Reptile ER

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While it has been well documented that the dog and cat numbers are in decline, reptile ownership represents a growing part of the pet population in Australia. This coupled with the fact that there is a general lack of preventative health care for reptiles, and the prevalence of poor husbandry and nutrition, means that sick reptiles are going to be presented to veterinarians at an increasing frequency.

Reptiles do everything slowly. They get sick slowly and they heal slowly. On top of this is the fact that reptiles are extremely good at masking illness. With this in mind it should be understood that reptiles that present for an "emergency" are rarely acutely ill. The vast majority of emergency cases usually have a chronic disease problem that has reached a point of showing acute progression. There are however some truly acute critical conditions that do occur in reptiles. These include burns, foreign body ingestion, prolapses, toxicities, dyspnoea, drowning, hypothermia, hyperthermia, hypocalcaemia, dystocia and of course, trauma. A simple philosophy to have when dealing with any emergency, including a reptile one, is that if it is an emergency to the client then it should be an emergency to us as veterinarians!

No matter what the type of emergency each case should be treated with a systematic approach. The three most important steps that should be followed when presented with any critical reptile case are:

- Know the species you are dealing with. There are about 7500 different reptile species throughout the world and every one of them has different requirements with respect to husbandry and handling. In reality veterinarians in general practice in Melbourne are potentially only going to see less than 0.2% of those species. The most common species of reptiles seen in practice in no particular order are:
    i. Eastern Bluetongue Lizard (Eastern and Blotched) (*Tiliqua scincoides scincoides*)
    ii. Central Bearded Dragon (*Pogona vitticeps*)
    iii. Shingleback or Stumpy Tail Lizard (*Trachydosaurus rugosus*)
    iv. Jungle Carpet Python (*Morelia spilota cheynei*)
    v. Eastern Long Neck Turtle (*Chelodina longicollis*)
    vi. Coastal Carpet Python (*Morelia spilota mcdowelli*)
    vii. Diamond Python (*Morelia spilota spilota*)
    viii. Centralian Carpet Python (*Morelia spilota bredlii*)
    ix. Eastern Water Dragon (*Physignathus lesueurii*)

x. Macquarie River Turtle (*Emydura macquarii*)
xi. Children's Python (*Antaresia childreni*)

In more specialised reptile practices other species such as assorted monitors and other lizards, crocodiles and various species of snakes would also be seen.

Many reptile owners (or "herpers" as they often call themselves) have a somewhat cynical view of veterinarians and will often do a lot of research into finding a veterinarian that is competent with reptiles rather than just go to the local veterinary clinic ... even in the case of an emergency!

- Perform a full physical examination. In cases of emergencies this initial assessment or triage is often done prior to getting the animal's history. Areas that need to be considered include:
    i. The ABC's of emergency medicine: A = airway, B = breathing and C = circulation. Emergency management should be no different in reptiles than it is in mammals. Check to see the airway is clear; check to see if the animal is breathing; and check the animal has a heartbeat.
    ii. Assess whether the patient is dead or alive if needed. While this may sound strange it is actually not always that easy to determine. A cold, sick reptile can be almost completely motionless and non-responsive. The heart beat needs sometimes to be considered as "minutes per beat" rather than "beats per minute". A doppler probe or ultrasound may be needed to assess cardiac motion. The complicating factor is also that it must be remembered that a reptile's heart may still continue to beat for some time after death! Getting a heart rate also provides a baseline that can be extremely useful for monitoring recovery.
    iii. Perform a visual examination first. Assess body condition, body conformation, neurological function, ambulation, degree of activity, respiratory rate and effort and any abnormal behaviours prior to handling the animal.
    iv. Take a core body temperature. This is simple to do by placing a lubricated thermometer in the cloaca and directing it cranially. Care should be taken as there is a blind ended pocket in the cranial part of the cloaca called the corprodeum that can easily be penetrated with a thermometer. Most digital thermometers only read down to a temperature of 32°C and this is often not low enough to read a sick reptile's core body temperature. Other digital thermometers are available, such as those commonly used to monitor an enclosure's temperatures, which are more suitable.
    v. Assess hydration, mucous membrane colour, obvious signs of trauma, discharge from the glottis, distension and swellings of the body and prolapses from the cloaca.
    vi. Record a body weight. This is needed to calculate fluid volumes and drug doses. A set of accurate kitchen scales that measure down to the gram are ideal as well as a set of cat scales and large weigh scales.
- Obtain a thorough history. Questions should be asked about where the animal came from, how long the current owners have had it, housing (e.g. cage mates, size, type, construction materials, heating, lighting, substrate and enclosure furniture etc.) and nutrition (e.g. how often, how much,

what fed, supplements provided etc.). Ideally owners should have health records detailing enclosure temperatures, humidity, feeding schedules, defaecation and urination records, shedding details and any other husbandry related facts.

Once the species has been identified, the physical examination has been completed and the history collected it is time to start treatment. This consists of five main areas.

- **Heat**

The single MOST important factor when treating a sick or injured reptile is the provision of heat. Critical patients often present hypothermic as a result of transport and inappropriate husbandry. Reptiles are not cold blooded. Rather they are ectotherms meaning their body temperature is reliant on the environmental temperature. They are able to control their body temperature through behavioural means rather than internal thermoregulation as occurs in mammals and birds.

All reptiles have what is referred to as an "Active Temperature Range" or "ATR". This is the temperature range where reptiles are capable of normal, voluntary activity. Below this temperature reptiles will just simply "shut down" until the temperatures are more suitable. Each species of reptile has a different ATR.

The Preferred Optimal Temperature Range/Zone or "POTZ" refers to the specific temperature range selected by a particular species of reptile when presented with a thermal gradient. Each reptile species has its own POTZ and it is only when the animal is in its POTZ that its physiology is functioning at its best. It therefore makes sense that when a reptile is ill its ability to heal and recover will be most efficient while it is within the POTZ. It is also important for the long term recovery and survival of the animal that it be maintained in its POTZ. While veterinarians treating reptiles should have some knowledge of the individual species' POTZ the reality is that in emergency situations all reptiles can be safely housed at 29.5°C to 32°C until they are stabilised and then maintained at the upper end of the their POTZ. If they are not kept at the proper ambient temperature they will not respond to medications in a predictable fashion. The POTZ for a number of the commonly kept species is shown in the table below.

Species	POTZ (°C)
Eastern Long neck Turtle	26
Children's Python	30-33
Carpet Python	29-33
Diamond Python	29
Bluetongue Lizard	28-32
Shingleback Lizard	33
Central Bearded Dragon	35-39

Be careful not to overheat the patient. Every species of animal, not just reptiles, has a "Critical Thermal Maximum" where the animal loses voluntary control and is incapable of thermoregulating. If the animal is maintained at or above this temperature it will die. The use of a continuous cloacal thermometer to monitor core body temperature can be useful to prevent hyperthermia.

Similarly be careful not to burn the patient. Hot water bottles, heat packs and heat mats are all capable of inflicting severe burns. When a sick, immobile reptile comes into contact with these sorts of heat sources the heat transfer is maximised and burns can occur.

It is not necessary to gradually warm the patient. Radiant heat is generally considered to be the best way to provide heat as it allows for a temperature gradient to be established. Severely ill patients may not be able to successfully thermoregulate and as such may be better in an enclosure with a fixed temperature until they are more stable. If practical soaking it in warm water can also be very effective.

- **Diagnostic Sampling**

Before any fluids and medications are administered samples for diagnostic testing should be taken. These may include bloods samples, aspirates of swellings, lumps and fluid accumulations and swabs for bacterial culture.

Blood collection should be performed only if the collection of the sample will not cause more stress or harm than warranted. All blood should be collected into lithium heparin tubes as EDTA may cause red cell lysis and a fresh blood smear made. Blood volumes in reptiles vary from 5% to 8% of the total body weight. As a rough guide the sample size should never be larger than 1% of the animal's total body weight. For example a 300 gram Bearded Dragon could have 3mls of blood removed from it for sampling – an amount that is far more than what is needed!

As a minimum a PCV and TP should be performed. If possible a more detailed blood panel can be run. In-house laboratory machines such as the IDEXX VetLab and REM VetScan are capable of running reptilian biochemistries and in fact they now market specific reptile/avian panels for these machines. Because of the nucleated red blood cells in reptiles most in-house analysers are useless for haematology. The external pathology laboratories such as Gribbles and IDEXX have become more familiar with reptilian clinical pathology.

In snakes blood is most commonly collected from the caudal (tail) vein via a ventral approach. Cardiac puncture can also be performed though this is preferably done under general anaesthesia.

The same caudal (tail) vein is used in lizards. Other sites include a lateral approach to the tail vein or jugular vein in larger lizards like monitors and the ventral abdominal vein.

For turtles the most common site is the right jugular vein though the subcarapacial site is sometimes used.

- **Fluid Therapy**

Fluid support is an important part of any critical case, including reptiles. When providing fluid therapy there are three components to consider. These are:

1. Route of Administration. There are various possible routes of administering fluids in reptiles. These are:
    i. Orally. If the mouth works, use it! It must be remembered that reptile patients that are not properly warmed do not efficiently absorb enteral fluids. Patients that are less than 5% dehydrated can be rehydrated with oral fluids. Passing a stomach tube or crop needle in reptiles is easy because their glottis is always closed except when breathing. Fluids should be warmed prior to administration. Soaking a reptile in warm water is a fast, inexpensive way to encourage water uptake as well as providing warmth.
    ii. Subcutaneous. This method has the advantage of causing minimal stress to the patient. It can be used intermittently for bolus administration but absorption can be very slow in

cold, debilitated reptiles. No more than 5-10mls of fluid should be injected in any one particular site.

iii. Intracoelomic. Like subcutaneous fluids these are used intermittently as a bolus and their absorption cannot be predicted in animals that are cold or have compromised vascular function. They are obviously more invasive than subcutaneous fluids. Care must be used with large volumes as they could compromise respiration so it is advisable not to use more than 20ml/kg in one dose.

iv. Intraosseous. This is the most practical route for fast and prolonged access in turtles and lizards. It usually requires a fluid pump, in particular a syringe pump, to allow administration. Care must be taken not to cause iatrogenic fractures and osteomyelitis. They can be placed using local anaesthetic in a compromised patient or using a short general anaesthetic. The most commonly used bone is the tibia. The stifle should be aseptically prepared and a small amount of lignocaine infiltrated around the injection site. A small incision in the skin is made with a blade or large gauge needle. The stifle is flexed and a 20 to 22 gauge needle of an appropriate length is inserted into the skin incision on the medial surface of the tibial plateau while visualising the shaft of the tibia. The needle should go no further than the mid-shaft region of the tibia and avoid the patella tendon. Correct placement can be confirmed on radiograph or by injecting 0.1ml of saline in and immediately aspirating back to check if bone marrow comes back. The catheter is taped and secured in position. In turtles the plastron-carapacial bridge area can also be used but it is technically challenging the place the needle correctly..

v. Intravenous. Intravenous fluid administration is the most effective method of providing fluid support to a critical reptile patient. The problem is that the only peripheral vessel visible in reptile patients is the dorsal buccal vein in snakes. Because of its location inside the mouth, medial to several dozen sharp teeth it is not a practical place for indwelling catheter placement! Intravenous catheter placement in reptiles requires a cut down technique. It goes without saying that the size of the catheter is dependent on the size of the patient and the size of the vein being catheterised. In snakes and turtles the right jugular vein is best used while in lizards the right jugular is used in small patients and in larger lizards the cephalic vein is used. With the animal sedated or anaesthetised a #11 scalpel blade or 18 gauge needle is used to cut through the skin and expose the vein. Sterile mosquito forceps may be required to blunt dissect the tissues around the vein. The catheter is then inserted and either sutured to the surrounding skin or glued in place.

vi. Intracardiac. There are reports of these being used in extreme emergency cases or when intravenous catheter placement is not feasible or possible.

2. Type of Fluid. Reptiles are slightly hypotonic when compared to birds and mammals and this has created much debate on the best type of fluids to administer to reptiles. There are all sorts of recipes for fluid replacement in reptiles but most of the standard crystalloids like lactated Ringers, Ringers and normal saline solutions can be used. Two common recipes are diluted

saline (9 parts 0.9% NaCl and 1 part sterile water) and “Reptile Ringers” (2 parts Dextrose 2.5%/Saline 0.45% with 1 part lactated Ringers). These same mixtures along with other products such as Lectade and Gatorade can be used as oral rehydrating fluids. Blood transfusions have also been performed on anaemic reptile patients.

3. Rate of Administration. The metabolic requirements of fluid balance in reptiles is poorly understood. It is generally accepted that a rate of 25mls/kg every 24 hours is appropriate as a rehydrating rate. It is estimated that up to 40ml/kg/day is the maximum safe volume for fluid administration but this should only be used if there is clinical or laboratory evidence of dehydration. For intraosseous and intravenous infusions, 1 ml/kg/hr is suggested as a routine rate. 5 to 10ml/kg daily is considered the maintenance rate for most species.

Analgesia

The assessment and control of pain in reptiles has been largely overlooked in the past. For a long time it was thought reptiles did not feel pain. This assumption is just that...an assumption and a bad one at that! Reptiles feel pain and they should be treated accordingly when necessary. Much of the dosing rates for reptiles have been extrapolated from mammals and like almost every medication given to reptiles their use is considered off-label. The commonly used analgesic agents are shown in the table below.

Drug	Dose (mg/kg)	Route	Frequency
Butorphanol	0.2-2.0	IM, SC, IV	Every 12 hours
Buprenorphine	0.02-0.2	SC, IM	Every 12 hours
Meloxicam	0.2	IM, SC, PO	Every 24 hours
Carprofen	1.0-4.0	IM, SC, PO, IV	Every 24 to 72 hours

Antimicrobial Therapy

Not every sick or injured reptile that presents to a veterinarian has a Baytril deficiency!

The majority of pathogenic microorganisms that affect reptiles are Gram negative and anaerobic bacteria and antibiotics should be selected with that in mind. These pathogens originate from within the reptile and are normally held in check by a healthy immune system. When the animal becomes immunocompromised for whatever reason (usually husbandry related) they develop these secondary bacterial infections. Patients should be rehydrated prior to starting on antibiotics and so initiating drug therapy may need to be delayed 24 to 36 hours. Commonly used antibiotics in reptiles are shown in the table below.

Drug	Dose (mg/kg)	Route	Frequency
Ceftazidime	20	IM, IV	Every 72 hours
Enrofloxacin/Difloxacin	5	SC, IM, PO	Every 48 hours
Ticarcillin	50-100	IM	Every 24 hours
Metronidazole	20	PO	Every 24 to 48 hours

It should be noted that enrofloxacin causes muscle necrosis when repeatedly given intramuscularly. For this reason it should either be avoided and difloxacin used instead or given subcutaneously.

The preferred site for a subcutaneous injection in lizards is the dorsal thoracic area, in snakes the dorsal area on either side of the spine in the cranial half of the body. Turtles can be injected in the loose skin near the shell margins of the fore or hind limbs.

For intramuscular injections the same locations as for subcutaneous injections in snakes and lizards can be used only a deeper injection into the epaxial muscles is used. In turtles the triceps muscle is the preferred place.

It is recommended that the injection site be alternated for each injection e.g. inject one day on the left side and inject on the left side the next time.

There are several other areas that need to be briefly mentioned that are specific to reptile emergencies. These are:

1. Resuscitation. The low metabolic rate of most reptiles means that there is a long period of cardiac and/or respiratory arrest from which an animal can be resuscitated and be functional. It is however quite difficult to successfully resuscitate reptiles because normally by the time they reach this point they are almost always terminally ill. In cases where resuscitation is required and attempted the following should be performed:
    i. Intubate and provide 100% oxygen via ventilation.
    ii. Begin rib compressions to aid ventilation. For turtles the legs can be moved in and out.
    iii. Doxapram can be administered every 15 minutes to stimulate respiration.
    iv. Administer fluids at 40mls/kg over one hour.
    v. If cardiac arrest occurs start cardiac compressions at a rate appropriate for the heart rate of the animal.
2. Oxygen Therapy. In mammals it is common to administer oxygen to animals in respiratory distress. In reptiles oxygen supplementation should be avoided except where resuscitation is required. The physiologic drive to breathe in reptiles is a low blood oxygen concentration. This means that if 100% oxygen is provided to a reptile it may in fact slow the respiratory rate to the point of apnoea. In addition 100% oxygen supplementation may result in cooling and drying of the mucous membranes.
3. Nutritional support. Only once the patient is warmed, rehydrated and stabilised should nutritional support be considered. Cold and sick reptiles cannot digest food and being fed can make things a lot worse. Many of the foods commonly used to “assist feed” reptiles such as Hill’s Prescription Diet A/D are high in protein and when given to a sick reptile may place undue strain on the kidneys and predispose the animal to gout. Stomach tubing or the placement of oesophageal feeding tubes may need to be considered in patients that are unwilling or unable to eat of their own accord.
4. Renal Portal System. The renal portal system is a component of the venous system of reptiles. Simplistically, some blood from the caudal body has the potential to enter the kidney directly, prior to circulating back to the heart. The blood that enters the kidneys via the renal portal system is used to ensure there is adequate perfusion of the renal tubules and does not undergo glomerular filtration. When blood flow through the glomerulus is decreased as a water-conservation mechanism the renal portal system continues to provide a blood supply to the

renal tubules , preventing ischaemic necrosis. Clinically this was thought to have implications with respect to therapeutics. Injections of drugs given in the caudal half of the body were thought to have the potential to be excreted by the kidneys before they entered the rest of the circulation. Drugs that are excreted by glomerular filtration (e.g. aminoglycosides) are likely not to have any greater toxic effects of the kidneys if injected in the caudal half of the body. Drugs with potential tubular toxic effects (e.g. quinolones, cephalosporins and penicillins) should be injected in the caudal half of the body with caution in the dehydrated patient. The fact is though that there is great variation in the degree of development of the renal portal system across reptile species and that the renal portal system is unlikely to have any significant effect on drug kinetics. It is however easiest to avoid any confusion and suggest that injections should, where possible, be given in the cranial half of the body.

References

1. Girling SJ. And Raiti P. BSAVA Manual of Reptiles – Second Edition. 2004.
2. Griswold, WG. Emergency Care of Reptiles. 2005. Proceedings of the Western States Veterinary Conference, Las Vegas, USA.
3. Hernandez-Divers S. Reptile Emergency Care. 2007. Proceedings of the Atlantic Coast Veterinary Conference, Atlantic City, USA.
4. Johnson D. Emergency, Critical and Supportive Care of Reptiles. 2004. Proceedings of the Atlantic Coast Veterinary Conference, Atlantic City, USA
5. Mader DR. Reptile ICU and Critical Care. 2004. Proceedings of the Western States Veterinary Conference, Las Vegas, USA.
6. Mader DR. Common Emergencies in Reptilian Patients. 2004. Proceedings of the Western States Veterinary Conference, Las Vegas, USA.
7. Mader DR. Reptile Medicine and Surgery – Second Edition. 2006. Saunders Elsevier.
8. McCracken H. Husbandry and Diseases of Captive Reptiles. Melbourne Zoological Gardens.
9. Vella D. Reptile Therapeutics. 2004. Proceedings of the Australian Veterinary Association Conference, Canberra, Australia.
10. Wilson H. Reptile Emergencies and Critical Care. 2002. Proceedings of the Atlantic Coast Veterinary Conference, Atlantic City, USA.