ASSOCIATION OF SHELTER VETERINARIANS

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ASV Backgrounder:
Carbon Monoxide Inhalation as a Method of Euthanasi

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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. (ASV 2014)

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 (HSUS 2015, HSUS 2013, WSPA, Close 1997). 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

The mission of the ASV is to advance and support the practice of shelter medicine in order to improve community animal health and well-being.

and dogs and that the preferred method of euthanasia in animal shelters is euthanasia by injection (EBI).[1]

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.[2] 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.

Summary table of supporting evidence for discontinuing use of CO in animal shelters.	
Principle	Evidence
Use of CO is likely to result in significant distress to animals being euthanized.	The rapid gas flow rates necessary to achieve the recommended 6% concentration can result in noise levels that frighten animals. Slowing the flow rate to lessen noise levels is not recommended as it will cause a delay in reaching the effective concentration of gas, thereby increasing the time

[1] AVMA Guidelines for the Euthanasia of Animals: 2013 Edition, contingencies for acceptable use of CO euthanasia. (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.

[2] The AVMA maintains a database of laws pertaining to euthanasia by state: https://www.avma.org/Advocacy/StateAndLocal/Documents/Euthanasia_Laws.pdf. EBI training opportunities are offered by several humane organizations, including the HSUS training site: https://www.animalsheltering.org/search/site/EBI%20training?f%5B0%5D=im_field_tags%3A29

	necessary to achieve loss of consciousness and prolonging distress (AVMA 2013, Valentim 2016).
	The initial physical response to CO poisoning is incoordination, which occurs prior to unconsciousness, and is likely to be distressing to the animal (AVMA 2013, Blackmore 2013).
	CO stimulates motor centers in the brain leading to convulsions and muscular spasms; it is still unknown whether these events occur prior to loss of consciousness (Blackmore 2013, Chalifoux 1983). Agents inducing convulsions prior to loss of consciousness are unacceptable for euthanasia (AVMA 2013).
	Animals have an aversion to CO, which could result in agitation, anxiety, and vocalization (AVMA 2013). If CO gas is obtained from a gas engine or chemical reaction, irritants will be present in the gas, which are "likely to result in considerable distress to the animals" (WSPA 2015).
	Placing individual or multiple animals in an unfamiliar delivery chamber, which contains the odors of previous animals killed in the chamber, causes distress and anxiety (AVMA 2013, Hansen 1991, Valentim 2016).
The use of CO does not reliably offer a rapid method of death.	"[Death] as confirmed by cessation of heartbeat does not occur until 10 - 20 minutes after initial exposure to carbon monoxide at concentrations reaching 6%" (WSPA 2015). Delivery of such concentrations requires time to reach levels and regular maintenance of equipment is often not feasible or available for systems used by shelters.
	Animals under 16 weeks of age, those with decreased respiratory function, and those who are geriatric, sick, injured, or pregnant may have delayed absorption and/or circulation of CO, prolonging the time it takes to cause loss of consciousness and death (AVMA 2013, WSPA 2015). Shelters may be unable to reliably identify these animals.
The use of CO poses a physical health risk for chamber operators.	CO is an odorless, tasteless, and highly toxic gas, making it extremely hazardous to human health (AVMA 2013). CO at concentrations higher than 10% are highly explosive and toxic to operators (Valentim 2016).
	CO is a poison that accumulates in the bloodstream over time; therefore operators must be regularly checked for circulating carboxyhemoglobin in their own blood (AVMA 2013). CO chambers pose potential danger to operators either through repeated exposure of low concentrations when operating the chamber or through accidental exposure to a lethal dose (WSPA 2015).

	CO is hazardous to animal workers because of the risk of explosions, hypoxia, and health effects resulting from chronic exposure (AVMA 2013 Valentim 2016).
	"There is no clear evidence that CO can be used as a refinement in euthanasia. Furthermore, it can be dangerous for the operator" (Valentim 2016).
	CO has caused the death of at least one shelter worker since 2000 (The Chattanoogan 2000).
Use of CO does not eliminate engagement in the euthanasia process and may exacerbate operator distress	CO delivery chambers must allow for direct observation of animals during the inhalation process (AVMA 2013).
	The process of placing animals into the delivery chamber and observing the animals as they become disoriented, convulse, vocalize, and then die could lead to increased secondary traumatic stress, vicarious trauma, moral stress, and other mental health threats for operators.
	CO does not eliminate handling of dead animals, as verification of death by cardiac puncture, stethoscope, and/or the presence of rigor mortis is required regardless of method of euthanasia (Fakkema 2010).
Euthanasia by CO inhalation is an expensive method of euthanasia	CO euthanasia is more expensive than euthanasia by injection (Fakkema 2010, AHA 2009).
	There are significant costs associated with maintenance of CO delivery chambers to ensure safe and accurate gas delivery Failure to maintain the chamber properly can result in gas leaks hazardous to other animals and personnel. Minor leaks can cause inconsistent gas concentrations during operation which can increase distress and suffering prior to death.
	There are significant costs associated with employee turnover.

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