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| **Amphibian Anesthesia**Note that all of these doses are approximations and must be titrated to the animal’s strain, age, sex and individual responses. Significant departures from these doses should be discussed with a veterinarian. Doses will also vary depending on what other drugs are being administered concurrently. Modified from Penn State UniversityAmphibians in the early stages of their life cycle (e.g., tadpoles) are entirely aquatic and have gills for respiration. Most amphibians lose their gills during metamorphosis and develop lungs. Most importantly, amphibian skin acts as a semipermeable membrane that allows for respiration (cutaneous respiration) and absorption of substances through the skin.Amphibians may be anesthetized by immersion in an anesthetic solution, placement in an anesthetic gas induction chamber or by anesthetic preparations applied to the skin.Amphibians can remain out of water for long periods of time if they are kept moist.Fasting for 12-24 hours prior to anesthesia is recommended to decrease the incidence of regurgitation which will foul the water of the anesthetic or recovery container.Amphibians go through an excitement phase during anesthetic induction. It is important to induce anesthesia in a container that will prevent injury due to the animal jumping or falling out.**Stages of anesthesia in amphibians**

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| **Induction** | **Light anesthesia** | **Surgical anesthesia** |
| Decreased gular movement and diminished withdrawal reflex | Loss of righting reflex and absence of abdominal respiration | No withdrawal reflex (toe pinch) and gular movements cease |

Pulmonary respiration will cease during anesthesia in amphibians and can not be used to monitor anesthetic depth. Cutaneous respiration is sufficient to prevent clinical hypoxia during anesthesia.Heart rate may be monitored during anesthesia by direct observation (ventral midline, caudal to the shoulders), ECG, ultrasonagraphy or a Doppler flow detector. Normal values for heart rates have not been published.

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| **Anesthetic agent** | **Dose** | **Comments** |
| **MS-222** (tricaine methanesulfonate). Anesthetic solutions must be buffered with sodium bicarbonate. | 250-500mg/l1g/l2-3 g/l | Tadpoles and newtsFrogs and salamandersLarge specimens and toads |
| **Benzocaine** (powder or hydrochloride). Anesthetic solutions must be buffered with sodium bicarbonate. | 2 gm/l | True toads, spadefoots and large salamanders |
| **Isoflurane** | Variable | Applied to skin in patch or viscous gel (see below) |

**MS-222** : Wide margin of safety. Solutions must be buffered with sodium bicarbonate to maintain neutral pH.**Benzocaine:** Powder must be dissolved in ethanol to create a stock solution. Solutions must be buffered with sodium bicarbonate to maintain neutral pH.**Isoflurane:** May be mixed into a viscous solution with KY jelly and water or injected into an absorbent pad and applied directly to the dorsum of the animal.Once the amphibian reaches the appropriate level of anesthesia for the procedures planned, the animal should be removed from the anesthetic bath and rinsed with fresh water or the topical preparation should be removed by rinsing. The animal will remain anesthetized for 10-80 minutes, depending on the method and drug concentration used.Recovery from anesthesia (righting reflex returns and animal able to move normally) will take 30-90 minutes after the animal is rinsed with fresh water.*Do not raise the amphibian's body temperature above that of normal room temperature in an attempt to speed recovery*. Increasing the body temperature will increase metabolism and oxygen requirements. Cutaneous respiration may not be sufficient to maintain adequate oxygenation.*Do not apply alcohol or other preparations that contain alcohol directly to the skin of an amphibian*. It may be absorbed through the skin and may dissolve normal secretions that protect the animal from dehydration and infections.For additional information regarding anesthetic use in amphibians please see the following references.1. Stetter MD: Fish and Amphibian Anesthesia. *In* Veterinary Clinics of North America: Exotic Animal Practice 4(1), January 2001; pp. 69-82.
2. Green DE: Anesthesia of Amphibians in the Field. Amphibian Research and Monitoring Initiative Standard Operating Procedure, March 2001. National Wildlife Health Center, United States Geological Service.
3. Smith JM and Stump KC: Isoflurane Anesthesia in the African Clawed Frog ( *Xenopus laevis* ). Contemporary Topics, 39(6), November 2000; pp. 39-42.
4. Wright KM and BR Whitaker: Amphibian Medicine and Captive Husbandry. 2001; pp. 115-121. Krieger: Malabar, Florida.
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