**FIELD EUTHANASIA FOR INVASIVE SPECIES CONTROL**

*Reptiles and amphibians (e.g. frogs, snakes, turtles)*

According to the American Veterinary Medical Association Euthanasia Guidelines (the animal welfare gold standard for euthanasia techniques in vertebrates), the *acceptable* methods for euthanasia of reptiles and amphibians are the noninhaled agents: a. barbiturates and barbituric acid derivatives (such as sodium pentobarbital); or b. nonbarbiturate anesthetic overdose (such as a combination of ketamine and xylazine); or c. topical agents (such as MS-222 or benzocaine hydrochloride).

Route of administration options for these products include intravenous (IV) or intracoelomic injections, injection into the lymph sacs, or water baths. Current federal drug regulations require strict accounting for barbiturates as well as ketamine, and these must be used under the supervision of personnel registered with the US Drug Enforcement Agency (DEA). **Given that barbiturates and ketamine are not always available for use by biologists without the presence of a veterinarian, the methods of euthanasia listed in this fact sheet will focus on those methods readily available to the biologist in the field.**

One method (MS-222) is considered an *acceptable* method of euthanasia while another, gunshot, is considered *acceptable with conditions*. This categorization means that: certain conditions must be met to consistently produce humane death; the euthanasia method may have greater potential for operator error or human safety hazard, is not well documented in the scientific literature, or may require a secondary method to ensure death.

Irrespective of the approach you choose, all methods of euthanasia should be performed in a low stress, quiet environment and only by properly trained personnel. Contact the Wildlife Health office for more detailed information and training opportunities on humane euthanasia techniques for free-ranging wildlife.

**Which method of euthanasia is right for your situation?**

The chart on the next page lists the euthanasia techniques that are *acceptable with conditions* and can be applied by a biologist in the field. The method you chose will depend on a number of factors:

1. the ability of personnel to induce loss of consciousness and death using a given technique without causing pain or distress
2. reliability and safety of the technique
3. training and logistics required for use of the technique in the field or facility
4. the health status of the animal and how easily it can be captured
5. compatibility with the purpose for euthanasia (such as needing to preserve organs for disease diagnostics)

**Unacceptable methods of euthanasia for all species:** freezing, drowning, use of car exhaust or other unapproved gases, injection of chemicals other than anesthetics or euthanasia solution(s).

**Please do not hesitate to contact the WHo with questions:** Sam Gibbs: 571-216-5776, [Samantha\_Gibbs@fws.gov](mailto:Samantha_Gibbs@fws.gov)

**Field euthanasia of reptiles and amphibians**

|  |  |  |
| --- | --- | --- |
|  | **Gunshot**  *(acceptable with conditions)* | **External or Topical chemical agents**  *(acceptable)* |
| Mode of action | Head shot - physical damage to brain; direct concussion of brain tissue. Heart shot – blood loss | (e.g buffered MS-222; benzocaine HCl) Hypoxia, loss of perception of sensations, depression of respiratory rate and cardiac arrest (medullary collapse) |
| Training required | Yes | Yes |
| Animal welfare considerations | If the animal is injured but not killed, it should be dispatched by a second shot or exsanguination (bleeding out) | A physical method, such as decapitation or pithing without decapitation, should be used once unconsciousness is achieved |
| Restraint necessary | No – may be applied to free-roaming animals; may also be performed at close range with animal inside cage trap | Yes -Buffered MS-222 may be administered via water baths at 5-10 g MS-222 per liter of water (amphibians), or injected directly into the lymph sacs (amphibians) or the coelomic cavity (amphibians and reptiles).  Benzocaine HCl may be applied topically to the ventrum as a 7.5% or 20% gel (amphibians) or administered via water bath at 1-3g benzocaine HCl per liter of water (amphibians). |
| Rapidity | Immediate, muscle activity may continue | May take 1 to 3 hours until death occurs |
| Safety for personnel | Injury to personnel, the public, and other animals | MS-222 is an irritant to the eyes, respiratory system, and skin. To avoid inhalation, the fine  crystalline powder should be weighed under a fume hood or with an N95 approved particulate  respirator. To avoid skin contact, goggles, gloves and a lab coat should be worn. |
| Biosafety/ biosecurity concerns | Exposure to brain tissue, blood, or venom | Decapitation or pithing may expose personnel to brain tissue, blood, or venom |
| Carcass consumption by scavengers | Depends on type of shot used; animals euthanized with lead shot should be made unavailable to scavengers | Animals euthanized with MS-222 should not be allowed to enter the food chain, MS-222 water bath liquid should not be discarded in the field. |
| Impacts on sample collection | May damage tissues needed for diagnostics | May damage tissues needed for diagnostics if secondary physical method is applied |
| Portable into the field | Yes | Yes |
| Equipment needed | Firearm, ammunition; see table on next page for required muzzle energy | Powdered drug, buffer, water, container |
| Cost | $800 – 2,000 | $150 |

**Average muzzle energies for common handguns and rifles:**

(Adapted from USDA, 2004, National Animal Health Emergency Management System Guidelines, USDA, Washington, DC. Available at: [www.dem.ri.gov/topics/erp/nahems\_euthanasia.pdf](http://www.dem.ri.gov/topics/erp/nahems_euthanasia.pdf) [Accessed August 27, 2009] and cited by Woods J, Shearer JK, Hill J. Recommended on-farm euthanasia practices. In: Grandin T, ed. *Improving animal welfare: a practical approach*. Wallingford, Oxfordshire, England: CABI Publishing, 2010; 194–195.)

**Muzzle energy**

|  |  |  |
| --- | --- | --- |
| **Cartridge/firearm** | **In foot pounds** | **In joules** |
| Handguns  .40 Smith and Wesson | 408 | 553 |
| .45 Automatic Colt Pistol | 411 | 557 |
| .357 Magnum | 557 | 755 |
| .41 Remington Magnum | 607 | 823 |
| 10-mm Automatic | 649 | 880 |
| .44 Remington Magnum | 729 | 988 |
| Rifles  .223 Remington | 1,296 | 1,757 |
| 30-30 Winchester | 1,902 | 2,579 |
| .308 | 2,648 | 3,590 |
| 30-06 Springfield | 2,841 | 3,852 |

**For euthanasia, the AVMA recommends that the combination of firearm and**

**ammunition selected should achieve a muzzle energy of at least 300 ft-lb (407 J)**

**for animals weighing up to 400lb.**

Methods of killing other than those deemed “acceptable methods of euthanasia” might be justified in situations with free-ranging wild animals. The quickest, safest, and most humane means of terminating the life of free-ranging wildlife in a given situation may not always meet all criteria established for euthanasia.

Confirmation of death: Amphibian and reptilian hearts can beat even after brain death. Death should always be confirmed by physical intervention (decapitation or pithing).

References

* American Association of Zoo Veterinarians (AAZV). Guidelines for Euthanasia of Nondomestic Animals. 2006
* AVMA euthanasia guidelines 2020: <https://www.avma.org/sites/default/files/2020-01/2020-Euthanasia-Final-1-17-20.pdf>