likely to use pentobarbital than veterinarians.

"I think the very specific knowledge that veterinarians have makes pentobarbital in their hands more dangerous as a suicide method because they've been specifically trained on how to enact death with it," Witte told VIN News in a telephone interview. Witte said her research indicates that even though veterinarians face multiple stressors, such as demanding hours and difficult clients, those stressors aren't unique to the veterinary profession.

"The evidence that we're seeing is that the main unique factor for veterinarians does seem to be this pentobarbital access and knowledge," Witte said. "Veterinarians, like workers in many other stressful professions, may have stressors, and that should be addressed. But the problem is when that's combined with access to this deadly substance that is often readily available."

JOURNAL OF VETERINARY MEDICAL EDUCATION
Failure to Acknowledge High Suicide Risk Among Veterinarians
2012

A high suicide risk has been reported among veterinarians in comparison to the general population. Postulated causes have included depression, substance abuse, work-related stress, reluctance to admit psychiatric problems, and access to lethal drugs and/or familiarity with euthanasia.

A recent article from the United Kingdom reported on the high prevalence of suicide among veterinarians,1 which is much higher than the rate of suicide in the general population and is also higher than the rate of suicide among other health professionals, who themselves are at a high risk of suicide.

Other possible factors cited that contribute to higher rates of suicide among veterinarians include work-related stress, reluctance to admit psychiatric or substance-abuse problems, ready access to lethal drugs, and familiarity with and regular practice of euthanasia.

PSYCHOLOGICAL MEDICINE: CAMBRIDGE UNIVERSITY PRESS
High-risk Occupations for Suicide
July 24, 2012

Several occupations with the highest suicide rates (per 100 000 population) during 1979–1980 and 1982–1983, including veterinarians (ranked first), pharmacists (fourth), dentists (sixth), doctors (tenth) and farmers (thirteenth), have easy occupational access to a method of suicide (pharmaceuticals or guns).

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The 30 occupations with the highest suicide rates are shown for the two study time periods 1979–1980, 1982–1983 and 2001–2005. During the earlier time period, the highest suicide rates were among veterinarians…

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We found that several of the occupations with the highest suicide rates in Britain during the late 1970s and the early 1980s were veterinarians (ranked first), pharmacists (fourth), dentists (sixth), doctors (tenth) and farmers (thirteenth). These mainly professional occupations were considered to have high suicide risks because of an easy occupational access to a method of suicide, pharmaceuticals or guns (Charlton, 1995; Hawton et al. 1998, 2000; Marzuk et al. 2002; Thoresen et al. 2003; Mahon et al. 2005; Mann et al. 2005; Meltzer et al. 2008; Platt et al. 2010).

Public Perception

JOURNAL OF AMERICAN VETERINARY ASSOCIATION
Providing a Humane Death
February 27, 2013

"As new research is conducted and more practical experience gained, recommended methods of euthanasia may change," the report states. "As such, the AVMA and POE have made a commitment to ensure the Guidelines reflect an expectation and paradigm of continuous improvement that is consistent with the obligations of the Veterinarian's Oath.

"As for other editions of the document, modifications of previous recommendations are also informed by continued professional and public sensitivity to the ethical care of animals."

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While the panel on euthanasia considered the aesthetics of euthanasia methods, animal welfare was the top concern, Dr. Golab said. For example, manually applied blunt-force trauma is considered to be an acceptable euthanasia method for some species under certain conditions.

"If blunt-force trauma is done correctly, it can actually be among the most humane of methods performed," she said.

But it can have negative effects on operators, and the public is increasingly opposed to it, so the panel recommended that those who use it look for alternatives.

THE NEWS REPORTER
Shelter Removing Gas Chamber
December 29, 2016

Animal welfare groups spent years criticizing Columbus County Animal Control over the device, even after the county ceased using the chamber.

HUMANE SOCIETY VETERINARY MEDICAL ASSOCIATION
Euthanasia Via Gas Chambers: Michael Blackwell, DVM, MPH
October 22, 2014

Quoting the Humane Society of the United States' publication: Euthanasia Reference Manual, "No matter how frequently or infrequently euthanasia is performed in a facility, no other component of shelter work is as consequential or will be as carefully scrutinized by the public."

NC OFFICIALLY BANS GAS FOR EUTHANIZING SHELTER ANIMALS
Associated Press
December 20, 2014

Just a few years ago, more than 20 shelters in the state used gas chambers, said Kim Alboum, North Carolina state director for the Humane Society of the United States.

"Regardless of where you stand on whether lethal injection is more humane, it (gassing animals) does put a stigma on North Carolina," Alboum said. "In 2014, the thought of a family pet being gassed in North Carolina is not something the community wants to think about."

HUMAN SOCIETY OF THE UNITED STATES
Compassion Fatigue in the Animal Care Community
2006

In addition to the emotional nature of the work, animal-care professionals experience significant external and internal pressures that affect the conditions in which they must work. The external stresses that shelter workers face include:

- Public perception and lack of understanding

- Relationships with other humans and animals
- Friends and family who do not understand the work
- Government regulation and administrators
- Negative media
- Requests for special favors from politicians and friends

These examples suggest that external stressors, especially how the public reacts to the work, contribute greatly to the nature of the work at the shelter and no doubt demonstrate that the toll the public inflicts on a shelter worker is profound. “Shelter workers do the dirty work for the general population members who continue to breed, abuse, overpopulate animals, and shift the blame onto shelter staff for a problem they created themselves” (Wagner 2000, 1).

NORTH UTAH VALLEY ANIMAL SERVICES

Public Perception Considerations
August 2021

A negative public perception due to the method of animal euthanasia utilized, whether based upon accurate or innacurate information, is likely to have an undesirable impact upon the animal shelter in a multitude of various ways. For specific areas of impact see the Operational Impact section of this report.

Operational Impact

AL.COM – ALABAMA LOCAL NEWS
Yvonne Betowt: The Huntsville Times
June 8, 2011

Huntsville Animal Services Director Dr. Karen Sheppard said ending the use of gas chambers will improve overall care at animal control centers that have used them. "It's just a simple fact, when a good shelter stops relying on the gassing chamber for euthanasia and begins to euthanize by the injection of sodium pentobarbital, the animal care and control staff becomes great," she said. "Pet adoptions rise, more people think about spaying and neutering, and citizens consider monetary and time donations."

Also, she said, the community "gains trust and respect for the shelter's empathy and skill."

JOURNAL OF AMERICAN VETERINARY MEDICAL ASSOCIATION
Impact of Euthanasia Rates, Euthanasia Practices, and Human Resource Practices on Employee Turnover in Animal Shelters
March 1, 2007

Employee turnover rates were positively related to euthanasia rate. Practices that were associated with decreased turnover rates included provision of a designated euthanasia room, exclusion of other live animals from vicinity during euthanasia, and removal of euthanized animals from a room prior to entry of another animal to be euthanized. Making decisions regarding euthanasia of animals on the basis of factors other than behavior and health reasons was related to increased personnel turnover. With regard to human resources practices, shelters that used a systematic personnel selection procedure (eg, standardized testing) had comparatively lower employee turnover.

The euthanasia rate for dogs was, as expected, correlated ($r = 0.36$; $P < 0.05$) with the turnover index such that higher euthanasia rates were associated with increased employee turnover. However, the euthanasia rate for cats was not significantly related to employee turnover. Two euthanasia practices were associated with decreased turnover: provision of a designated euthanasia room ($r = –0.36$; $P < 0.05$) and removal of euthanized animals from an area prior to entry of an additional animal to be euthanized ($r = –0.33$; $P < 0.05$). Two practices were also associated with increased turnover: presence of other live animals during euthanasia ($r = 0.51$; $P < 0.01$) and euthanasia of animals on the basis of factors not related to behavior or health such as breed, age, or pregnancy ($r = 0.28$; $P < 0.05$). In terms of human resource practices, the use of systematic employee selection systems was related to lower rate of turnover ($r = –0.29$; $P < 0.10$). Job rotation among employees performing euthanasia, the use of a formal performance appraisal system, and the use of a realistic job preview system were not related to turnover.

Overall, our data have provided important insight into the turnover of employees with euthanasia responsibilities at shelters and perhaps suggest several specific avenues that can be pursued to mitigate this turnover. The findings of the study reported here are applicable to any organization in which euthanasia of animals is conducted, such as animal control facilities, animal shelters, or veterinary care establishments. Although changes in euthanasia rates may be a more difficult challenge because those rates are usually determined by societal neglect and assertive adoption practices, public education programs are encouraged. Furthermore, by more widely adopting advocated euthanasia practices and human resource systems, employee retention at shelters should be greatly improved, which serves to help the organization and its ability to promote animal welfare.

ANIMAL SHELTERING MAGAZINE
Closing the Door on the Gas Chamber: Colleen Jaskot
February 2017

Closing chambers also impacts how shelters are seen in the community, and there is no better example of that than North Carolina. Kim Alboum, former HSUS North Carolina state director and current director of the HSUS Emergency Placement Partners program, says the 20-plus chambers there in 2009 plagued the reputations of North Carolina shelters as a whole—even if they didn't have chambers. When a shelter, which is supposed to be the paragon for humane treatment of animals, doesn't hold itself to those standards, the community doesn't want to be a part of it.

“A lot of people don’t want to go to a rural shelter—couple that with a gas chamber, forget about it,” says Alboum. “… So when the shelters make this transformation, it really does open it up to the community.” Vance County experienced this transformation after it got rid of its chamber, with the help of a grant from The HSUS, in November 2012, says Frankie Nobles, chief of animal control. It was a positive change that increased community support for the shelter, he says. It has taken work, though. The stigma of a gas chamber is so damaging that some people still think the shelter uses a chamber, despite public outreach efforts that tried to make it clear that it doesn’t anymore, he says.

NORTH UTAH VALLEY ANIMAL SERVICES

Operational Impact Considerations
August 2021

The impact on operations, due to negative public perception with regard to the method of animal euthanasia employed at the North Utah Valley Animal Shelter, is difficult to quantify, however the following are representative of the kinds of influences the animal shelter has seen in the past and will likely continue to experience should the perception of the public remain negative:

- Declining community support
- Diminishing employee morale
- Increase in employee turn-over
- Diminishing ability to hire quality personnel
- Decline in and/or elimination of the ability to seek grant funding
- Decreasing partnerships with animal rescue groups and welfare agencies
- Possible modifications and/or withdrawl of municipal inter-local agreements
- Reduction in donations, monetary or otherwise, received at the animal shelter
- Change in acceptance of legislation that prohibits particular methods of animal euthanasia
- Reluctance of animal services agencies, veterinarians, pet stores, and suppliers to form collaborative partnerships
- Diminishing confidence in the animal shelter from partner agencies and personnel (cities, animal control officers, etc.)

Options

OPTIONS FOR CONSIDERATION

Operational Possibilities to Consider
July 2021

The following is a list of options that could be considered for future animal euthanasia operations at North Utah Valley Animal Services:

- Continue using carbon monoxide as a means of animal euthanasia as presently conducted
- Continue using carbon monoxide as a means of animal euthanasia in conjunction with a public relations campaign
- Continue using carbon monoxide as a means of animal euthanasia as presently conducted with a pre-euthanasia sedative injection
- Continue using carbon monoxide as a means of animal euthanasia and utilize euthanasia by injection of sodium pentobarbital as well
- Discontinue the use of carbon monoxide and exclusively employ euthanasia by injection of sodium pentobarbital
- Hire Euthanasia Technicians specifically to perform all animal euthanasia by injection of sodium pentobarbital
- Outsource all animal euthanasia to local veterinarian(s) via contract
- Discontinue all euthanasia services for the general public
    - This will result in a loss of annual revenue of approximately $6,375 (85 animals per year at $75 per animal)
    - This will result in decreased expenses for labor, CO or euthanasia drugs, removal fees, carcass bags, etc.
    - Will likely result in decreased stress and emotional impact on staff
    - Will create more favorable statistical data with reduced percentage of animals euthanized
    - Will create a more positive public perception
- Increase fee for euthanasia services for the general public akin to what a veterinarian charges
    - NUVAS current fee is $75
    - Veterinarians charge roughly between $100 - $400
    - In home euthanasia services charge between $300 - $500
- Increase in pay for employees that are tasked with euthanasia and have undergone euthanasia training
    - Consider an annual stipend, for example:
        - $200 per month for employees who performed euthanasia in a given month
    - Consider an 5% increase in annual pay, for example:
        - Animal Shelter Technician without Euthanasia Endorsement = $30,000
        - Animal Shelter Technician with Euthanasia Endorsement = $31,500

Recommendations

RECOMMENDATIONS FOR OPERATIONAL CHANGES

North Utah Valley Animal Services
July 2021

ANIMAL WELFARE

WHEREAS, the use of carbon monoxide as a euthanasia agent is not recommended for use in animals that are old, young, ill, injured, or otherwise circulatory compromised; and

WHEREAS, their exists in the scientific community inconsistencies with regard to when an animal loses consciousness when utilizing carbon monoxide for animal euthanasia; and

WHEREAS, the uptake of carbon monoxide for each individual animal cannot adequately be measured and is differential between animals thereby eliminating the ability to accurately predict the time required for a given animal to lose consciousness with any degree of specificity; and

WHEREAS, the accurate concentration of carbon monoxide cannot be satisfactorily guaranteed when utilizing it as a means of animal euthanasia; and

WHEREAS, euthanasia by injection of sodium pentobarbital is currently considered the best practice for animal euthanasia in animal shelters; and

WHEREAS, the American Veterinary Medical Association's Guidelines for the Euthanasia of Animals recommends using the methods of euthanasia that "induce the MOST rapid and painless and distress-free death possible" and that "death occurs as rapidly as possible" and further identifies euthanasia by injection of sodium pentobarbital as that method; and

WHEREAS, the American Veterinary Medical Association now considers euthanasia by injection of sodium pentobarbital the preferred method for animal euthanasia in animal shelters; and

HUMANE SAFETY AND WELLBEING

WHEREAS, the safety of our employees, as well as our customers and clients, is of the utmost importance; and

WHEREAS, the potential for a catastrophic incident that endangers the lives of employees, customers, and animals exists with the continued use of carbon monoxide equipment and does not exist with the utilization of euthanasia by injection of sodium pentobarbital; and

WHEREAS, both methods of animal euthanasia pose a significant safety risk to personnel, the risk of both methods can be addressed by and mitigated with proper equipment, training, procedures, and protocols; and

WHEREAS, the risk to personnel handling and restraining animals for euthanasia by injection can largely be mitigated through the use of pre-euthanasia sedation using anesthetic drugs coupled with fractious animal injection techniques and equipment; and

WHEREAS, the risk of suicide that exists with the use of sodium pentobarbital (that does not exist with the use of carbon monoxide) can largely be abated by restricting access to sodium pentobarbital and having safeguards and protocols in place; and

WHEREAS, the emotional impact of euthanizing animals has not been shown to be increased or decreased between the two methods of euthanasia considered; and

COST

WHEREAS, the operational cost differential between euthanasia via carbon monoxide and euthanasia by injection of sodium pentobarbital appears to be inconsequential; and

PUBLIC PERCEPTION

WHEREAS, the public perception, whether accurate or inaccurate, has been shown to be almost unreservedly in opposition to the use of carbon monoxide for animal euthanasia; and

WHEREAS, the overwhelming majority of animal welfare organizations consider the use of sodium pentobarbital for animal euthanasia to be the preferred method; and

WHEREAS, the American Veterinary Medical Association, the National Institute for Occupational Safety and Health, as well as several other scientific organizations reference the Humane Society, and other animal welfare agencies, as authoritative sources, and these agencies oppose the routine use of carbon monoxide for animal euthanasia; and

OPERATIONAL IMPACT

WHEREAS, the operational impact of continued use of carbon monoxide as a means of animal euthanasia is entirely negative; and

WHEREAS, North Utah Valley Animal Services desires to always implement and follow those best practices that vouchsafe animal welfare in conjunction with human safety;

NOW, THEREFORE, IT IS RECOMMENDED that the North Utah Valley Animal Services Special Service District create and adopt a euthanasia by injection protocol and eliminate the use of carbon monoxide as a means of animal euthanasia. It is further recommended that NUVASSD discontinue accepting owner surrendered animals for euthanasia. Finally, it is recommended that employees who receive additional training and are charged with having to euthanize animals are given a pay increase; either as part of their salary or as a stipend given monthly.

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