

# BC Ministry of Forests

## Standard Operating Procedure (SOP): Bat euthanasia

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## 1. PURPOSE

The purpose of this document is to supply an optimal method for the euthanasia of various species of bats that may be found in BC. The goal is to describe euthanasia methods that are humane for the animals, safe for the staff performing the euthanasia, and acceptable from a public relations viewpoint.

## 2. APPLICATION

This standard operating procedure (SOP) is intended to be a guidance document for performing euthanasia of bat species. The described procedures must be performed by veterinarians or individuals with specific training in the handling and care of bats. Ideally, the appropriate training should be given to individuals prior to delivery by someone already experienced with the technique.

## 3. BACKGROUND

There are 16 species of bat currently found in BC, with a large variety of habitat range, size, and behavior. Bats are essential to the health of the public, the environment and the economy in BC in several ways, including biodiversity, insect control, pollination and infectious disease monitoring.

Bats may carry infectious diseases, some of which are zoonotic (transmissible to humans), however only one is known to infect bats in BC. Rabies is of high concern because bats are the only wildlife reservoir in BC, the disease can be transmitted to humans, and the disease is almost always fatal to infected mammals and humans. The only method to definitively diagnose a bat with rabies is to submit the brain for testing; therefore, the suspect animal is euthanized if accessible.

The requirement of euthanasia of bats for rabies testing is an issue since the federal agency which used to manage this disease, the Canadian Food Inspection Agency (CFIA), has devolved rabies management to the province. Private veterinarians and wildlife professionals will now collect and ship bat samples for rabies testing. Therefore, veterinarians and wildlife professionals may be responsible for both handling and euthanasia of bats. To protect human health and ensure the humane care of bats, a standard protocol for the safe, effective and efficient handling and euthanasia of bats is a necessity.

This document provides best management practices to guide the handling and euthanasia of bats in BC. While the procedures described in this document are among the current acceptable methods of bat handling and euthanasia, those using this document as guidance are encouraged to consult recent literature and publications about the topics discussed here. Some of the materials/products described may require additional information or specialized access.

## 4. PROCEDURE

### 4.1 Bat Handling

When handling bats, the most important goals are maintaining human safety and preventing avoidable stress and injury to the animal. Since the risk of rabies must always be considered, those personnel routinely handling bats should be protected by a current rabies vaccination. Information from the Public Health Agency of Canada on rabies

vaccines can be found at the following link: <http://www.phac-aspc.gc.ca/publicat/cig-gci/p04-rabi-rage-eng.php>.

Encounters with bats are rare. For those found outside, it is best to avoid handling them at all. However, if an ill bat is found indoors and must be captured, an effective method is to place a box, jar, or other container over the bat, trapping it against a wall or object. A piece of cardboard or similar material can then be moved between the container and object, the cover can be taped to the top of the container, and holes should be made in the covering material to allow air movement in and out of the container for the bat to breathe. If it is exhibiting normal behavior and there is no reason to capture it, simply opening a window or door and allowing it to fly away is always preferred.

If this is not possible for some reason, use a sheet or blanket to throw over the bat and pull all edges of the sheet together to form a bag in which the bat is trapped instead. Then, take the sheet outside and suspend it from either a fence or tree so the bat will be able to crawl out on its own (which it may not do until dark).

Hand nets can easily injure a bat when used incorrectly, so are discouraged unless necessary. If using a hand net, the best technique is to move the net as slowly as possible and capture the bat from behind moving the net in the same direction the bat is travelling.

If bats are captured outside of buildings, mist nets or hand nets are the preferred methods of capture. The same techniques used with hand nets in indoor environments should be used outside as well. Bats frequently tangle in netting when captured with mist nets or hand nets, so great care should be taken when removing them from the net to avoid injury. It may be necessary to cut part of the net with scissors to successfully remove a bat. Mist netting technique requires training and is used when capturing bats for research purposes, not for disease surveillance or investigations.

Because of their small size and fragility, bats are always handled by hands. The handler must wear gloves that are thick enough to prevent bat bites from penetrating through the gloves, but not so thick that the use of the gloves increases the risk of bat injury due to encumbered handling agility.

#### 4.2 Euthanasia

Several methods of euthanasia of bats are considered unacceptable. These include the use of vehicle exhaust (carbon monoxide), freezing, drowning, and gunshot (destroys the brain, preventing rabies testing).

There are, however, other methods of euthanizing bats in a humane manner that are acceptable when carried out by individuals trained in the method; the three methods discussed in detail in this document are inhalational anesthetic overdose, cervical dislocation, and anesthesia with carbon dioxide followed by injectable barbiturate.

The method chosen for use should be carried out as quickly and efficiently as possible by trained personnel to minimize anxiety and discomfort of the animals.

After performing any of the described techniques, the bat must be assessed for loss of sensibility. Signs to indicate a complete loss of sensibility include: loss of vocalization, loss of corneal reflex (no blinking when surface of eye is touched), loss of breathing and lack of response to external stimuli (e.g., light, touch and noise). Death should be confirmed by listening for a heartbeat with a stethoscope.

If the heart is still beating or there are signs of return to sensibility, continue with gas anesthetic (if that is the chosen method) or proceed to a secondary euthanasia protocol (e.g., barbiturate overdose).

#### 4.2.1 Inhalation (volatile) anesthetic overdose

Isoflurane and sevoflurane are the current inhalation anesthetics of choice due to their efficacy, minimal adverse effects on the animal, availability in Canada, relatively low cost, and low risk to human health. Both are available as liquids that vaporize on exposure to air and can be inhaled.

To administer either anesthetic, the bat must first be placed in a leak-proof container that can be sealed. Ideally, the container should be transparent so that the bat being euthanized can be monitored for signs of anesthesia, loss of consciousness and potential distress. A large mouthed plastic container with a screw on top and large enough to fit several bats within is adequate.

If an anesthetic machine is available to use for delivery of the anesthetic, the fresh gas outlet should be fixed to the container in a manner that creates an air-tight seal. If an anesthetic machine is not available, a cotton ball can be placed in a plastic syringe case, the cotton ball is soaked with approximately 3-4 mL of the anesthetic, and the syringe case with cotton ball and anesthetic is then placed inside the euthanasia container. This is to protect the bat from direct contact with the anesthetic agent.

Once the method of anesthetic delivery is affixed to or placed in the euthanasia container, the bat can carefully be placed in the container and the container must then be sealed.

The bat should be monitored periodically during the euthanasia procedure to ensure success of anesthesia and absence of distress. It is best to wait an hour or so to allow for nervous system depression and death and to avoid partial torpor. Confirmation of death can then occur.

If euthanasia is not successful or a quicker euthanasia is desired once anesthesia has occurred, the secondary euthanasia technique should be performed (e.g., cervical dislocation, barbiturate injection).

Inhalation anesthetics should be used only by those trained in the safety and use of these compounds. If you or your facility does not have access to inhalation anesthetics or access to individuals with the correct training, please consult with a facility that does have the necessary materials and training.

When using gas anesthetics or other chemical euthanasia, a thorough knowledge of the use and safety of the compounds in use is a requirement. For more information on isoflurane or sevoflurane, please read and save the material safety data sheet (MSDS) of each compound, located at the links below.

Isoflurane:

<http://www.usp.org/pdf/EN/referenceStandards/msds/1349003.pdf>

Sevoflurane:

<http://www.usp.org/pdf/EN/referenceStandards/msds/1612540.pdf>

#### 4.2.2 Cervical dislocation

Cervical dislocation is an acceptable method of euthanasia for bats that weigh 30 g or less (approximately the size of a mouse or chickadee).

The bat should be restrained by hand while wearing gloves. The head should be grasped with one hand, while the body is held in the other. The neck should then be felt to locate a space between two cervical vertebrae. The ventral/bottom surface of the neck at this location should then be placed against a hard, linear object, such as the handle of closed scissors or hemostats, the edge of a table, or a metal rod.

Once the bat is restrained properly and the neck is positioned correctly adjacent to the object, dislocation should be performed quickly and efficiently. The head is pulled down and forward, while the body is pulled down and in the direction of the tail (away from the head). This motion puts pressure on the aiding object and causes separation of the vertebrae placed on either side of the object, leading to the spinal cord being rapidly severed at this location.

Before performing this technique on a live animal to perform euthanasia, the individual that will perform euthanasia should practice the technique on several bat carcasses to become familiar and competent with the technique.

#### 4.2.3 Anesthesia with carbon dioxide followed by injectable barbiturate

This technique requires a compressed gas tank that is filled with carbon dioxide, an air-tight container that the carbon dioxide can flow into, and injectable barbiturate, such as pentobarbital, in a syringe with a needle.

Similar to the anesthetic overdose technique, the bat is placed in the euthanasia container with tubing connecting the carbon dioxide source to the container and the container is then sealed. The carbon dioxide is then turned on, and the bat is monitored until it becomes anesthetized (unconscious).

Important in the use of CO<sub>2</sub> - if an animal is not anesthetized prior to CO<sub>2</sub> administration, a gradual fill-rate of less than 30% and greater than 20% of the chamber volume per minute should be used. I.e., if the chamber is 1L (1000mL), the flow rate of CO<sub>2</sub> should be 200-300mL/min. CO<sub>2</sub> must be administered from a compressed gas cylinder as this is the only way to control flow rate.

CO<sub>2</sub> is acceptable alone, but death can be very prolonged. Preferably once anesthetized, the bat can be carefully removed from the container, and the barbiturate can be injected using the intravenous (IV) route or intraperitoneal (IP) route.

If using the IV route, the most accessible veins are antebrachial vein, located in the wing membrane beside the fore limb, and the interfemoral vein, located in the wing membrane between the hind legs. IV puncture and injection may be easier if using a butterfly catheter attached to a syringe rather than a needle.

IP injection is performed by puncturing the ventral/lower body wall just behind the last rib.

An effective dose for sodium pentobarbital is 110 mg/kg, or 0.11 mg/g of body weight. Using the preparation with the name Euthansol, which is licensed in Canada, this would equate to 0.002 mL. As this is an extremely small amount and would be difficult to measure, an acceptable alternative is to use between 0.1 mL and 0.2 mL.

#### 4.3 Carcass Handling

The Ministry of Forests, Lands and Natural Resource Operations (FLNRO) should be contacted to discuss how the ministry can obtain the carcass/carcasses. Please contact the provincial wildlife veterinarian at 250-953-4285.

Once the carcass is acquired by the Ministry of FLNRO, it will then be submitted to a diagnostic laboratory, such as the Animal Health Centre, located in Abbotsford, BC.

#### 4.4 Human Safety – including rabies and other zoonotic diseases

The health and safety of staff performing euthanasia is of primary concern. All personnel should be trained to carry out their roles correctly and safely. Any individual or group who feels that their safety may be compromised by a work environment, procedure, or situation should remove themselves from the situation and evaluate how they may be able to continue in a safe manner.

Because of the risk of rabies transmission from bats to humans, all personnel involved in the handling and euthanasia of bats must be vaccinated for rabies and have their antibody titre checked regularly.

Additionally, any person that has been bitten or had sufficient contact (e.g., bat saliva in an open wound) for virus transmission should immediately wash the wound or area of

contact with soap and water for 10 minutes and then the individual must receive post-exposure rabies treatment at a medical facility as soon as possible.

The best method of maintaining high safety standards is through education. Please access the references located at the end of this document for further information on the topics covered in this SOP.

## 5. REFERENCES

ASM Animal Care Committee. 1998. Guidelines for the capture, handling, and care of mammals as approved by the American Society of Mammalogists. *Journal of Mammalogy* 79 (4): 1416-1431.

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