

In a survey carried out by the Association of Veterinary Anaesthetists (AVA), rodents and other small mammals had much higher clinical mortality associated with anaesthesia than in other domestic species (e.g. 1 in 1,000 for dogs). The cause of such high mortality probably results from unfamiliarity with the species and the generally less healthy state of the animals.

- x There has been a growing popularity of exotic pet ownership in recent years, and as a result, more practitioners are faced with treating exotic species.
- x

- x Lungs are less elastic, and have smaller functional residual capacity
- x High basal metabolic rate results in rapid utilization of any tissue oxygen reserve
- x Renal portal circulation may reduce the efficacy of anesthetic drugs when injected in the leg muscles or veins. However, this is of little clinical significance as one can increase the anesthetic dose until the desired effect is achieved

Preparation for anesthesia

- x Thorough physical exam and history taking must be carried out if non-approachable, behavioral characteristics are assessed in distance
- x They are very liable to develop handling stress so observation may be the only practical pre-anesthetic evaluation process. Any changes in body disposition, feather condition, grooming should be carefully assessed.
- x They can be brought into the procedure area in advance to acclimatize so as to reduce the stress
- x The following laboratory data are generally required as a minimum: PCV, TP, BUN, Glucose
- x Fasting requirement is contentious, but in general it is recommended in most birds as birds regurgitate during anesthesia. However, in smaller birds with high basal metabolic rate fasting is better avoided to minimize the likelihood of hypoglycemia
- x Although not as commonly administered as in other domestic species, pre-anesthetic medication may be useful to minimize the stress and provide analgesia prior to anesthetic induction.
 - o In diving birds administration of midazolam with/without butorphanol can substantially reduce the diving reflex.
 - Midazolam can be administered at 2-10 mg/kg IM
 - Butorphanol can be administered at 0.24 mg/kg IM

Figure 1. A sedated goose following midazolam and butorphanol premedication



- x Ratites or bigger birds may require deep sedation or chemical restraint prior to anesthetic induction: alpha 2 agonists with/without dissociatives are used for healthy animals

Inhalant anesthesia

- x Modern potent inhalants such as isoflurane, sevoflurane and desflurane are the preferred choice both for anesthetic induction and maintenance
- x In most birds that can be handled with little stress, anesthetic induction is achieved by using face mask induction technique, but chamber induction is better for birds that are difficult to control
- x Although face masks commercially available for small animals are appropriate for many birds, due to widely varying sizes in beaks, bills and cerebra, tight face mask placement is not always easy, increasing anesthetic leakage
- x Intubating the bird once the anesthesia is induced will provide a secure airway as well as reducing the anesthetic leakage.
- x It is better to use non-cuffed ET tubes in birds, but if cuffed tubes are used, beware not to over inflate the cuff to avoid damage to the trachea

Anesthetic monitoring & maintenance

x

- x They have high metabolic rate and this characteristic must be taken into account for preanesthetic preparation and drug dosing

Preanesthetic preparation

- x Thorough physical exam and previous medical history ~~check~~
- x Fasting is not necessary as vomiting during induction does not occur and also to prevent hyperglycemia

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Anesthesia for Reptiles

Physioanatomic peculiarities

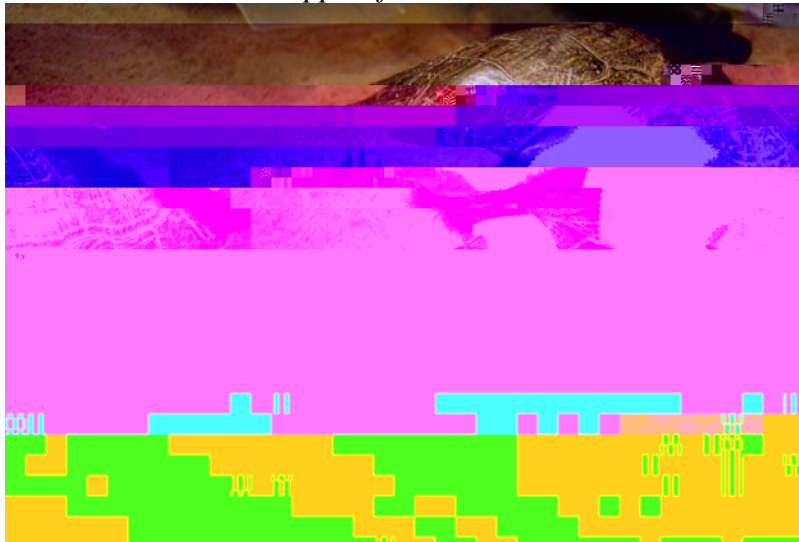
- x Reptiles are poikilothermic or ectothermic (cold blooded) and their body temperature and metabolic rates are governed by the ambient temperature
- x In snakes the tracheal ring is incomplete but turtles and crocodilians have complete tracheal rings and it is important not to over inflate the ET tube cuff in these species
- x Except in crocodilians where the pulmonary morphology is similar to that of the mammals, most reptilians have more primitive lung structures and possess air sacs which do not involve in gas exchanges
- x Crocodilians have a similar heart structure to mammals but most reptiles have a three chamber heart with two atria and one ventricle. The ventricle is functionally subdivided into cavum arteriosum, cavum venosum and cavum pulmonale
- x Reptiles have an extensive pulmonary shunt. They also undergo extensive anaerobic metabolism which is particularly well developed in aquatic reptiles such as sea turtles. These evolutionary adaptations enable them to sustain hypoxic insult much better than mammals in a low oxygen environment.
- x Renal portal circulation may reduce the efficacy of anesthetic drugs injected in the leg muscles or veins. However, this is of little clinical significance as one can increase the anesthetic dose until the desired effect is achieved
- x Reptiles do not possess a true diaphragm but negative pressure pumping system is used to ventilate
- x Respiratory muscles are used both for inspiration and expiration
- x In apneic Chelonians ventilation can be supported by moving the legs in and out by changing the volume of coelomic cavity
- x The reptile glottis is slit like opening between the arytenoid cartilages and located at the base of the tongue on the floor of the oral cavity
- x Low basal metabolic rate

Preparation for anesthesia

- x Thorough physical exam and history taking must be carried out. However, due to the danger involved in handling some vicious and venomous species observation of behavioral characteristics in distance may be the only practical pre-anesthetic evaluation process. Any changes in body disposition, the skin condition, discharges from the nostrils and eyes should be carefully assessed.
- x The following laboratory data are generally required as minimum: PCV, TP, BUN, Glucose
Blood glucose level is generally lower than mammals (300 mg/dl)
- x Any abnormalities (dehydration, anemia, electrolyte imbalance, hypoglycemia) must be corrected prior to anesthetic induction

- x Although regurgitation and aspiration is unlikely, fasting is recommended because of impaired digestion
- x Injectable premedicants can provide sedation and facilitate the anesthetic induction using inhalants, and t

Figure 3. A small snapping turtle is intubated using an 18 G catheter and is being monitored using a Doppler flow detector



Anesthetic monitoring & maintenance

- x As in other domestic species heart rate, respiratory rate and body temperature are for the physiologic monitoring
- x An esophageal stethoscope can be useful to monitor both cardiac rate, rhythm, intensity and respiratory rate and rhythm.
- x Anesthetic monitoring utilizing combination of an ECG and a Doppler flow detector (typically placed in a site near the heart) will provide useful monitoring of electrical and mechanical activities of the heart
- x Due to their thick skin (scales) pulse oximetry and noninvasive blood pressure readings are difficult to obtain
- x Most veterinary pulse oximeters are calibrated with mammalian oxygen hemoglobin saturation dissociation curve, so its accuracy is uncertain
- x Small reptiles may become very hypothermic and external heat source (heating pad, forced warm air blanket etc) must be supplied to prevent the animal becoming hypothermic

Recovery

- x Ensure to maintain optimal temperature of the particular species for faster drug metabolism (and recovery)
- x Provide a secure and clear airway
- x Provide adequate analgesia
- x Reverse any reversible drugs that may prolong recovery

Fish anesthesia

Figure 4. A basic set-up for inducing and maintaining sm

- x As the fish recovers, respiration increases, fin starts to move and then the fish swims with progressively better coordination.
- x Most recover within 5 minutes after being placed in clear water, animals taking longer than 10 minutes are suspected to have been overdosed or medically compromised

Further readings

- x Thurmon, Tranquilli and Benson Veterinary Anesthesia Williams and Wilkins 1996
- x Hall, Clarke, and Trim Veterinary Anesthesia WB Saunders 2001
- x Muir, Hubbel and Skarda A handbook of Anesthesia Mosby 1999
- x Greene Veterinary Anesthesia and Pain Management Saunders and Belfus 2002
- x Heard Analgesia and Anesthesia Exotic Species The Veterinary Clinics of North America Philadelphia WB Saunders 2001
- x Seymour and Gleed BSAVA Manual of Small Animal Anaesthesia and Analgesia BSAVA Publication 1999