



Alternative Euthanasia Methods

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Other Euthanasia Methods

Methods other than pentobarbital

- Carbon monoxide chamber
- Carbon dioxide chamber
- Decompression chamber
- Nitrogen, Argon
- Embutramide
- Ultrapotent Opioids
- Gunshot





Carbon Monoxide CO

- 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.**



Carbon Monoxide CO

- HSUS considers CO conditionally acceptable if:
 - in states without direct DEA licensing, when no veterinarian is available to the shelter to oversee pentobarbital use
 - When administered by a commercially manufactured and properly equipped and maintained chamber
 - Only cool bottled, commercial grade CO used
 - engine or chemically generated gas is not acceptable due to impurities and heat, which make its use painful and inhumane.



Carbon Monoxide CO

- Dogs and cats can not be mixed in a CO cycle
- AHA & AVMA – conditionally acceptable
- Allowed in that State of Texas for species other than dogs and cats

AnimalSheltering.org - What is a Good Death?

[SDS CO](#)

[OSHA Quick Card – CO](#)

[OSHA Fact Sheet - CO](#)



CO Cost Analysis

- CO is more costly than sodium pentobarbital
- Premedication with acepromazine is recommended
 - Given IV is most effective, within 10 minutes
 - IM is nearly as effective, but takes up to 15-20 minutes or more for full effect
 - PO can take more than 30 minutes to an hour to take effect, and the dose is much higher



CO Cost Analysis

- Figures from Animal Control Agency in North Carolina 2007, via HSUS
- Total number of dogs and cats euthanized: 5427
 - 2430 dogs
 - 2997 cats
- Average number of dogs and cats euthanized per day: 15 (365 days)
- Number of employees (operators): 2
- For purposes of this cost analysis matrix, an average dog is 30 pounds.

CO Cost Analysis

- CO Equipment Costs:
 - CO chamber: \$10,500
 - 10 years in service
 - \$1050 per year
 - CO sensor: \$300
 - 10 years in service
 - \$30 per year
 - Estimated cost to maintain seals, gaskets and hardware over 10 years = \$500 per year
 - Equipment cost per animal ($\$1580/5427$) = **\$0.29 per animal**



CO Cost Analysis

- CO Labor Costs:
 - 2 employees
 - Total Cycle Time 50 minutes
 - Load time – 10 minutes
 - Run time – 35 minutes – employees watch chamber and do paperwork
 - Unload time – 5 minutes
 - Total time per day 125 minutes
 - 6 dogs or cats per cycle
 - 15 animals euthanized per day
 - Average 2.5 cycles per day



CO Cost Analysis

- CO Labor Costs:
 - Wage 10.44/hr, benefits 3.12/hr = 13.56/hr
 - 2 people x 125 min = 250 min = 4.17 hrs
 - \$56.54 per day / 15 animals = **\$3.77 per animal**
- CO Supply Costs:
 - CO gas cylinder \$219
 - 15 cylinders used annually
 - \$3285 per year
 - **\$0.60 per animal**
- Cost per animal **\$4.66** for CO Euthanasia

CO Cost Analysis

- Euthanasia by Injection Equipment Costs:
 - Floor Safe \$350
 - Table: \$100
 - Electric Clippers: \$120
 - Clipper blades: \$20 per year
 - Restraint Gate: \$100
 - Total \$690
 - 10 years in service
 - \$69 per year
 - Equipment cost per animal ($\$69/5427$) =
\$0.01 per animal – CO \$0.29 per animal

CO Cost Analysis

- EBI Labor Costs:
 - 2 employees at 13.56/hr
 - 5 minutes per animal
 - Labor cost EBI \$1.13 per animal –
 - Labor Cost CO \$3.77 per animal
- EBI Supply Costs:
 - Pentobarbital \$46 for 250 ml
 - \$0.184/ml
 - Average injection 4cc = \$0.736
 - Needle cost \$0.01
 - Syringe cost \$0.08
 - Supply cost EBI \$0.83 per animal
 - Supply cost CO \$0.60 per animal





CO Cost Analysis

- Total Costs:
 - Equipment cost EBI \$0.01 per animal
 - Labor cost EBI \$1.13 per animal
 - Supply cost EBI \$0.83 per animal
 - Total Cost EBI \$1.97 per animal
 - EBI Euthanasia Budget - **\$10,691.19**
 - Equipment Cost \$0.29 per animal
 - Labor Cost CO \$3.77 per animal
 - Supply cost CO \$0.60 per animal
 - CO Euthanasia Budget - **\$25,289.82**



CO 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

Dangers of CO

- 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.



Dangers of CO

- shelter workers have died at the hands of faulty CO chambers.
- 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



Dangers of CO

- shelter workers have died at the hands of faulty CO chambers.
- in 1997 a shelter veterinarian in Illinois was severely injured while operating a gas chamber.





Texas State Law

([HASC 10.821.054](#) – [TAC 25.1.169D](#))

- commercially manufactured carbon monoxide chamber or equivalent.
- located outdoors or in a well-ventilated room.
- Chamber must be airtight & equipped with:
 - exhaust fan ducted to the outdoors
 - a gas flow regulator and flow meter
 - gas concentration gauge
 - accurate chamber temperature gauge
 - audible alarm system if indoors



Texas State Law

([HASC 10.821.054](#) – [TAC 25.1.169D](#))

- Chamber must be airtight and equipped with:
 - All electrical equipment exposed to CO must be explosion-proof
 - view-port with either internal lighting or external lighting sufficient to allow visual surveillance of any animal(s) within the chamber
 - independent sections or cages to separate individual animals.
- The gas concentration process must achieve at least a 6% carbon monoxide gas, not to exceed 10% due to flammability and explosiveness throughout the chamber within 5 minutes after the introduction of carbon monoxide into the chamber is initiated.



Texas State Law

([HASC 10.821.054](#) – [TAC 25.1.169D](#))

- The ambient temperature inside the chamber should not exceed 85°F
- All equipment, must be in proper working order and used at all times during the operation.
- Animal(s) must be in the chamber with continuous gas supply for a minimum of 15 minutes.
- Animal(s) must not be removed from the chamber until at least 5 minutes after cessation of respiratory movement.
- The chamber must be thoroughly vented prior to removing any carcasses.
- The chamber must be thoroughly cleaned after the completion of each cycle.
- Chamber surfaces must be constructed and maintained so they are impervious to moisture and can be readily sanitized.



Texas State Law

([HASC 10.821.054](#) – [TAC 25.1.169D](#))

- Persons operating the chamber must be thoroughly trained in the proper methods and techniques for euthanizing animals.
- Operation, maintenance, and safety instructions and guidelines must be displayed prominently in the area containing the chamber.
- Can not be used on any animal less than 16 weeks of age.
- Only compatible animals of the same species may be placed in the chamber simultaneously.



Texas State Law

([HASC 10.821.054](#) – [TAC 25.1.169D](#))

- shall also not be used to euthanize any animal that could be anticipated to have decreased respiratory function, such as the elderly, sick, injured, or pregnant.
 - Such animals may be resistant to the effects of carbon monoxide and time to death increased
 - In animals with decreased respiratory function, carbon monoxide levels rise slowly, making it more likely that these animals will experience elevated levels of stress.
- No live animal(s) may be placed in the chamber with a dead animal(s).

Carbon Monoxide CO



Carbon Monoxide CO





CO Chamber Recommendations

- Chamber and cylinders inspected annually
- **regulator and flow meter
 - Regulator maintains proper gas concentration
 - Flow meter maintains proper gas flow rate
- In addition to being explosion proof, all electrical fixtures in the chamber should be protected by shatterproof cover
- Euthanasia tech should be present and monitoring during the entire cycle



CO Chamber Recommendations

- Sedation of animals prior to placement in the chamber is desirable
 - Remember animal must be breathing in order for the CO to work
- Animals should have enough room to sit and lie down comfortably
- Animals should be unconscious within 45-60 seconds
- Death should occur within 2-4 minutes
- Animals left in the chamber for 30 minutes at CO 6-10% to ensure death

Comments About CO

- Sound of gas rushing in can frighten dogs and especially cats
- As with all methods of euthanasia, death must be confirmed on every animal
- Just like re-dosing of pentobarbital (sometimes multiple redoses) is necessary to achieve death, redosing gas is sometimes necessary.



Comments About CO

- Redosing 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.
- Repeated near death experiences separated by periods of recovery are needed to achieve death.





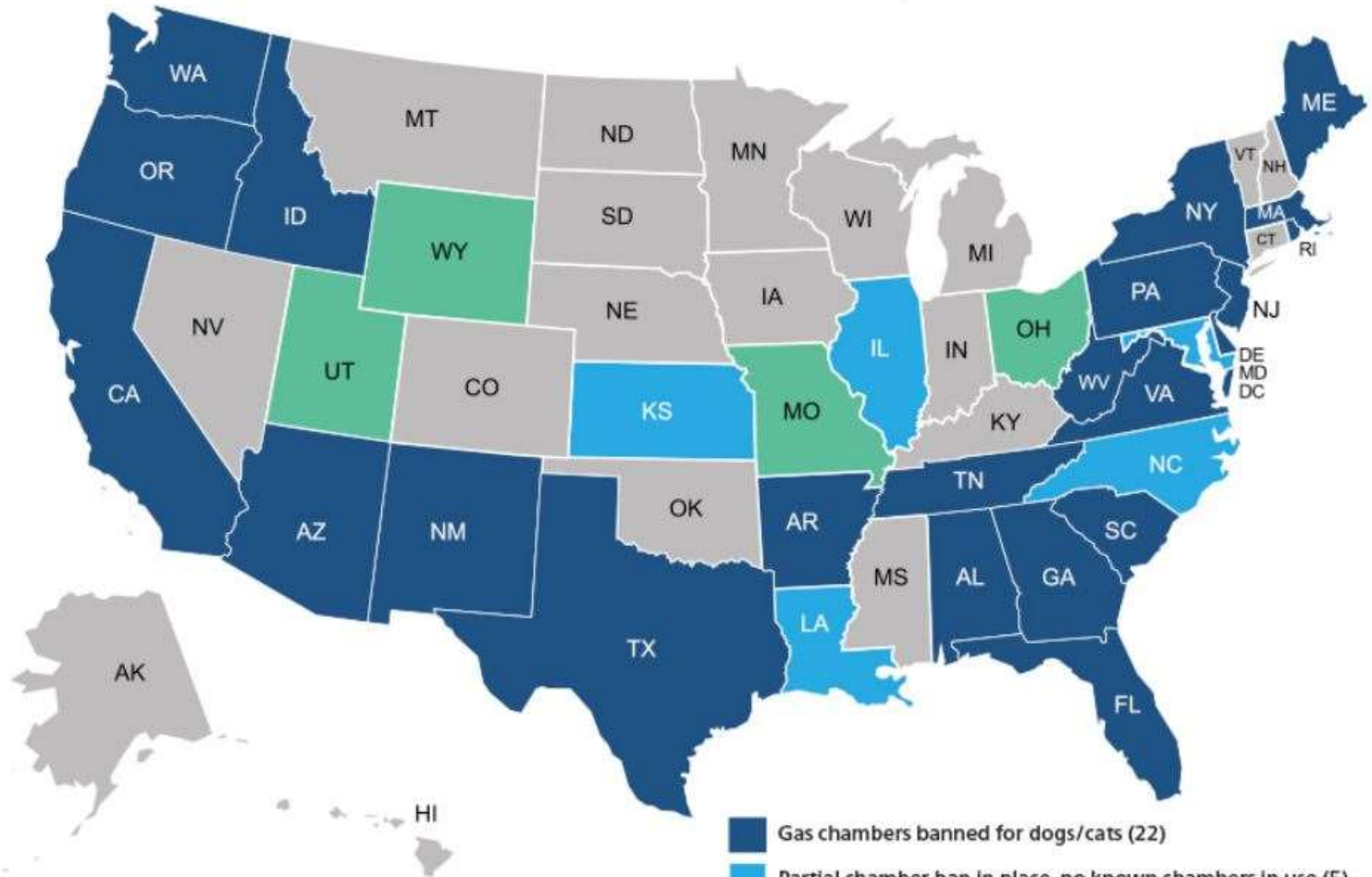
CO Resources

- AHA Position Statement – [Gassing of Animals at Shelters](#)
- [Letter from a Gas Chamber Man](#)
- Video – [Gassing Animals in North Carolina "Kill Box"](#)



Gas Chambers Current Landscape

Based on best available information, July 2016



- Gas chambers banned for dogs/cats (22)
- Partial chamber ban in place, no known chambers in use (5)
- No formal gas chamber ban, but no indications of use (19)
- No ban; gas chamber use confirmed or suspected (4)

Total number of states with active chambers: 4



Carbon Dioxide (CO₂)

- Causes death by suffocation
- **AHA, HSUS** - Not acceptable for euthanasia
- **AVMA** - acceptable with conditions for euthanasia in those species where aversion or distress can be minimized.
- Not legal in the state of Texas

Nitrogen, Argon

- **AVMA** - Hypoxia resulting from exposure to Ar or N₂ gas mixtures is acceptable with conditions for euthanasia of chickens and turkeys.





Embutramide

- FDA Approved for euthanasia
- **Tributame** – embutramide, chloroquine phosphate, lidocaine, ethanol (schedule III)
 - Slower than pentobarbital – death can take more than 5 minutes, more agonal breathing
 - Can cause pain on injection in cats
 - Not recommended for cats
- **T61** – embutramide, mebozonium, tetracaine
 - Mebozonium causes paralysis, and could result in immobilization/suffocation prior to unconsciousness
 - Increased vocalization stressful to animals and people
- Not currently available
- Could be used if pentobarbital becomes unavailable
- IV administration only₃₃

Ultrapotent Opioids

- Etorphine and carfentanil
- Administered IM (by dart)
- Very potent (10,000x morphine) – small volumes
- Used for sedation of large zoo animals & to euthanize captive apes PO (lollipop)
- Dangerous to people handling them
 - Can be absorbed through broken skin or mucous membranes
- Secondary poisoning is a large risk – careful disposal
- Unfortunately, abused by people (very dangerous drug)
- **AVMA** - Acceptable for euthanasia only when other methods are dangerous or otherwise not possible



Gunshot

- Not acceptable for routine euthanasia
- Acceptable only in the field in an emergency situation
- Gunshot to the head may need to be followed by gunshot to the heart
- Avoid doing this inside a building, alley or trailer, due to danger of ricochet
- **AVMA** - When other methods cannot be used, an accurately delivered gunshot is acceptable with conditions for euthanasia.

