

Reptile Wildlife Euthanasia Techniques

LafeberVet Webinar
R.A.C.E. Program #776-41762

Renée Schott, DVM, CWR
Wildlife Rehabilitation Center of Minnesota

Define wildlife rehabilitation:

Wildlife rehabilitation is the act of providing temporary care to injured, sick, or orphaned wildlife with the goal of **releasing** them back into the wild.¹

Pain?

Reptiles have all the anatomy necessary to feel pain and suffer and therefore should be treated with the same humane standards as other species, which includes providing them with proper analgesics.² Sladky and Mans provide a review of clinical analgesia in reptiles.³

Legality

- If the animal is wild, its "owner" is the State, Federal, or Tribal authority.⁴
- Some endangered or migratory species may require approval by the appropriate federal agency prior to euthanasia, however, if the animal is actively suffering, agencies will usually defer to the veterinarian's discretion.
 - Migratory birds = U.S. Fish and Wildlife Service (USFW)
 - Marine mammals = National Oceanic and Atmospheric Administration (NOAA)
 - Rest usually = State

Define euthanasia

- Derived from the Greek terms "*eu*" = well or good and "*thanatos*" = death.^{5,6}
- Definition: ending the life of an animal in a way that eliminates or minimizes pain and distress.^{5,6} The technique employed should result in rapid loss of consciousness followed by cardiac or respiratory arrest and, ultimately, a loss of brain function.
- Actually determining the pain/distress of a method of euthanasia can be very difficult because as humans we will never fully know/understand the subjective experience of the animal.⁷ We use our best judgement; paddling, vocalizations, convulsions before apparent loss of consciousness is obviously suffering. We also use our knowledge of physiology and assume suffering in the absence of behaviors if a physiological process theoretically leads to suffering.
- Pain, distress and suffering are subjective affective experiences that are perceived in the brain. Therefore, one must be conscious and alive to suffer.
- General rule: a gentle death that takes longer is preferable to a rapid but more distressing death and conversely, if all other methods are equally humane, the quickest method should be chosen.⁸
- Taking a life is abhorrent to many. We often forget this and need to keep it in mind.⁹
- What's the difference between euthanasia and humane killing?^{6,7,9}

- Most veterinary/animal fields define euthanasia simply as “good death”, however, the human field does not. Consider the death penalty—we don’t consider these humans “euthanized” or eligible for “euthanasia”. Applying this to animals, we do not consider healthy cattle going to slaughter to be going for euthanasia. That’s because the decision whether or not to end a life, is central to the euthanasia definition. **The decision of whether or not to end a life must be based on the animal’s welfare, that is, to anticipate what the animal would want & and what is in the animal’s best interest.** So even though we won’t be discussing today the decision on whether or not to euthanize, we should keep this in mind. And finally, even though humane slaughter and humane depopulation (i.e. with animal disease outbreaks) may not be considered true euthanasia, we can consider these techniques when we are looking for the most humane way to euthanize our patients in wildlife rehabilitation.

Evaluating euthanasia methods:⁶

- Animal factors:
 - Ability to induce loss of consciousness and death with a minimum of pain and distress ¹⁰; compatibility with species, age, and health status
 - Minimize exposure to human presence and other animals that could be perceived as predators, loud noises, stress vocalizations that can serve as sources of anxiety.^{10,11}
 - Time required to induce loss of consciousness⁵
 - Reliability/irreversibility
- Human factors:
 - Safety of personnel
 - Documented emotional effect on observers or operators
 - Emotional impact : The potential emotional and psychological effects on the people performing the euthanasia, and on observers must be acknowledged ⁵
 - *“No matter what the situation, the act of performing euthanasia on a wild animal involves emotions. While we can’t remove the emotions, we can develop guidelines which will help make the actual decision a little easier and hopefully remove some of the doubt.”* ¹²
 - Drug availability, human abuse potential, legal requirements
 - Lay rehabilitators are often left to perform euthanasia without a veterinarian (emergency situations, evenings, weekends, etc.); alternatives need to be available for these situations in which controlled drugs, advanced training or equipment is not available.¹³
 - Ability to maintain equipment in proper working order
- Remains (carcass) factors: Compatibility with intended animal use and purpose
 - Intracardiac injections can potentially damage heart tissue both mechanically and chemically
 - Commercial euthanasia solutions are NOT sterile
 - Barbiturates can precipitate in tissues.¹⁴
 - Environmental impacts of the method or remains, including safety for predators or scavengers should the animal’s remains be consumed; Barbiturates should not be used where carcasses can potentially be consumed.¹⁵

We must view the above within a practical systems view/process flow:

- Handling/restraint

- Euthanasia methods/agents: 2+ phases¹⁶; multi-stage process recommended.^{2,17,18,19}
 - Loss of consciousness (unaware of surroundings, cannot feel pain, fear, distress)
 - Sedation = animal may be aroused to a conscious state with sufficient stimulation⁶
 - Anesthesia = unconsciousness and cannot be aroused⁶
 - Causing death
- Confirmation of death
- Disposal of remains, necropsy needed (and why)

Case Examples

- Case #1: Snapping turtle brought to a wildlife rehabilitator, obtunded from trauma, barely alive
 - Sodium pentobarbital
 - Routes of administration
 - Mechanism of action
 - Reptile physiology relevant to sodium pentobarbital administration
 - Confirmation of death in reptiles
- Case #2: Painted turtle presents to veterinary clinic bright, alert and feisty but with an obvious carapacial fracture over the caudal spine, rear end paralysis, and no deep pain in the rear limbs.
 - Use of preanesthetic medication
 - Physical methods of euthanasia
 - Unacceptable methods
- Case #3: A common garter snake that presents bright, alert, and feisty, but with a spinal fracture and no deep pain in the tail.
 - Recommended techniques for lizards, snakes, chelonians versus crocodylians
 - Guidelines for tiny (<4 gram) patients

Reptile References

1. Pokras M. Introduction to wildlife rehabilitation purpose and philosophy. In: Moore AT, Joosten S (eds). *NWRA Principles of Wildlife Rehabilitation*, 2nd ed. St. Cloud, MN: National Wildlife Rehabilitators Association; 2002:1.7.
2. Nevarez JG. Euthanasia. In: Divers S, Stahl S (eds). *Mader's Reptile and Amphibian Medicine and Surgery*, 3rd ed. Elsevier; 2019:437-440.
3. Sladky KK, Mans C. Clinical analgesia in reptiles. *J Exot Pet Med*. 2012;21(2):158-167.
[doi:10.1053/j.jepm.2012.02.012](https://doi.org/10.1053/j.jepm.2012.02.012).
4. American Veterinary Medical Association. Emergency euthanasia of wildlife. *AVMA web site*. Available at avma.org/emergency-euthanasia-wildlife. Accessed Feb 6, 2020
5. Charbonneau R, Niel L, Olfert, et al. Overview of acceptable euthanasia methods. In: *CCAC Guidelines on: Euthanasia of Animals Used in Science*. ; 2010:12-16. Available at ccac.ca/Documents/Standards/Guidelines/Euthanasia.pdf. Accessed Mar 31, 2020.
6. Leary S, Underwood W, Anthony R, et al. *AVMA Guidelines for the Euthanasia of Animals: 2020 Edition* ; 2020.

7. Meyer RE. Euthanasia and humane killing. In: Grimm KA, Lamont LA, Tranquilli WJ, Greene SA, Robertson SA (eds). *Veterinary Anesthesia and Analgesia The Fifth Edition of Lumb and Jones*. 5th ed. Ames, Iowa: Wiley Blackwell; 2015:130-146.
8. Hawkins P, Prescott MJ, Carbone L, et al. A good death? Report of the second newcastle meeting on laboratory animal euthanasia. *Animals*. 2016;6(9):1-28. [doi:10.3390/ani6090050](https://doi.org/10.3390/ani6090050).
9. McMillan FD. Rethinking euthanasia: Death as an unintentional outcome. *J Am Vet Med Assoc*. 2001;219(9):1204-1206. [doi:10.2460/javma.2001.219.1204](https://doi.org/10.2460/javma.2001.219.1204)
10. Wack R, Morris P, Sikarskie J, Miller DS. Criteria for humane euthanasia and associated concerns. In: Baer K (ed). *Guidelines for Euthanasia of Nondomestic Animals*, 1st ed. American Association of Zoo Veterinarians; 2006:3-5.
11. Greer L. Proc Annu Conf American Association of Zoological Veterinarians. In: *Euthanasia Guidelines, Ethics and Reality*; 1999:72-76.
12. Miller E. Euthanasia: Euthanasia the other release. In: NWRA Principles of Wildlife Rehabilitation, 1st ed. St Cloud, MN: National Wildlife Rehabilitators Association; 1995:219-221.
13. Clark E. The veterinary practitioner and the wildlife rehabilitator. In: Hernandez S, Barron H, Miller E, Aguilar R, Yabsley M (eds). *Medical Management of Wildlife Species: A Guide for Practitioners*, 1st ed. Hoboken, NJ: Wiley Blackwell; 2020:97-104.
14. Orosz S. Birds. In: *Guidelines for the Euthanasia of Nondomestic Animals*. American Association of Zoo Veterinarians; 2006:46-49.
15. Baier J. Reptiles. In: *Guidelines for the Euthanasia of Nondomestic Animals*. American Association of Zoo Veterinarians; 2006:42-45.
16. Bexton S, Couper D, Grogan A. Euthanasia. In: Williams K (ed). *Wildlife Rehabilitation: A Comprehensive Approach*, 1st ed. Eugene, OR: International Wildlife Rehabilitation Council; 2016:95-110.
17. Warren K. Thinking outside the cage : a different point of view. Proceedings of the 2012 ANZCCART Conference. In: *Reptile Euthanasia-No Easy Solution?* Perth, Western Australia; 2012:111-113.
18. Nevarez JG, Strain GM, da Cunha AF, Beaufrère H. Evaluation of four methods for inducing death during slaughter of American alligators (*Alligator mississippiensis*). *Am J Vet Res*. 2014;75(6):536-543. [doi:10.2460/ajvr.75.6.536](https://doi.org/10.2460/ajvr.75.6.536).
19. Hyndman T. Euthanasia. In: Doneley B, Monks D, Johnson R, Carmel B, eds. *Reptile Medicine and Surgery in Clinical Practice*, 1st ed. Hoboken, NJ: Wiley Blackwell; 2018:449-451.
20. Tranquilli WJ, Grimm KA. Introduction: use, definitions, history, concepts, classification and considerations for anesthesia and analgesia. In: Grimm KA, Lamont LA, Tranquilli WJ, Greene SA, Roberston SA (eds). *Veterinary Anesthesia and Analgesia: The Fifth Edition of Lumb and Jones*. 5th ed. Wiley Blackwell; 2015:5.
21. Usach I, Martinez R, Festini T, Peris JE. Subcutaneous injection of drugs: literature review of factors influencing pain sensation at the injection site. *Adv Ther*. 2019;36(11):2986-2996. [doi:10.1007/s12325-019-01101-6](https://doi.org/10.1007/s12325-019-01101-6).
22. Stranz M, Kastango E. A review of pH and osmolarity. *Int J Pharm Compd*. 2013;6(3):216-220.
23. Close B, Banister K, Baumans V, et al. *Recommendations for Euthanasia of Experimental Animals: Part 2*. Vol 31.; 1997. [doi:10.1258/002367797780600297](https://doi.org/10.1258/002367797780600297).
24. Gartrell BD, Kirk EJ. Euthanasia of reptiles in New Zealand: current issues and methods. *Kokako*. 2005;12(1):12-15.
25. Expert Panel. Analysis on humane killing methods for reptiles in the skin trade. In: Office SFV, ed. *Swiss Federal Veterinary Office FVO*; 2013.
26. Humane Society of the United States. *Euthanasia Reference Manual*, 2nd ed. The Humane Society of the United States web site; 2013. Available at animalsheltering.org/sites/default/files/content/euthanasia-reference-manual.pdf. Accessed Mar 27, 2020.
27. Jackson DC, Ultsch GR. Physiology of hibernation under the ice by turtles and frogs. *J Exp Zool Part A Ecol Genet Physiol*. 2010;313 A(6):311-327. [doi:10.1002/jez.603](https://doi.org/10.1002/jez.603).
28. Ultsch GR. The ecology of overwintering among turtles: where turtles overwinter and its consequences. *Biol Rev Camb Philos Soc*. 2006;81(May):339-367. [doi:10.1017/S1464793106007032](https://doi.org/10.1017/S1464793106007032).
29. Pizzi R, McArthur S. Euthanasia technique for chelonians. *Vet Rec*. 2004;154(19):607-608.
30. Krivoruchko A, Storey KB. Turtle anoxia tolerance: Biochemistry and gene regulation. *Biochim Biophys Acta*. 2015;1850(6):1188-1196. [doi:10.1016/j.bbagen.2015.02.001](https://doi.org/10.1016/j.bbagen.2015.02.001).
31. Nilsson GE, Lutz PL. Anoxia tolerant brains. *J Cereb Blood Flow Metab*. 2004;24(5):475-486. [doi:10.1097/00004647-200405000-00001](https://doi.org/10.1097/00004647-200405000-00001).

32. Cooper JE. Humane euthanasia and post-mortem examination. In: Girling S, Raiti P (eds). *BSAVA Manual of Reptiles*, 2nd ed. BSAVA; 2004:168-183.
33. Milton SL, Prentice HM. Beyond anoxia: The physiology of metabolic downregulation and recovery in the anoxia-tolerant turtle. *Comp Biochem Physiol - A Mol Integr Physiol*. 2007;147(2 SPEC. ISS.):277-290. [doi:10.1016/j.cbpa.2006.08.041](https://doi.org/10.1016/j.cbpa.2006.08.041).
34. Kesaraju S, Schmidt-Kastner R, Prentice HM, Milton SL. Modulation of stress proteins and apoptotic regulators in the anoxia tolerant turtle brain. *J Neurochem*. 2009;109(5):1413-1426. [doi:10.1111/j.1471-4159.2009.06068.x](https://doi.org/10.1111/j.1471-4159.2009.06068.x).
35. Larson J, Drew KL, Folkow LP, Milton SL, Park TJ. No oxygen? No problem! Intrinsic brain tolerance to hypoxia in vertebrates. *J Exp Biol*. 2014;217(Pt 7):1024-1039. [doi:10.1242/jeb.085381](https://doi.org/10.1242/jeb.085381).
36. Reese SA, Stewart ER, Crocker CE, et al. Geographic variation of the physiological response to overwintering in the painted turtle (*Chrysemys picta*). *Physiol Biochem Zool Ecol Evol Approaches*. 2004;77(4):619-630. [doi: 10.1086/383514](https://doi.org/10.1086/383514).
37. Kesaraju S, Milton SL. Preliminary evidence of neuronal regeneration in the anoxia tolerant vertebrate brain. *Exp Neurol*. 2009;215(2):401-403. [doi:10.1016/j.expneurol.2008.10.017](https://doi.org/10.1016/j.expneurol.2008.10.017).
38. Storey JM, Storey KB. Natural freezing survival in animals. *Annu Rev Ecol Syst*. 1996;27:365-386. doi.org/10.1146/annurev.ecolsys.27.1.365.
39. Miller D, Citino S, Drew M, et al. Captive amphibians and reptiles. In: *AVMA Guidelines for the Euthanasia of Animals*. American Veterinary Medical Association; 2020:92-94. Available at avma.org/sites/default/files/2020-02/Guidelines-on-Euthanasia-2020.pdf. Accessed Feb 6, 2020.
40. Petritz OA, Son TT. Confirmation of death. In: Divers SJ, Stahl SJ (eds). *Mader's Reptile and Amphibian Medicine and Surgery*, 3rd ed. Elsevier; 2019:968.
41. Martínez-Silvestre A, Perpiñan D, Marco I, Lavin S. Venipuncture technique of the occipital venous sinus in freshwater aquatic turtles. *J Herpetol Med Surg*. 2002;12(4):31-32. [doi:10.5818/1529-9651.12.4.31](https://doi.org/10.5818/1529-9651.12.4.31).
42. Work TM, Balazs GH. A simple humane method to euthanize a sea turtle. *Mar Turt Newsl*. 2013;(136):5-6. Available at seaturtle.org/mtn/archives/mtn136/mtn136p5.shtml.
43. Warwick C. Euthanasia of reptiles-decapitation: an inhumane method of slaughter for the class "Reptilia". *Can Vet J*. 1986;27:34. PMID: [PMC1680226](https://pubmed.ncbi.nlm.nih.gov/1680226/).
44. Seymour TL, Nagamine CM. Evaluation of isoflurane overdose for euthanasia of neonatal mice. *J Am Assoc Lab Anim Sci*. 2016;55(3):321-323. PMID: [PMC4865695](https://pubmed.ncbi.nlm.nih.gov/274865695/).
45. Lutz PL, Nilsson GE, Pérez-Pinzón MA. Anoxia tolerant animals from a neurobiological perspective. *Comp Biochem Physiol - B Biochem Mol Biol*. 1996;113(1):3-13. [doi:10.1016/0305-0491\(95\)02046-2](https://doi.org/10.1016/0305-0491(95)02046-2).
46. USDA, APHIS, Health TC for FS& P. Physical methods. In: *NAHEMS Guidelines: Mass Depopulation and Euthanasia*. ; 2011:17-25.
47. Woolcott CR, Torrey S, Turner PV, et al. Assessing a method of mechanical cervical dislocation as a humane option for on-farm killing using anesthetized poults and young Turkeys. *Front Vet Sci*. 2018;5(NOV):1-10. [doi:10.3389/fvets.2018.00275](https://doi.org/10.3389/fvets.2018.00275).