

Operational Guide

Euthanasia by Injection



AMERICAN HUMANE

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Doug taught his first Euthanasia by Injection workshop in 1973. Since then, he has conducted hundreds of technical workshops for animal care and control agencies across the country. In 1987, he received the Rosemary Ames Award for excellence in teaching of American Humane-sponsored training programs and for his outstanding promotion of a humane philosophy and objective.

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Introduction

Because euthanasia by injection (EBI) is a complex task involving precision and skill, as well as emotional stamina, animal care and sheltering agencies have a responsibility to train and support their staff to ensure that they properly euthanize animals and receive proper education and support in their work. This guide provides information on how best to support euthanasia technicians (ETs), while using the most humane method of euthanasia currently available. It also includes valuable information on products, determining the cost of euthanasia and federal regulations on controlled substances.

Euthanasia is best described as the process of gently and painlessly putting to death sentient beings (those capable of feeling). In an animal care and sheltering organization, that means mostly unwanted, injured or sick dogs and cats, but it can include other animals as well.

Agencies most often administer euthanasia when:

- The number of animals housed at their facility exceeds allowable occupancy
- An animal exhibits behavior problems that make him unsuitable for adoption
- An owner requests euthanasia for his or her pet(s)
- An animal is sick or injured beyond intervention or the facility's limits and resources
- The staff decides that continuing to house the animal indefinitely is no longer in the animal's best interest

People who care for and understand the most about animals perform EBI. They are also the people who are hurt the most by

having to do it. Far from being unfeeling or unkind, the vast majority of shelter workers exhibit a high level of compassion and sensitivity for animals. Therefore, sheltering professionals perform EBI, often at the expense of their own emotional well-being.

This comprehensive guide is not intended to replace the hands-on training needed to perform EBI properly. Instead, it offers general information on types of equipment required, suggestions for EBI room design, and basic understanding of restraint, pre-euthanasia drugs, verification of death, safety issues, laws and regulations, and compassion fatigue.

The American Humane Association recommends EBI as the *only* method of euthanasia for the dogs and cats in our shelters. Dogs and cats in our care must be euthanized by the same means as we would choose for our own beloved pets. We do not believe in a double standard: one method for homeless dogs and cats, and another method for our own pets. Other methods, however, may be more appropriate for other species.

American Humane Association Policy Statement

Approved January 26, 2003

American Humane considers euthanasia by the injection of sodium pentobarbital (EBI) to be the only acceptable method for euthanasia of dogs and cats in animal shelters.

American Humane considers the use of any other lethal method for dogs and cats in animal shelters unacceptable, including the use of carbon monoxide, carbon dioxide, nitrogen, nitrous oxide, argon or

anesthetic gasses, as well as physical methods such as drowning, electrocution, gunshot and blunt-force trauma.

For other species, American Humane recommends EBI as the primary method of euthanasia, but recognizes that other methods or agents such as carbon monoxide, carbon dioxide and inhalant anesthetics can be acceptable when administered in accordance with guidelines set forth by the American Veterinary Medical Association in their most recent “Report of the AVMA Panel on Euthanasia.”

Overview Practice Standards for Animal Shelter EBI

Best Practice is the application of state-of-the-art techniques and methodologies for the job at hand. Best Practice typically exceeds generally accepted industry standards. What is currently considered Best Practice can degrade to Acceptable Practice as techniques, methodologies, industry standards and public values evolve and change.

Acceptable Practice is the application of techniques and methodologies that may not be the best available, but that meet generally accepted industry standards. What is currently considered Acceptable Practice can become Unacceptable Practice as new techniques and methodologies develop.

Unacceptable Practice is the application of out-of-date or non-approved techniques or methodologies that are not held to be generally acceptable within the industry. What was once considered Acceptable Practice or even Best Practice can become Unacceptable Practice (even illegal) as industry standards or public values change.

It is the responsibility of sheltering professionals and leaders to keep current with changing industry standards and make changes where warranted. At any given agency, the staff veterinarian (where such a position exists), veterinary technician, shelter director or kennel manager assumes responsibility for ensuring that animals are treated according to acceptable standards of practice and, if not, to advocate on their behalf until such standards are met or exceeded.

Euthanasia Timeline

The change in animal shelter lethal methods over the past 80 years illustrates these three categories. What is now considered Acceptable (or Best) Practice is very different from what used to be.

- 80 years ago, Acceptable Practice was electrocution and drowning (now unacceptable).
- 50 years ago, Acceptable Practice was carbon monoxide via internal combustion engine (now unacceptable).
- 45 years ago, Acceptable Practice was high-altitude, low-pressure decompression (now unacceptable).
- 35 years ago, Acceptable Practice was commercially compressed carbon monoxide gas (now illegal in many states, but still considered acceptable by some organizations, if done according to American Veterinary Medical Association guidelines).
- 30 years ago, Acceptable Practice was EBI using intracardiac (IC) and intravenous (IV) injections on conscious animals (IC on conscious animals is now unacceptable).
- 25 years ago to the present, Acceptable Practice is EBI using intravenous (IV) and intraperitoneal (IP) injections on conscious animals or intracardiac (IC) injections on deeply anesthetized animals only.

Best, Acceptable, Unacceptable Practice Standards for EBI

Best Practice

- IV injections on dogs, puppies, very calm cats and pregnant cats
- IP injections on cats and kittens
- IC injections on deeply anesthetized (not sedated or tranquilized) animals to whom IV or IP cannot be gently administered due to the animal's temperament or physical condition
- Gentle and compassionate handling of all friendly and socialized animals
- Using muzzles, restraint gates and control poles on dogs only, and only where a specific animal warrants such restraint
- Gently holding cats without scruffing or stretching except where a specific animal warrants such restraint
- Using purpose-designed cat nets to restrain feral or fractious cats, or small mammals
- Sodium pentobarbital dose at 390 mg per 10 lbs. for IV and IC; 1170 mg per 10 lbs. for IP and oral administration
- Verifying death of every animal using cardiac puncture technique, stethoscope technique or presence of rigor mortis
- Using needles only once
- Rinsing and reusing syringes multiple times

Acceptable Practice

- IC injections on anesthetized dogs, cats, kittens and puppies
- IV injections on pregnant dogs and cats (may be anesthetized first)
- Gentle and compassionate handling of all friendly and socialized animals
- Using muzzles, restraint gates and control poles on dogs only, and only where a specific animal warrants such restraint
- Gently holding cats without scruffing or stretching except where a specific animal warrants such restraint
- Using fish nets or other non-purpose-designed cat nets to restrain feral or fractious cats, or small mammals
- Sodium pentobarbital dose at 390 mg per 10 lbs. for IV and IC; 1170 mg per 10 lbs. for IP and oral administration
- Oral administration of sodium pentobarbital (powder form mixed with food or liquid squirted into the animal's mouth) for either pre-euthanasia heavy sedation or euthanasia (depending on dose)
- Using needles only once
- Rinsing and reusing syringes multiple times
- Verifying death of every animal using cardiac puncture technique, stethoscope technique or presence of rigor mortis

Unacceptable Practice

- IC injections on non-anesthetized animals
- IC injections on sedated or tranquilized animals
- Over-handling or over-restraining animals, including routine use of control poles, muzzles or restraint devices
- Using control poles on cats
- IM or subcutaneous administration of sodium pentobarbital
- Flat dose of 390 mg per 10 lbs. for all routes of administration or less than 1170 mg per 10 lbs. for IP administration
- Intrahepatic (IH) injections of sodium pentobarbital
- Reusing needles
- Reusing syringes without first rinsing them
- Not verifying death using cardiac puncture technique, stethoscope technique or presence of rigor mortis

EBI Room

Performing EBI properly is crucial to the agency's overall mission of public safety and/or the alleviation of animal suffering.

To better achieve this mission, create a suitable environment that meets the needs of both ETs and animals. Because of the nature of the work, perform EBI in a room separated from the public and general activities of the shelter. A quiet, clean, orderly and well-designed environment helps reduce stress in both animals and ETs.

Ideally, perform EBI in a single-purpose room, where no other activity is performed. Sharing EBI with other activities in the same space creates chaos and confusion, seriously compromising ET safety and performance. Many agencies, however, have no choice but to share the EBI room with treatment, grooming, food preparation or other activities. In these cases, maintain a consistently calm, relaxed and orderly environment when performing EBI, and establish protocols that limit access to the room and disturbance to ETs and animals during EBI. If a multi-purpose room is necessary, schedule the various activities around EBI.

Location

Locate the EBI room near the animal housing areas and the body-disposal area, whether incinerator, cooler or freezer. Place the entrance in an area of the shelter accessible only to employees. Exit access to vehicle parking also helps if guardians wish to retrieve a pet's body. If the EBI room is located next to a cooler, put some physical separation between the two, which keeps the cooler smell from entering the EBI room.

Size

American Humane recommends a minimum room size of 10-by-12 feet. Anything smaller feels cramped.

Heating/Ventilation/Air Conditioning (HVAC)

The HVAC system should be centralized for the entire building rather than a separate window, floor or tabletop unit. Optimally, the facility's HVAC system provides specified areas of positive and negative airflow and separate ventilation routes for various parts of the building. (Refer to *American Humane's Operational Guide on Planning and Building an Animal Shelter* for additional information on HVAC units.) The equipment must maintain a room temperature of 68 to 72 degrees Fahrenheit and provide maximum ventilation for its occupants.

Lighting

Create a bright EBI room filled with light. Use ceiling lighting and outside windows or skylights, if possible. Install a wall- or ceiling-mounted surgical light as well to illuminate the IV injection spot on the animal's leg.

Flooring/Drainage

Choose sealed concrete or other suitable flooring material, appropriately slanted for drainage with a 3- to 4-inch floor drain.

A mixable hot and cold hose connector in the EBI room allows for warm or hot water cleaning. (For more information on proper cleaning techniques, refer to *American Humane's Operational Guide on Sanitation and Disease Control*.)

Quiet Room or Closet

An attached small room or closet, measuring approximately 6-by-8 feet, provides a dark and quiet post-injection area for animals undergoing the effects of either sodium pentobarbital or pre-euthanasia drugs. Equip the room with a few small indoor kennels and a sound-deadened, stainless-steel cage bank. Keep the room darkened, preferably with no outside light source (windows or skylights), and use a soundproof metal door.

Entry and Exit Doors

Use insulated (soundproof) metal entry and exit doors on the EBI room — with the entry door leading to the kennel, holding or isolation areas, and the exit door leading to the cooler, freezer, incinerator or outside.

Furnishings, Equipment and Supplies

In order for EBI to be performed safely and efficiently, the EBI room needs to be properly furnished as follows:

Sink

Install a large sink with mixable hot and cold water for proper sanitation, hand washing and syringe rinsing.

Eyewash Station

Mount an approved eyewash station on the faucet or on the wall (or both) as per safety regulations.

EBI Table

An EBI table provides a work surface for all but the largest dogs, who are most comfortably euthanized on the floor. The best table is of stainless-steel construction with adjustable height, such as a veterinary surgery table or adjustable-height gurney.

This allows ETs of different sizes to adjust the table using a foot pedal. Euthanizing all animals on the floor, which is popular at some shelters, can lead to back strain and fatigue in ETs. Stainless-steel, fixed-height tables, while not ideal, are suitable.

Shelves

Install ample built-in or attached steel or laminate shelves or cabinets for equipment storage.

Locking “Day-Use” Drug Box

Mount a steel lockbox or cabinet on the wall or countertop for safe storage of opened bottles of sodium pentobarbital and pre-euthanasia drugs. (Store unopened, sealed bottles in a more secure inventory safe located elsewhere in the building.) The best lockbox is made of heavy-gauge steel and is specifically designed for secure storage.

Restraint Gate

A wall-mounted restraint gate is the most effective and safest means of restraining a large, fractious dog in order to administer pre-euthanasia drugs. At present, restraint gates cannot be purchased. They can, however, be easily made with available materials:

- Use a chain-link gate (approximately 4-by-4 feet) made from heavy-gauge chain link (same as an outdoor kennel).
- Mount the gate (chain-link fabric toward the wall) either to a steel gatepost or directly to the wall so that there is about 1 inch of clearance at the bottom.
- Install the gate in the EBI room, centered along one wall so that there is plenty of room to maneuver on either end of the gate.
- Adjust the gate on its mountings so that there is a 3-inch gap between

the wall and the gate fabric at the hinged end.

Weight Scales

To administer the correct dose of sodium pentobarbital and/or pre-euthanasia drugs, use a floor scale to weigh the animal.

Guessing may result in an estimate that is off by 20 pounds or more, which can lead to an improper dose. American Humane recommends a walk-on floor scale with digital readout.

Supplies

ETs need a variety of supplies on hand for EBI. These supplies include, but are not limited to:

- Muzzles of various sizes and types
- Clippers and blades
Keep clippers clean and lubricated and blades sharp and clean. Use a #40 surgical clipper blade.
Suggested models include:
 - * Andis AG or Oster A-5 (cord models)
 - * Laub or Oster (cordless models)
- Tourniquets that make the vein easier to see. (One type is called a “Nye” tourniquet, but a thumb or finger also works as a tourniquet.)
- An assortment of syringes
 - * 1 ml (standard or leur lock hub)
 - * 3 ml (standard or leur lock hub)
 - * 6 ml (standard or leur lock hub)
 - * 12 ml (eccentric hub for IV — not available in leur lock hub)
 - * 20 ml (eccentric hub for IV — not available in leur lock hub)(Rinse syringes after each use and reuse them for up to a week or until worn out.)
- Disposable needles
(Use needles only once and then dispose them in a sharps container.) Keep an assortment of these types of needles in inventory:

- * 25-gauge, 5/8-inch
- * 22-gauge, 3/4-inch
- * 20-gauge, 1-inch
- * 18-gauge, 1 1/2-inch
- * 22-, 23- and 25-gauge butterfly catheter

Restraint Nets and Tools

Use a restraint net only to handle fractious or caged cats and small mammals. Types of restraint nets include:

- Freeman Cage Net
- Campbell EZ-Nabber
- Wellborn Cat Catcher
- Capture, catch or rabies pole

Use Safety Stick[®] or pole syringe with dangerous dogs only (never on cats).

Cat Tong or Animal Grasper[®] permits safe administration of pre-euthanasia drugs for uncooperative animals (never use to administer IP sodium pentobarbital).

Animal-handling gloves allow for safer handling of feral cats.

Wear gloves for small, fractious animals and feral cats. (Warning: Animals can bite through even the thickest of gloves.)

Use a squeeze cage for cats and small wild animals.

Environment

A calm and orderly EBI room minimizes stress, both for the animals being euthanized and the ETs performing the task. However, animal shelters can be a continuous flurry of activity, noise and confusion — sometimes making it difficult to achieve tranquility and any sense of order. Here are some suggestions for reducing environmental stress in the EBI room:

Keep the area kept clean and odor-free. Immediately wipe and disinfect all areas contaminated with urine and feces. Clean up water or other liquid spills, so the EBI room floor stays dry.

Keep all other animals — both dead and alive — out of the EBI room. However, if this is completely unavoidable, cover dead bodies with a blanket or place them behind a shower curtain or drape. Also, cover the cages of live animals with a blanket or curtain while other animals are being euthanized to reduce noise and distractions in the room.

Paint the walls of the room in calming colors. Painted murals or interesting graphics can improve visual interest.

Play soft, soothing, agreeable music as an option. Music can be calming (or distracting) for both ETs and the animals, so allow music only when all staff present agree on the music selection.

Remove or mute public-address horns and intercoms so that they don't disrupt the euthanasia process. Turn off the ringer on the room's phone or set to allow only outbound calls.

Organize materials and equipment in the EBI room to allow quick and easy access.

Keep vaccine refrigerators, general storage lockers, food containers, old cages and anything else not directly related to the euthanasia process out of the room if possible.

Speak softly and calmly in the room.

Control interruptions by implementing procedures that keep other staff from disrupting or barging in during the

euthanasia process. For example, post a “Do Not Knock, Do Not Enter” or similar sign on the door or wall outside the EBI room when euthanasia is in process.

Keep the room temperature at 68 to 72 degrees Fahrenheit.

Guardian Witness EBI Room

Sometimes, especially when performing euthanasia requests, a non-staff member will be with an animal during the euthanasia process. Because EBI rooms are designated for employees only, many shelters build or set up a separate EBI room specifically for instances when the guardian, or a specified witness, wishes to observe. Two different possible design concepts are described here:

Living Room

This room is designed and equipped to look like a home living room with carpeting or area rugs, comfortable chairs or couch, and a lamp or two. The atmosphere is warm and home-like with equipment kept out of view in a cabinet. Plants, pictures of the sea or landscapes, and throw pillows add to a homey feel. A blanket on the floor allows the animal to rest or sit while being euthanized.

Veterinary Exam Room

This room is designed and equipped to look like a veterinary examination room with a stainless-steel table, Formica-type countertops, and a bright, clean, sanitary-looking atmosphere. Chairs are included for the guardian. Equipment is visible, and the animal is placed on the exam table for euthanasia.

Restraint

To ensure ET safety, approach and handle each animal in a manner appropriate for that animal. There is no single restraint technique suitable for every animal in every situation. Teach staff working in the EBI room some basic background and understanding of working with the various species of animals they may encounter and need to restrain.

Restraint is the application of just enough force upon an animal to perform required procedures. In the EBI room, the goal is to enable the ET to safely restrict the animal's movement. The best restraint is usually the least restraint needed to accomplish this goal.

Never apply more restraint on an animal than is necessary. Once the animal is restrained, safely give an injection (either sodium pentobarbital or a pre-euthanasia drug). Physical restraint of fractious animals involves a variety of techniques and equipment depending on the situation. It is never appropriate to wrestle with animals — animal wrestling is dangerous to the ET, generally ineffective and almost always unnecessary. In addition, it usually causes the animal additional distress and pain.

The application of proper restraint requires an understanding of how animals are affected by human body language, tone of voice, clothing and accessories, such as sunglasses, hats or belt-attached equipment. ETs must understand how to use their voices to calm a frightened animal or trigger an obedient response in a dog who is not paying attention. The more confidence an ET exhibits around a particular animal, the more easily and safely the ET will be able to handle the animal.

Interacting with the Animal

It is perfectly OK and appropriate to hug, caress, pet and talk, hum or sing to the animal being restrained. Do not hold the animal away from the body as if the animal is inherently dangerous or nasty. Even a mangy or dirty animal deserves to be hugged. Use a towel or wear proper cover clothing to allow for free interaction with the animal.

EBI Certification

American Humane believes that only certified ETs should administer EBI. The certification process should include state (if any) and organizational requirements.

State Requirements

Some states stipulate that only certified ETs may administer controlled substances for EBI. ETs should first meet all requirements necessary for certification and then successfully complete all state-required training.

Organizational Requirements

All agencies should have an in-house certification program in place and require ETs to obtain and maintain certification in order to perform EBI. Organizational requirements should include:

1. Three months of employment at the shelter
2. Successful completion of a formalized course of training (American Humane holds EBI training workshops throughout the country)
3. At least one month of practical training in hands-on techniques (trainee should work closely with a staff trainer who is ET certified to sharpen EBI skills)
4. Practical exam in front of a panel (trainee should perform EBI on a variety of animals in a variety of situations)
5. Yearly performance review and evaluation to test skills

Staff members who hold animals for EBI should also receive EBI certification plus specialized training in proper, humane and safe restraint.

Euthanasia Drugs

Pre-euthanasia Drugs

Pre-euthanasia drugs are typically administered for one or more of the following reasons:

- To calm nervous or agitated animals
- To make animals who are dangerous or potentially dangerous safer to manage
- To make animals who are technically difficult to euthanize easier to inject

Various drugs or drug combinations (veterinary compounds) commonly used by ETs for pre-euthanasia tranquilization, sedation and anesthesia include:

- Acepromazine
- Xylazine
- PreMix (a mixture of ketamine and xylazine)
- TKX (a mixture of Telazol[®], ketamine, and xylazine)
- Telazol[®]

In addition, sodium pentobarbital can be used orally as a pre-euthanasia sedative. FP-3[®], the newest sodium pentobarbital combination, permits pre-euthanasia IM administration (both lethal and non-lethal doses) without causing stinging or burning.

Never use acepromazine, xylazine, PreMix, TKX, and Telazol[®] as the sole lethal agent. Use these drugs only according to the manufacturer's label or generally accepted practice.

American Humane does not recommend the use of acepromazine or xylazine as the sole agent for pre-euthanasia. These drugs do not produce anesthesia, and the sedated or tranquilized animal may still

bite the handler or feel pain if certain procedures, such as IC administration, are attempted.

American Humane recommends the use of PreMix, TKX or Telazol[®] for pre-euthanasia use.

Sodium Pentobarbital

Like all barbituric acid derivatives, sodium pentobarbital is a central nervous system depressant that acts by interfering with the transmission of neurological impulses from the cerebral cortex to the medulla oblongata. Brain functions are depressed starting with the pain center, producing loss of pain and progressing to unconsciousness and loss of sensation. Deeper functions are also depressed, bringing about a slowing, then a complete cessation, of respiration and circulation.

Sodium pentobarbital acts quickly and without pain or discomfort to the animal. In less than lethal doses, however, sodium pentobarbital acts as a sedative or anesthetic and is not lethal to the animal. For many years veterinarians used sodium pentobarbital for surgical anesthesia. At anesthetic doses, the body metabolizes sodium pentobarbital, and the animal recovers within hours.

Sodium pentobarbital is available from numerous pharmaceutical manufacturers that offer products with an acceptable shelf life and a stable-in-solution (liquid) form, and that are inexpensive. When comparing different products, measure the strength (concentration) in grains or mg/ml (one grain equals 65 mg). At least six grains per ml (390 mg/ml) is recommended for EBI, as this concentration offers effectiveness with a relatively low dosage volume.

There are no approved non-sodium pentobarbital injectable EBI agents.

Advantages and Disadvantages of Sodium Pentobarbital

Advantages

Sodium pentobarbital can be used on mammals, including dogs, cats, rabbits, horses, ruminants, marine mammals, wildlife, exotic animals and rodents, as well as on birds, fish and reptiles. It is suitable for use on these animals regardless of age or health conditions.

Because of the gentle way the drug affects the body, euthanizing with sodium pentobarbital provides the most calming environment for observers. Also, because administration of the drug involves a simple injection, there is relatively little in the way of equipment to purchase and maintain.

American Humane cost studies show that properly administered EBI is the most cost-effective lethal method. The assertion that gas chamber methods are less expensive or more cost-effective than EBI is false.

Disadvantages

There are some disadvantages to using the drug that require awareness, education and safety precautions.

In some instances, animals may exhibit a mild to severe reaction to the drug, causing an increase in the rate of vital signs (heartbeat, respiration and blood pressure) with accompanying physical movement of limbs and vocalizing. Also, postmortem gasping (agonal breathing) is sometimes observed. While these reflexive physical movements can be potentially uncomfortable for the ET to observe, they

in no way indicate that the animal is undergoing an inhumane death.

Sodium pentobarbital is a Schedule II controlled substance (see the section on Laws and Regulations, Definitions of Schedules), meaning it has a high potential for human abuse. Sodium pentobarbital can be used to commit suicide, as there is no chemical reversal agent (antidote) for a lethal dose. As a controlled drug, it may also have a strong appeal for thieves and drug addicts.

Small amounts of sodium pentobarbital can be accidentally injected into the ET's body or sprayed into the mouth or eyes, causing minute amounts of the drug to be absorbed. While a small amount is not lethal, it can be hazardous. This guide includes instructions for what to do in the case of accidental absorption of sodium pentobarbital.

The tissue of animals euthanized with sodium pentobarbital can be toxic if eaten by other animals. Dispose of animals euthanized with sodium pentobarbital according to state law or generally accepted practice to ensure that the dead animal will not endanger other animals.

In general, anyone performing EBI should receive comprehensive practical training in injection procedures and animal handling to ensure a safe and effective procedure.

Routes of Administration

Approved Routes

Approved routes of administration for sodium pentobarbital are:

- IV — intravenous (into a vein)
- IP — intraperitoneal (into the abdominal cavity but not into an organ)
- IC — intracardiac (into one of the blood chambers of the heart; this route is acceptable only on animals who are unconscious or deeply anesthetized)
- PC — per os (an oral dose given as a squirt via feeding tube or dosing needle, or as a powder added to food)

Non-approved Routes

Non-approved routes of administration for sodium pentobarbital are:

- IM — intramuscular (into the muscle). This route should never be attempted with sodium pentobarbital due to its tissue-burning high pH. However, sodium pentobarbital with lidocaine added [FP-3[®]] can be given IM with no discomfort to the animal.
- IH — intrahepatic (into the capsule of the liver). This route is acceptable only on anesthetized animals.

Sodium Pentobarbital Combinations

Sodium pentobarbital combinations are Schedule III controlled drug substances (see the section on Laws and Regulations), which means they have a lower abuse potential than those drugs in Schedule II.

Currently available sodium pentobarbital combinations include Beuthanasia-D Special[®] (Schering-Plough Animal Health Corporation) and Euthasol[®] (Delmarva). Both drugs contain the active ingredient phenytoin, a cardiotoxin. According to the package label, administer these products only via IV or IC in dogs. They must not be given via IP or PC, as the active ingredient phenytoin may interfere with normal cardiac activity prior to unconsciousness. IC administration is approved only when the animal is unconscious or deeply anesthetized.

A third sodium pentobarbital combination, FP-3[®] (Vortech) became available in 2005. It contains an additional active ingredient (lidocaine), is approved for dogs only and is suitable for all routes of administration.

Verification of Death

No matter which lethal method is used, positively verify the animal's death in every instance. Three methods determine death: 1) cardiac puncture, 2) stethoscope, and 3) rigor mortis.

Cardiac Puncture

After the animal is unconscious and has no toe-pinch reflex, insert a syringe with a needle long enough to reach and penetrate the heart muscle into the animal's chest cavity and into the heart. Determine proper location by aspirating blood into the syringe. If the heart is beating (normal sinus rhythm), the syringe typically moves in a circular motion or in an up/down and back/forth motion. If the heart is fibrillating, the syringe typically moves back/forth only. Once movement completely ceases, or if no movement is detected, the ET can bag the animal's body or place it in the cooler.

Stethoscope

Place the drum of the stethoscope on the animal's chest in the proper location, and verify death by total lack of heartbeat and respiration sounds.

Rigor mortis

The overall stiffening of the muscles in the dead animal indicates rigor mortis. Partial rigor can take place in as little as 20 minutes in dogs and cats (the "wrists," "ankles" and lower jaw will stiffen). Full rigor takes up to two hours or longer (all skeletal muscles will stiffen).

Proper verification of death is an essential part of the EBI process. It is each agency's responsibility to ensure that no animal's body is disposed of until death is first verified according to this standard.

Laws and Regulations

In 1970, Congress approved the Comprehensive Drug Abuse Prevention and Control Act. Today, the act is administered through the federal Drug Enforcement Administration (DEA). Title II of this law, the Controlled Substance Act, regulates the manufacture, distribution and dispensing of controlled substances in order to reduce their diversion from legitimate to illegal channels.

Based on their potential for abuse, the Act places all drugs defined as controlled substances into one of five schedules or categories. Schedule I substances have the highest potential for human abuse while Schedule V substances have the least potential for human abuse. Each schedule also has specific purchase, use and record-keeping requirements.

Schedule I

Drugs in this category have no accepted medical use in the United States and pose the highest potential for abuse. Examples are “crack” cocaine, heroin and LSD.

Schedule II

Drugs in this category have an accepted medical use. They have a high potential for human abuse with severe psychic or physical dependence liability. Examples are sodium pentobarbital, secobarbital and amphetamines.

Schedule III

Drugs in this category have an accepted medical use. They have less potential for human abuse than Schedules I and II. Examples are ketamine, Telazol[®], Pentothal[®] and sodium pentobarbital combinations such as FP-3[®], Beuthanasia D[®] and Euthasol[®].

Schedule IV

Drugs in this category have an accepted medical use. They have less potential for human abuse than Schedules I to III. Examples are phenobarbital, chloral hydrate, Valium[®] and Librium[®].

Schedule V

Drugs in this category have an accepted medical use. They have less potential for human abuse than Schedules I to IV. Examples are Lomotil[®] and Robitussin AC[®].

Code of Federal Regulations Part 1300 to End

The DEA is also charged with writing appropriate rules designed to enforce the Controlled Substances Act. These rules are published in Title 21, Chapter II of the Code of Federal Regulations (21 CFR, Part 1300 to End). Printed copies may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 or downloaded through the Government Printing Office’s website at <http://www.gpoaccess.gov>.

State Direct Registration

The purchase, storage and use of controlled drug substances always involves federal law, but in most cases it also falls under the jurisdiction of state laws and regulations. To date, 33 states have enacted what’s commonly called “direct registration.” Direct registration enables animal shelters to acquire the necessary DEA “license” to obtain, store and administer controlled substances for EBI purposes without a veterinarian having to purchase the drug or be responsible for its use. In some cases, states have set standards that not only meet, but also exceed federal

requirements. For example, some states require that drug inventory records be kept for three years compared to only two years under federal law.

In a letter to American Humane dated April 2, 1993, the DEA noted the registration process involved under state direct registration:

“The registration of animal shelters with DEA is predicated under the requisite that proper registration is first obtained under state regulations, in those states that permit this type of activity. Upon verification, the facility, in concert with the responsible designated individual, will be issued a DEA registration. This registration will be designated as a ‘practitioner’ type and the applicable regulations of the Code of Federal Regulations, Title 21, Section 1304, will apply. These regulations would include the permission to purchase controlled substances.”

The major advantage of state direct registration is that a veterinarian is not needed for the sheltering agency to purchase, store and administer specific controlled substances for EBI. Instead, a named individual (who does not have to be a veterinarian) at the shelter is responsible for ordering, security, record-keeping and notification of loss or theft. To obtain DEA registration in these states, shelters must contact the state agency that regulates controlled substances.

Federal (Minimum) Standards

States without direct registration laws operate under federal regulations, which means that the animal shelter must obtain the controlled substances under the registration (or license) of a veterinarian. The veterinarian must apply for DEA registration using the physical address (not

a P.O. box) of the animal shelter. This permits the agency to store and administer controlled substances, but the shelter can only do so under the supervision of the veterinarian whose name appears on the registration. In this case, it is the veterinarian, not the shelter, who orders the controlled substances, maintains inventory, installs security measures and notifies the DEA field office of any loss or theft of the drug. Animal care and sheltering agencies located in states without state direct registration must conform to standards outlined for individual veterinary practitioners. A summary of those standards is listed here.

Security

Effective controls and procedures must be in place to guard against theft and diversion of controlled substances. Controlled substances must be stored in a substantially constructed, securely locked cabinet. While not required, the DEA does recommend the use of a safe or safe and alarm.

Theft or Loss

The theft or significant loss of any controlled substance must be reported immediately to the DEA field office, and Form #106 must be filled out and returned to DEA.

Disposal

Disposal of outdated, unwanted or obsolete sodium pentobarbital or other controlled substances must be performed in accordance with DEA procedures, and Form #41 must be filled out and returned to DEA.

Records Inventory

The official registrant must maintain a written inventory of all on-hand controlled substances (“on hand” means that they are

in the possession of or under the control of the registrant). If the records are kept in computer files, they must be easily readable and retrievable. The actual inventory can be a handwritten or printed document. An inventory must be performed every two years and must contain a complete and accurate record of all controlled substances on hand the date inventory was taken.

Records Retention

The written inventory, purchase records and original invoices must be kept at the registered location for two years. The registered location is the address on the registration where the drugs are stored and used. Records of Schedule II controlled substances must be maintained separately from ordinary business records of the registrant. Records of Schedule III controlled substances should either be kept separately from other records or be maintained in such a way that the information is readily retrievable.

American Humane Recommended Standards

While the federal standards address some very important issues, the language of the regulations, originally written for medical practitioners, can be vague and difficult for animal shelters to interpret. For example, the “securely locked, substantially constructed cabinet” standard for sodium pentobarbital security is vague.

The following American Humane recommendations exceed federal standards in an effort to strengthen and more clearly define security of controlled substances:

Security

Keep unopened and sealed bottles of sodium pentobarbital, sodium

pentobarbital combinations, ketamine and Telazol[®] in one of the following:

- Floor safe (cemented to the floor)
- Safe securely bolted to the floor, wall or built-in tabletop
- Safe weighing more than 750 lbs.

Keep opened bottles of controlled substances (day use supply) in either a steel lockbox with an internal locking mechanism that is bolted to the wall or a sturdy shelf, or in a built-in and very sturdy steel cabinet with internal hinges and an internal lock.

Vehicle Security

Keep sodium pentobarbital for emergency field use in a locked metal box that is securely attached to the inside of the vehicle. Consult state regulations, however, because carrying sodium pentobarbital in a vehicle may be prohibited or otherwise regulated by state law.

Safety Considerations for Sodium Pentobarbital

Sodium pentobarbital is not considered a health hazard to staff unless it is deliberately misused or handled incorrectly. However, administering this drug, especially around frightened, fidgety or injured animals, may sometimes present a safety hazard.

American Humane believes that EBI should be performed only by veterinarians, certified veterinary technicians or certified ETs who have received formal training. To ensure worker safety and consistency in the performance of EBI, American Humane offers specialized EBI training and certification programs year-round throughout the country. Many states now require a 16-hour course of training covering all aspects of the EBI process for anyone performing EBI. State-mandated or not, proper training reduces the risks associated with this work and ensures animals the most humane death.

The Material Safety Data Sheet (MSDS) for sodium pentobarbital indicates it is toxic to humans if ingested in larger than therapeutic quantities. It also has a high pH that can cause tissue damage if accidentally injected. Therefore, accidental injection or other contact with EBI drugs requires immediate first aid or medical treatment. Shelters must keep on file the MSDS for each EBI and pre-euthanasia product so that the specific safety precautions and first-aid procedures can be implemented, if needed. An MSDS is available upon request from the manufacturer or distributor of the drug.

Exposure Hazards and Procedures

American Humane recommends the following emergency and first-aid procedures for human exposure to sodium pentobarbital without additional active ingredients:

Product on Skin

Immediately wash skin with soap and water, and remove and wash any contaminated clothing. While sodium pentobarbital will not penetrate healthy skin, take care to avoid exposure to cuts or scratches. Some ETs prefer to use exam gloves when handling sodium pentobarbital.

Product Ingested (swallowed)

Induce vomiting and seek immediate medical attention. If a small amount is taken into the mouth, but not swallowed, immediately spit it out and rinse the mouth with water. Small amounts of sodium pentobarbital will not damage the tissue of the mouth.

Product in Eye

As a preventive measure, install an approved eyewash station in the EBI room. Some ETs prefer to wear eye protection when handling sodium pentobarbital. If sodium pentobarbital contacts the eyes, immediately flush the eyes with large amounts of water for 15 minutes or with optical saline (eyewash). Occasionally lift the upper and lower lids when rinsing.

Needle Stick

A needle stick is a puncture without the injection of any sodium pentobarbital. Infection from a needle stick is possible. Encourage bleeding by gently squeezing the puncture. Hold the wound under fresh water and scrub with soap.

Accidental Injection

The injected worker must immediately tell a co-worker what has happened, apply first aid to the area and seek medical attention. Bring a copy of the MSDS along to show to the health care provider. Leave the sodium pentobarbital bottle behind, however, as transporting the bottle could violate state regulations.

Address similar considerations for each controlled substance and/or hazardous material in the shelter. Train all ETs and involved shelter staff in all such safety-related information.

Managing Compassion Fatigue

Regardless of the reason for euthanasia, administering EBI requires compassion, kindness and emotional strength. It is an enormous challenge for shelter workers to rebuild their emotional strength after handling day-to-day work, including performing EBI; taking in unwanted, abused and abandoned animals; and dealing with the public. At times, many shelter workers temporarily become so exhausted that they lose the ability to care. This is “compassion fatigue.”

Putting an animal to death can trigger a roller coaster of emotions for the ET and the person holding the euthanized animal. In addition, shelter workers who are not directly involved in the process can feel deep emotions about the euthanasia process, especially when they have interacted with the animal(s) who are euthanized by their co-workers. These emotional responses are not isolated incidents and can happen to everyone doing this work. Understanding what those emotions are and how to handle them is crucial to managing compassion fatigue.

While stress is a natural part of human functioning, excessive levels of stress and long-term stress as a result of working in animal care and sheltering are often associated with compassion fatigue. Some of the characteristics of compassion fatigue include:

- Unprovoked anger
- Hopelessness or frustration
- Excessive fatigue
- Depression
- Sleeping and eating difficulties
- Isolation from family and friends
- Emotional outbursts, such as sudden crying and rage
- Nightmares

- Substance abuse (whether caffeine, nicotine or alcohol)

A combination of these characteristics can lead to job burnout and is often responsible for the loss of many talented, valuable professionals in our field.

Each person manages compassion fatigue in a different way. Improved tolerance to stress comes from regular exercise and relaxation, interests outside of work that are unrelated to caregiving, a healthy diet, a good sense of humor, and open communication with friends, family and co-workers. Also, it helps immensely to talk with others who do the same work. Unlike family and friends who rarely understand the work and the range of emotions it can produce, professional peers can offer support, reassurance and common ground from which to discuss the problems that naturally occur.

Effective management of compassion fatigue is crucial to long-term employment and a healthy lifestyle. In addition, organizations that effectively manage compassion fatigue are more likely to decrease turnover, increase adoptions and reduce euthanasia.

Resources for Effectively Managing Compassion Fatigue

American Humane offers “Managing Compassion Fatigue” one-day training and awareness-building workshops (see <http://www.americanhumane.org> for details).

Support Services for Animal Care Professionals (SSACP): Dr. Carol Brothers and her team offer training and awareness-building workshops. Contact Dr. Brothers at carol_ab@juno.com.

Internet support group (list serv) for
euthanasia technicians:

<http://groups.yahoo.com/group/euthtechsupport>

Drug & Supply Manufacturers

Sodium Pentobarbital Manufacturers

The Butler Company
5000 Bradenton Ave.
Dublin, OH 43017
800-551-3861
SOCUMB[®]: Schedule II, 389 mg/ml
solution

Fort Dodge Animal Health
141 East Riverside Dr.
Fort Dodge, IA 50501
800-685-5656
SLEEPAWAY[®]: Schedule II, 260 mg/ml
solution

Veterinary Laboratories, Inc.
12340 Santa Fe Dr.
Lenexa, KS 66215
800-255-6368
EUTHANASIA-6[®]: Schedule II, 389
mg/ml solution

Vortech Pharmaceuticals, Ltd.
P.O. Box 189
Dearborn, MI 48121
800-521-4686
FATAL-PLUS[®]: Schedule II, 392 mg/ml
powder
FATAL-PLUS SOLUTION[®]: Schedule II,
390 mg/ml solution

Sodium Pentobarbital Combination Manufacturers

Schering-Plough Animal Health
Corporation
P.O. Box 3182
Union, NJ 07083-1982
800-526-3660
BEUTHANASIA-D SPECIAL[®]: Schedule
III, 390 mg/ml sodium pentobarbital
solution denatured with phenytoin,
approved for dogs only

Delmarva Laboratories, Inc.
1500 Huguenot Rd.
Midlothian, VA 23113
804-794-7064
EUTHASOL[®]: Schedule III, 390 mg/ml
sodium pentobarbital solution denatured
with phenytoin, approved for dogs only

Vortech Pharmaceuticals, Ltd.
P.O. Box 189
Dearborn, MI 48121
800-521-4686
FP-3[®]: Schedule III, 390 mg/ml sodium
pentobarbital solution denatured with
lidocaine, approved for dogs only

Animal Care and Sheltering Equipment Suppliers

ACES
Animal Care Equipment & Services
PC Box 3275
Crestline, CA 92325
800-338-2237
email: info@animal-care.com
www.animal-care.com

Campbell Pet Company
P.O. Box 122
Brush Prairie, WA 98606
360-892-9786
email: info@campbellpet.com
www.campbellpet.com

Additional Resources

Euthanasia Training Manual
by Rebecca H. Rhoades, DVM
Humane Society Press
2100 L Street, NW
Washington, DC 20037

SAFER: The Safety Assessment for
Evaluating Rehoming by Emily Weiss, PhD
American Humane
63 Inverness Drive East
Englewood, CO 80112

Glossary

EBI “Euthanasia by injection” of sodium pentobarbital. Euthanasia from the Greek meaning “good death.” A dignified, quiet and painless death without fear or stress.

euthanize To provide an animal with a good death

fractious A tame or domesticated animal who resists handling or approach

intracardiac (IC) Injection into one of the chambers of the heart or into one of the large vessels leading to or from the heart

intra-peritoneal (IP) Injection into the abdominal cavity, but not into an organ

intravenous (IV) Injection into a vein

intramuscular (IM) Injection into a muscle

intrahepatic (IH) Injection into the liver

ketamine Rapid-acting anesthetic approved for use in humans, sub-human primates and cats. Classified as a Schedule III controlled substance. Mix with xylazine to produce PreMix

legend drugs (veterinary prescription legend drugs) Available from a licensed veterinarian or by prescription only, not classified as a controlled substance by the federal government (e.g., acepromazine and xylazine)

per os From the Latin, meaning “through the mouth.” Refers to any substance that is introduced to the system by mouth

PreMix Ketamine/xylazine compound for pre-euthanasia anesthesia

reflex An involuntary reaction to a stimulus

restraint Any means of immobilizing an animal. The best restraint is the least restraint. The use of devices such as a net, squeeze cage or restraint gate in order to restrain an animal’s movement

restraint gate Similar to the squeeze cage, but used only with larger dangerous animals (primarily dogs)

rigor mortis From the Latin, meaning “rigidity of death”

sedative A drug that calms mainly by inducing drowsiness (e.g., xylazine)

sodium pentobarbital General anesthetic widely used before gas (inhalant) anesthesia was developed. Sodium pentobarbital is the only approved drug for EBI

squeeze cage Used with small, fractious animals, a device that has a moveable sidewall that can be pressed against the enclosed animal, restraining it firmly against the other sidewall to allow the ET to safely and effectively administer a pre-euthanasia drug

EBI COST ANALYSIS MATRIX 2009

This cost analysis matrix uses actual 2007 cost and animal data from a municipal animal control agency in North Carolina.

- *Note: no actual data for fractious/feral or age breakdown – those data are estimates.*
- Number of dogs euthanized: 2,430 (1,701 over 4 months – 70% and 729 less than 4 months – 30%) (972 fractious – 40%)
- Number of cats euthanized: 2,997 (1,798 over 4 months – 60% and 1,199 less than 4 months – 40%) (1,499 feral – 50%)
- Total dogs and cats euthanized: 5,427
- Average number of animals euthanized per day: 15 (5,427/365 days)

Assumptions:

- a. fractious/feral animals (2,471 40% dogs and 50% cats) are given pre-euthanasia anesthesia (ketamine/xylazine)
- b. friendly cats (1,498) are given IP injection of sodium pentobarbital with no pre-euthanasia anesthesia
- c. friendly dogs (1,215) are given IV injection of sodium pentobarbital with no pre-euthanasia anesthesia

EBI EQUIPMENT COST		
1	Equipment cost: \$670	Floor safe (\$350) + table (\$100) + electric clippers (\$120) + restraint gate (\$100)
2	Total equipment cost per animal: \$0.123	\$670/(animals euthanized per year) 5,427 = \$0.123
EBI LABOR COST		
3	A. # of employees required for IV: 2 B. # of employees required for IP: 1 C. # of employees required for IC: 1	NOTE: 1 employee can safely and effectively administer IP on conscious, friendly cats and IC on unconscious or anesthetized animals; 2 employees are required for IV

4	A. # of IV injections (dog): 1,215 B. # of IP injections (cat + puppy): 1,741 C. # of IC injections (dog + cat): 2,471	A. 1,215 = 50% of 2430 dogs and 0 cats B. 1,741 = 243 puppies (10% of dogs) + 1,498 cats (50% of cats) C. 2,471 = 972 dogs + 1,499 cats
5	Average time to euthanize: 5 minutes average	Transport to euthanasia room + preparation (including IM injection of pre-euthanasia anesthesia as needed) + scanning for microchip + injection + verification of death + removal of carcass + record-keeping <i>NOTE: average time for IP (friendly cats, puppies and kittens) is typically less than 5 minutes; average time for IV is sometimes longer than 5 minutes</i> <i>Considering an average of 15 animals per day, a typical scenario will involve multiple activities happening concurrently, such as animals going under pre-euthanasia anesthesia in a quiet area while another animal is being injected</i>
6	Total time to euthanize: 75 minutes	# of animals per day (15) × average time to euthanize (5 minutes)
7	Hourly labor cost per worker: \$13.57	Hourly wage: \$10.44 + 30% fringe: \$3.13 = \$13.57
8	5-minute labor cost per worker: \$1.13	Hourly labor cost: \$13.57 / 60 minutes = \$0.226 X 5 minutes = \$1.13
9	IV labor cost: \$2.26	5-minute labor cost: \$1.13 X 2 employees = \$2.26
10	IP and IC labor cost: \$1.13	5-minute labor cost: \$1.13 X 1 employee = \$1.13
11	Total annual IV labor cost: \$2,746	IV labor cost: \$2.26 X 1,215 = \$2,746
12	Total annual IP & IC labor cost: \$4,759	IP and IC labor cost: \$1.13 X 1,741 (IP) + 2,471 (IC) = 4,212 X \$1.13 = \$4,759
13	Total annual labor cost for IV, IC & IP: \$7,505	Labor cost IP & IC + IV = \$2,746 + \$4,759 = \$7,505
14	Total labor cost per animal: \$1.38	Total annual labor cost / # of animals euthanized: \$7,504 / 5,427 animals = \$1.38
EBI SUPPLY COST		
15	Sodium pentobarbital cost per 250 ml bottle: \$46.00	

16	Cost per ml (cc): \$0.184	Cost of bottle (\$46.00) ÷ 250 ml
17	Average IV dose (dog): 5 ml	50-pound dog average
18	Sodium pentobarbital cost per IV dose: \$0.92	Cost per ml \$0.184 X average dose: 5 ml
19	Annual sodium pentobarbital IV cost: \$1,118	Average IV dose (5 ml) cost: \$0.92 X 1,215 dogs = \$1,118
20	Average IP dose per cat + puppy = 2 ml	7 pound cat and puppy average (some cats and puppies will weigh more, kittens and neonates will weigh less)
21	Sodium pentobarbital cost per IP dose: \$0.368	Cost per ml \$0.184 X average dose: 2 ml
22	Annual sodium pentobarbital IP cost: \$641	243 puppy IP + 1498 cat IP = 1741 X \$0.368 = \$641
23	Average IC dose (dog) = 5 ml	50-pound dog average
24	Sodium pentobarbital cost per IC dose (dog): \$0.92	Cost per ml \$0.184 X average dose: 5 ml = \$0.92
25	Annual sodium pentobarbital IC (dog) cost: \$894	Average IC dose cost: \$0.92 X 972 dogs = \$894
26	Average IC dose (cat) = 1 ml	7-pound cat average (some cats will weigh more, some will weigh less)
27	Sodium pentobarbital cost per IC dose (cat): \$0.184	
28	Annual sodium pentobarbital IC (cat) cost: \$276	1,499 (feral) cat estimate X \$0.184 = \$276
29	Total sodium pentobarbital cost: \$2,929	Annual IV (\$1,118) + IP (\$641) + IC cat (\$276) + IC dog (\$894) = \$2,929
30	Average sodium pentobarbital cost per animal: \$0.54	Total sodium pentobarbital cost (\$2,929) / # of animals euthanized (5,427) = \$0.54
31	Syringe cost per animal: \$0.019	Syringe (6 ml) cost: \$19 per 100 (\$0.19 each) estimate 100 uses per syringe (<i>reusing syringes is standard practice in EBI</i>)
32	Total annual syringes: 79	Total animals: 5,427 EBI injections + 2,471 (pre-euthanasia IM injections) = 7,898 injections total / 100 = 79 syringes
33	Annual syringe cost: \$15.01	79 syringes X \$0.19 = \$15.01

34	Average syringe cost per animal: \$0.003	$\$15.01 / 5,427$ (total animals euthanized) = \$0.003
35	Needle cost: \$0.01	Needle (22 ga.) cost: \$10.00 per 100 (one use only)
36	Total annual needles: 7,898	1 per euthanasia: 5,427 + 1 per pre-euthanasia anesthesia: 2,471 = 7,898
37	Annual needle cost: \$78.98	$7,898 \times \$0.01 = \78.98
38	Average needle cost per animal: \$0.014	$\$78.98 / 5,427$ (total animals euthanized) = \$0.014
39	Pre-euthanasia anesthesia cost per dog: \$1.00	5:1 ratio ketamine/xylazine per 50 pound dog = $\$0.40 \text{ ml} \times 2.5 \text{ ml} = \1.00
40	Annual pre-euthanasia anesthesia cost for dogs (fractionous): \$972	$972 \text{ fractionous dogs} \times \1.00 per dog (average weight = 50 pounds, 2.5 ml @ \$0.40 per ml)
41	Pre-euthanasia anesthesia cost per cat: \$0.20	5:1 ratio ketamine/xylazine per 10 pound cat = $\$0.40 \text{ ml} \times 0.5 \text{ ml} = \0.20
42	Annual pre-euthanasia anesthesia cost for cats (feral): \$299	$1,499 \text{ feral cats} \times \0.20 per cat (average weight = 10 pounds, 0.5 ml @ \$0.40 per ml)
43	Annual total cost of pre-euthanasia anesthesia: \$1,271	Annual cost dogs (\$972) + cats (\$299) = \$1,271
44	Average pre-euthanasia cost per animal: \$0.23	$\$1,271 / 5,427$ (total animals euthanized) = \$0.23
45	Total supply cost per animal: \$0.787	Sodium pentobarbital per animal: \$0.54 + syringe: \$0.003 + needle: \$0.014 + pre-euthanasia anesthesia: \$0.23 = \$0.787
EBI TOTAL COST		
46	Total EBI cost per animal: \$2.29	Equipment cost per animal: \$0.123 + labor cost per animal: \$1.38 + supply cost per animal: \$0.787 = \$2.29

CARBON MONOXIDE COST ANALYSIS MATRIX 2009

This cost analysis matrix uses actual 2007 cost and animal data from a municipal animal control agency in North Carolina. Although the actual agency reported best practices use of euthanasia by injection (EBI) for animals younger than 4 months of age (25 percent of total animals euthanized), this cost analysis assumes 100 percent chamber use in order to more accurately reflect the industry as a whole and to provide a more useful cost comparison to EBI. Although frequent, 100 percent chamber use is **not** acceptable practice.

Industry standards demand the use of EBI for animals less than 4 months of age and for animals suffering from respiratory conditions, generally poor health or severe injury.

Industry standards recommend administering 0.5 mg/pound acepromazine maleate (tranquilizer) to adult dogs 20 minutes prior to placing them in the chamber to reduce vocalization/agitation. The dose is typically 25 mg for an average 50-pound dog.

- Total number of dogs euthanized: 2,430
- Total number of cats euthanized: 2,997
- Total number of dogs and cats euthanized: 5,427
- Average number of dogs and cats euthanized per day: 15 (365 days)
- Number of employees (operators): 2 (alternate costs for 1 operator are included)
- For purposes of this cost analysis matrix, an average dog is 50 pounds



CARBON MONOXIDE EQUIPMENT COST		
1	CO chamber: \$10,500	Cutting Edge Fabrication, estimated usable life: 10 years
2	CO sensor: \$300	Unknown brand, estimated usable life: 10 years
3	Chamber lifetime routine maintenance: \$5,000	Estimated cost to maintain seals, gaskets and hardware over 10 years = \$500 per year
4	Annual depreciation: \$1,080	Chamber: \$10,500 + sensor: \$300 = \$10,800/10 = \$1,080
5	Annual depreciation + maintenance: \$1,580	Equipment depreciation: \$1,080 + maintenance: \$500 = \$1,580
6	CO equipment cost per animal: \$0.29	\$1,580 (annual depreciation/maintenance) / 5,427 (total animals euthanized per year) = \$0.29
TRANQUILIZER COST		
7	Acepromazine tranquilizer per average dog: \$1.00	Average dog: 50 pounds: 2.5 ml at \$0.40 per ml = \$1.00
8	Syringe/needle cost per dog: \$0.013	Syringe (reused) cost: \$0.003 + needle cost: \$0.01 = \$0.013
9	Tranquilizer cost per 50 pound dog: \$1.013	\$1.00 + \$0.013 = \$1.013
10	Number of dogs tranquilized (estimate): 1,701	1,701: number of estimated adult dogs euthanized by CO chamber (70% of total dogs)
11	Total annual cost of tranquilizer: \$1,723.11	1,701 dogs X cost per dog: \$1.013 = \$1,723.11
12	Tranquilizer cost per animal: \$0.32	\$1,723.11 / 5,427 (total animals euthanized) = \$0.317
CO LABOR COST		
13	Number of employees to euthanize: 2	<i>Note: actual municipal animal control agency uses 2 operators (employees) to euthanize by carbon monoxide</i>
14	Load time: 10 minutes	Includes transport to chamber
15	Run time: 35 minutes	Employees do paperwork and watch chamber

16	Unload time: 5 minutes	Remove carcasses, clean chamber for next cycle
17	Total cycle time: 50 minutes	Load: 10 + run: 35 + unload: 5 = 50 minutes
18	Number of dogs or cats per cycle: 6	Dogs and cats are not mixed in a cycle
19	Number of cycles per day: 2.5	Average number of animals euthanized per day: 15/number of animals per cycle: 6 = 2.5
20	Total time per day: 125 minutes	Load + run + unload (cycle time) = 50 minutes X 2.5 cycles = 125 minutes (2.08 hours)
21	Labor cost per minute per person: \$0.226	Hourly wage: \$10.44 + 30% fringe: \$3.13 = \$13.57/60 minutes = \$0.226
22	Total labor cost per minute (2 operators): \$0.452	\$0.226 X 2 operators = \$0.452
23	Total labor cost per cycle: \$22.60	\$0.452 X 50 minutes = \$22.60
24	Labor cost per day: \$56.25	\$22.60 X 2.5 cycles = \$56.50
25	Labor cost per animal: \$3.77	\$56.50/15 animals = \$3.766
26	Alternate: labor cost per animal with 1 operator rather than 2: \$1.88	\$0.226 X 50 minutes = \$11.30 X 2.5 cycles = \$28.25 / 15 animals = \$1.88 (note: will likely take longer to load and unload, but is not reflected in this matrix)
	CO SUPPLY COST	
27	CO gas cylinder: \$219.00	Includes cylinder rental plus gas
28	Annual number of cylinders: 15	Total number of cylinders used in 2007
29	Total gas cost:	\$219 per cylinder X 15 cylinders = \$3,285

30	Gas cost per day:	Annual cost/365 days = \$9.00
31	Supply cost per animal: \$0.60	\$9.00/15 animals = \$0.60
CARBON MONOXIDE TOTAL COST		
32	CO cost per animal: \$4.98	Equipment cost per animal: \$0.29 + tranquilizer cost: \$0.32 + labor cost per animal: \$3.77 + supply cost per animal: \$0.60 = \$4.98
33	Alternate CO cost (1 operator): \$3.09	Equipment cost per animal: \$0.29 + tranquilizer cost: \$0.32 + labor cost per animal: \$1.88 + supply cost per animal: \$0.60 = \$3.09

CARBON MONOXIDE vs. EBI

34	EBI cost per animal	\$2.29
35	CO cost per animal (2 operators)	\$4.98
36	CO cost per animal (2 operators) <i>without tranquilizer</i>	\$4.66
36	CO cost per animal (1 operator)	\$3.09
37	CO cost per animal (1 operator) <i>without tranquilizer</i>	\$2.77