

Euthanasia is defined as the act of inducing humane death. Ideally, the method used to administer painless death to an animal should cause minimal stress throughout the procedure. It should result in rapid unconsciousness, followed by cardiac or respiratory arrest, and ultimately, loss of brain function.

### **Unacceptable Methods**

Carbon dioxide gas is often used in specially designed chambers to euthanize small laboratory animals. In mammals of similar size to insectivorous bats, such as mice, carbon dioxide has rapid depressant and anesthetic effects and is considered conditionally humane. However, insectivorous bats appear to have a high tolerance to carbon dioxide. Two species of insectivorous bats (*T. brasiliensis* and *L. borealis*) suspected of rabies were euthanized with a specially designed CO<sub>2</sub> chamber by the Bat World Sanctuary in 1998. Distress, such as gasping for air, was noted almost immediately in both species. (These bats were removed from the CO<sub>2</sub> chamber and euthanized with isoflurane.) Further, when 25 pallid bats (*A. pallidus*) were euthanized at Texas A&M University, a research assistant noted gasping, and contortions in each of the bats for a period of one to three minutes. When suffocation was thought to be achieved, each bat was placed into a plastic zip-lock bag and placed into a refrigerator to await tissue sample collection to test for rabies. A small number of these bats remained in a semi-conscious state after being placed into plastic bags, and awoke while being necropsied (at which time their necks were broken) (M. Singleton, pers. comm.). Bat World Sanctuary, therefore, considers CO<sub>2</sub> an unacceptable method of euthanasia for insectivorous bats.

Inhalant compounds containing ether, nitrous oxide, and alkyl nitrites, such as lighter fluid, starter fluid, and air fresheners, and fumes such as carbon monoxide, are not considered acceptable methods of euthanizing bats. Solvent and gas inhalation can cause nausea and hallucinations preceding death.

T-61, Ketamine, Telazol, and Diazepam are not acceptable means of euthanasia for insectivorous bats. T-61 is a non-barbiturate, non-narcotic, injectable used for euthanasia. Although it may be available to animal caretakers in Canada, it is no longer commercially available in the United States. It provides a combination of general-anesthetic, curariform, and local-anesthetic actions. The AVMA Panel on Anesthesia recommends that, if the drug is used at all, it should be administered only intravenously as there is some question as to the absorption and onset of action when administered by other routes. Because curariform causes paralysis, including that of the respiratory system, an animal could be conscious and aware as it suffocates. Bat World Sanctuary, therefore, considers it unacceptable as a means of euthanasia for insectivorous bats.

Ketaset®/PromAce is a combination of Ketamine hydrochloride and Acepromazine, a general anesthetic and a tranquilizer. Although it has been injected subcutaneously to euthanize bats, it is known to induce an excitability phase characterized by tremors and vocalization preceding loss of consciousness. Bat World Sanctuary, therefore, considers it unacceptable as a means of euthanasia in bats.

Freezing was recommended as a method to euthanize torpid bats for many years (Barnard, pers. comm). The AVMA lists the rapid freezing of conscious animals as inhumane, but does not address torpid animals. Although bats enter a state of torpor when subjected to cold temperatures, they may awaken to full consciousness in an attempt to find a warmer location as their body temperature approaches lethal level. Bat World Sanctuary therefore does not recommend this method for euthanasia in insectivorous bats.

## Acceptable Methods

Isoflurane and Sevoflurane are the preferred inhalants and recommended by Bat World Sanctuary for euthanizing bats. Both chemicals produce a moderately rapid anesthetic effect followed by death when used in high enough doses (concentrations) or with prolonged exposure.

Insert a cotton ball into the plastic casing used as packaging for a 6ml syringe and then pour 5.0ml of Sevoflurane or Isoflurane onto the cotton ball. If the bat is calm, it can be placed in a roosting pouch or soft cloth. Place the open end of the plastic casing over the bat's head. Do not shove the bat's head into the casing so far that it panics, but rather hold the casing just above its head until the anesthetic effect is obvious. It should take only seconds for the bat to succumb, and it should exhibit no signs of distress during this process. Once the bat is unconscious, completely cover its head with the casing, and place the bat into a small airtight container, in a quiet location, for one to two hours. Use a neonatal stethoscope to insure the heartbeat has stopped.

Bats that are difficult to handle should be put in a roosting pouch or dark cloth and placed in a small plastic container with a tight-fitting lid, as pictured. Place the plastic casing with the cotton ball (which has been saturated with the inhalant) into the container and close the lid. The plastic casing should not be placed directly in front of the bat's face. Although the bat will fall asleep quickly, wait for one to two hours before checking for a heartbeat with a neonatal stethoscope.

As an alternative for bats that are exhibiting signs of respiratory distress, an injectable method of euthanasia may be preferred. Bat World Sanctuary recommends using injectable medications such as Acepromazine and Butorphanol Tartrate (0.008ml/g of body weight) mixed with Xylazine (0.01ml/g of body weight). The solution should be warmed before injecting. Mix 0.05ml Acepromazine with 0.05ml Butorphanol Tartrate and 9.8ml of an electrolyte solution. Administer 0.08ml SQ. Put the bat in a roosting pouch or in the folds of a soft cloth. Wait 20 minutes before administering 0.1 ml Xylazine. Alternately, sodium pentobarbital (euthanasia solution) can administered peritoneally after the bats is sedated.

Bats are usually anesthetized within minutes, however, the bat should be left undisturbed and safely contained in a quite, dark location for several hours. Ensure death has occurred by checking for respiration and heartbeat.



*A euthanasia box. Crevice bats are placed inside the pouch and tree bats are placed on top the pouch. Cotton inside the plastic casing is saturated with isoflurane and the lid is then closed.*