Handling and Nursing Reptiles

(What’s Normal & What’s Not)

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Introduction

The examination procedure should not begin as the client walks into the consulting room, but with the client’s first contact with the Veterinary Hospital – in most cases this will be with a telephone call. A well-trained Veterinary Nurse can give this procedure a good foundation by giving clear instructions to the client before they come. This will help make the examination more fruitful.

Client Instructions Prior to Attending

• If it is cold or windy, take the necessary steps to protect the reptile.
• Closely examine the cage floor prior to coming in. Bring in the cage floor covering or a sample of any vomitus, diarrhoea etc.
• Bring any medications etc. that have been used.
• Make sure that the reptile is accompanied by someone who knows the current history. If they are unable to attend have a telephone contact available, or provide a detailed written history.

You may find it useful to place the following list near the telephone for you or your nurse to discuss with a client seeking advice about an ill reptile. The list includes clinical signs, easily recognisable by the concerned reptile owner, which may suggest significant problems for the reptile:

General Signs

• Weight loss
• Dehydration
• Abnormal odour
• Seeking areas of higher temperature (behavioural fever)
• Changes to skin or mucous membranes
• Reduction in appetite or complete cessation of eating
• Inability to adequately swallow or manipulate food within the mouth
• Swelling around head, mouth or neck
- Vomiting/regurgitation or rejection of food
- Inactivity
- A break in reptile’s routine – abnormal behaviour
- Visible lumps or masses – anywhere on the body
- Bleeding – always should be treated as an emergency situation
- Abnormal skin shedding (dysecdysis)

**Eyes**
- Unilateral or bilateral discharges
- Changes in clarity or colour
- Closing of one or both eyes – partial (squinting) or complete
- Swelling around one or both eyes

**Nostrils/Nares**
- Unilateral or bilateral discharges
- Plugging of one or both nostrils
- Bubbles appearing at nares

**Respiratory**
- Open-mouthed breathing when at rest (very serious)
- Audible respiratory noises (Sneezing, wheezing, gasping etc.)
- Forks of tongue not separating (snakes & varanids)

**Musculoskeletal/Neurological**
- Balance problems
- Inability to coil on branches or logs
- Limping or lack of full weight-bearing on one limb
- Swollen foot/feet and or joint/joints

**Scats**
- Change in quality and/or quantity of components of scats

**Handling & Transport**
Many different containers are used to transport reptiles including bags, pillow slips, boxes and bins. It should be noted that any container used to transport a reptile should be leak proof, crush proof and secure. Special conditions apply for the transport of venomous species. Confidence, knowledge and assistance are required when handling reptiles. Depending on the order and species various precautions need to be taken.
Chelonia

- Glands either end of the bridge (between plastron and carapace) discharge a pungent fluid.
- Side-necked turtles – All except one Australian freshwater species are side-necked. The necks are usually difficult to straighten and examine.
- Restrain by holding the caudal or lateral edge of the carapace. Avoid the mouth in *Emydura spp* (short-necked).

Lizards

- Tails may drop off when handling some lizards (small skinks and geckoes).
- Some may bite, e.g. Blue-tongued lizards, bearded dragons and eastern water dragons.
- Some may bite, scratch and flick their tail, e.g. varanids (monitors).

Snakes

- Pythons of all sizes may bite and constrict
- Venomous snakes must be accurately identified before the physical examination and only handled if the handler is experienced and known by the veterinarian to be competent. There is no need for any veterinarian to “head” or catch a venomous snake. Never put your hand in a “snake bag” without knowing EXACTLY what is in it!

1. History

The time spent collecting the history should allow the reptile to settle down from the excitement of transport. Use this time to perform a distant examination of the patient to look for subtle signs of disease.

The basic questions that should be asked are:

- **If the reptile was acquired recently, from what source?** Wild caught or captive bred? Reptiles that have recently been through a transfer may have been stressed or exposed to a host of infectious agents and environmental conditions. Some sources are know by reputation to be either good or bad.

- **What is the animal’s age?** Often this is unknown. If it was hatched recently ha it undergone its first slough (ecdysis).

- **How long has the reptile been in its present environment?** Is the animal settling in to a new environment or is it well established. New arrivals are more likely to suffer from stress and acute problems such as infectious diseases. Established animals are more likely to suffer from husbandry problems, dietary problems or chronic diseases such as neoplasia or parasites.

- **Any recent changes to the environment?** This may indicate sources of stress or toxins.

- **The size and type of cage?** Pay particular attention to the nature of the floor surface or substrate. What are the climbing and hiding facilities provided? Is the reptile normally kept in an indoor enclosure or an outdoors aviary? If it is in an aviary ask for a description noting the size, floor type, design, aspect it faces and any preventative medicine program currently in use?

- **The frequency of cage cleaning and the cleaning methods used?** This is a means of determining the client’s approach to hygiene and some potential sources of toxins.

- **The range of temperature and humidity in the cage?** Is there a temperature gradient in the cage? Is there a basking spot and what is the temperature where the reptile is able to bask?
- **Water supply?** Determine the source and quality of the water and the type of water container used. How often is the water changed? Are there bathing facilities? What is the size and how often it is used?

- **Light sources?** Type of light provided (incandescent, fluorescent). What is the availability of ultraviolet light or exposure to direct sunlight? What is the normal photoperiod provided? Many reptiles housed indoors are subject to internal lighting as people are in the room. This can result in them being exposed to very long light intervals – much longer than the natural interval.

- **Describe any cage mates?** Pay attention to size, gender, species and any interactions. What is their health status? Any new introductions to or departures from the enclosure – when was the most recent? Any other reptiles acquired recently in the collection? Also question about quarantine procedure used.

- **What are the characteristics of the diet?** Nutritional disease is extremely common. Many reptiles are suffering from malnutrition (especially obesity).
  - Type of food items provided
  - Quantity offered
  - Frequency of feeding
  - Method of presentation
  - Any supplements provided
  - When was the last meal

- **Describe the recent scats (faeces/urates/urine) passed?** What was its relation to feeding (normally should be passed within 4-5 days of a feed)?

- **Describe the most recent skin shedding (ecdysis)?** When did it occur? Was it normal?

- **Describe normal handling?** How often is it done? Describe the techniques used? Is the reptile a pet that is handled regularly?

- **Have there been any changes to the reptile’s behaviour?** Behavioural changes are often the first subtle signs that are noticeable. These are often overlooked. Has the reptile been less active or sitting in an unexpected position? Does the reptile respond differently to the owner’s presence or approach? Are there periods of excessive inactivity or hiding?

- **What are the current signs of disease that are causing concern & how long have they been evident?** Describe these signs of this patient or of any other reptiles on the premises.

- **What treatments or medications have been used?** What was the response to these? Check the dose, frequency etc. Always ask the client to describe how the drug was used to rule out any errors in administration.

### 2. Examination of Environment

Often this is not available as the animals come in a cloth bag or small travel cage. Much of the information regarding the environment will be gathered during the history taking or a visit to their home.

While the history is being gathered you can also quickly visually assess the animal, its current environment or any scats that have been passed, to glean any further information that may be available. Take note of such details as cleanliness of the water dish or transport enclosure. Use this observation to make an assessment of the general level of hygiene and sanitation.
3. Distant Examination

Spend a little time assessing the reptile’s demeanour (alert and responsive). Is it normally active? Are there any obvious physical abnormalities? Assess respiratory rate and depth. Make a subjective assessment of the reptile’s weight by assessing the level of fat deposition at the base of the tail or at the latero-dorsal body wall.

Make an assessment of general appearance and behaviour.

- **Chelonians**: Bright, alert and responsive. Swim evenly balanced in the water. When first caught, they pull their head and limbs beneath the carapace and strongly hold them in when you try to remove them. When walking, they support all the weight on their legs. The plastron bears no weight and does not touch the ground.

- **Lizards**: They stand high and strongly on all four limbs. The body and limb muscles are well rounded and firm. There is no excessive folding or creasing of the skin. They run away quickly when you attempt to catch them.

- **Snakes**: The body is flat on the substrate with the weight borne by the ventral scales. They respond to you approaching them by moving their head and flicking their tongue. If they feel threatened they will form a coil. If not they will begin to explore the surroundings.

- **Crocodilians**: They have a very sedentary life, rarely moving unless threatened or at feeding time. Resent handling and restraint. Will thrash their head and neck, trying to bite, while lashing their tail in your direction.

4. Physical Examination

Collect all the equipment you will require before moving onto the physical examination. This allows you to be as efficient as possible with your examination and causes less stress for the reptile.

The reptile should be given a complete physical examination. I prefer to start at the head and move distally. You should develop your approach to the examination as a habit and carry out the examination the same way each time so that nothing is overlooked. Pay particular emphasis to any suggestive signs detected during the history and distant examination, so that they may be explored in more detail.

- Begin by examining the head, eyes, ears and nares (pay particular attention to the nares as dried discharge may occlude on or both- this is the equivalent of a “runny” nose). The head should be symmetrical.

- Examine the skin creases around the eyes ventral neck and labial pits as this is often a location to detect mites. Avoid handling snakes and lizards if the animal is in ecdysis.

- Assess the hydration status. Signs of dehydration are: decreased turgor – skin tents when pulled from the animal; skin is standing in multiple folds; abnormal ecdysis; in snakes and some lizards, spectacle is shrunken and opaque; sunken eyes in lizards, chelonians and crocodilians.

- Open the mouth and examine the tongue, teeth, gums, other oral structures and pharynx – note any sour or abnormal odours. Is there excessive mucous or are cheesy plaques or petechiae present? Examine the gum margins carefully for any sign of necrosis or ulceration.

- Carefully palpate the entire body, beginning at the neck and working down the body. Gently palpate the ventral coelomic cavity between the ribs. Feel for organs and any firm masses or fluid accumulation. Take care if the animal has been fed recently that you do not place pressure on the ingesta as it is passing through the intestine. An animal that has eaten recently may regurgitate if the stress of handling is too great.
• Locate the cardiac impulse and auscultate the heart and surrounding lungs. Auscultate the chest (dorsal and ventral) and the abdomen. Heart rate is extremely variable and may be difficult to count. The sounds of inspiration are louder and shorter in duration than expiration. Abnormal respiratory wheezes or whistling are signs of severe pathology. Most unrestrained reptiles will have 1-2 respirations per minute. Healthy animals breathe with the mouth closed. Rate and depth of respiration will vary with the ambient temperature.

• The body wall muscle mass should have firm muscle tone. The lower coelomic cavity contents are often easily palpable. If the abdomen is enlarged palpation must be extremely gentle. The reptile should not demonstrate pain with normal, gentle abdominal palpation.

• Examine the cloaca and vent for swellings, encrustations or soiling (indicative of loose droppings). If the tail is gently flexed dorsally, the vent will open slightly and allow inspection of the cloacal mucosa or insertion of a swab or sexing probe.

• Most reptiles will pass faeces that is formed. Urates are often passed at the same time. Normally they precede the stool. Urates are normally chalky paste that is pure white to yellow in colour. Terrestrial reptiles will also pass a small amount of clear liquid urine.

• Biliverdinuria (green discoloration of the urates) is abnormal and is usually associated with liver disease, anorexia or haemolytic anaemia. The reptiles have biliverdin rather than bilirubin.

• Any abnormal faeces should be examined, by performing a faecal flotation and fresh warm, saline smear.

• Examine the skin. Look for any missing scales or scars. Assess any lumps or swellings present.

• Pull out each limb individually. Palpate the bones from shoulder or hip to distal end of each digit, paying particular attention to the joints. Examine each joint for full range of motion or any swelling. A weak limb may be indicative of abdominal tumours, fractures or neurological disease. Unilateral lameness is more common than bilateral. Assess the length of the claws. Overgrown claws may be associated with poor substrate. Inspect the plantar aspect of each foot.

• This whole procedure should take less time to perform than it takes to read.

Once the examination is finished immediately place the reptile back into its cage and assess its tolerance of the procedure. Most reptiles will return to normal behaviour. If the reptile looks obviously stressed or is breathing heavily, it is safe to assume it is ill.

**Hints for Specific Reptile Groups**

The technique for physical examination of reptiles is similar in principle to that used for most other pets. Animals must be adequately restrained but not distressed. Like most other animals, reptiles resent oral examination.

**CHELONIA**

• Chelonia are generally easy to handle. A healthy turtle can be surprisingly mobile. Demeanour varies from species to species. Of the commonly occurring species the common eastern long-necked turtle is quite docile. Short-necked turtles (*Emydura spp*) are usually more mobile and liable to bite.

• Turtles should be weighed and measured (straight carapace length [SCL]). A data base can be developed and used to gauge body condition.

• Carapace and plastron injuries and lesions are common. A central groove in the carapace deepens with age.
Skin lesions may be an indication of more serious disease.

Oral examination may be revealing in an otherwise healthy animal. Look for crusts, ulceration and rostral abrasion. Abscesses occur frequently, especially around the eyes and ears.

Oedema of the neck and limbs with accompanying petechial haemorrhages may indicate septicaemia.

**SQUAMATA**

i. **Lizards**

The attitude of lizards varies greatly with species, age and state of health. The larger skinks such as blue-tongued lizards (*Tiliqua helomian*) and shingle backs (*Tiliqua rugosa rugosa*) are usually placid and used to handling. Bearded dragons, except for the eastern species (*Pogona barbata*) are also quite docile. Eastern water dragons (*Physignathus leseurii*) are flighty and can be aggressive as adults. Young lizards of this species may be “hypnotised” by lying them on their backs and gently stroking their abdomens. This is similar to the condition of “tonic immobility” reported in many animals, e.g. chickens.

Skin tenting, as in mammals, may indicate dehydration.

Dysecydysis (difficulty with sloughing) can cause constriction or strangulation of digits and the tail tip in some species.

Mites occur frequently, especially in blue-tongued lizards.

Abnormalities in muscle tone and posture, fitting and muscle fasciculation may indicate metabolic bone disease (MBD). Lizards may also exhibit hindlimb and tail paresis. Eastern water dragons are more commonly affected and sometimes present as a “neurological” problem. A rubbery mandible occurs in the more chronic form of MBD.

Examination of the mouth is difficult in many lizard species. Guitar plectra are useful for prying open mouths in skinks and agamids. Nematode infestation of the pharynx occurs commonly in bearded dragons. Stomatitis presents as swollen and malodorous gingivae.

Abdominal swelling may occur for a variety of reasons; a full stomach, eggs, tumours and foreign bodies. Agamids, especially smaller ones, may gorge themselves on invertebrates and consequently have a very swollen stomach. Tumours are not common. Eggs may be palpated in the agamidae and easily differentiated from other swellings. Monitor lizards are scavengers and may ingest bone scraps that lead to intestinal or gastric obstruction.

ii. **Snakes**

Restraining the head of a python will usually cause it to struggle, whereas if it is handled gently by supporting the body only it will tend to relax. Snakes will excrete voluminous faeces and urates if distressed. Australian pythons, except for the scrub python (*Morelia amethistina*) and water python (*Liasis fuscus*), are usually easy to handle. Venomous snakes should be expertly restrained for the physical examination. It is recommended that only experienced reptile veterinarians examine and treat venomous species.

Initially the snake should be weighed and its movements closely observed, watching for any unusual coiling, twisting motions or weakness of the distal body and decreased constriction. Flaccidity or any neurological sign in a python, especially *Morelia spp* may indicate Inclusion Body Disease (IBD).
Snakes with respiratory disease may “mouth breathe”. Gentle and patient palpation is then required for a closer examination. Inspection of the head and mouth should be left as a final procedure as the snake will frequently become distressed when its mouth is opened.

The snake is a conveniently linear animal and charts have been made to facilitate organ location\(^2\). The heartbeat (approximately 25% of the snout/vent length [SVL]) can be palpated in debilitated or anaesthetised pythons. It is difficult to feel in a healthy, well muscled snake. Auscultation using a stethoscope is unrewarding.

The skin will vary in texture and smoothness depending on the state of hydration, ecdysis and external parasitism. Unlike lizards and turtles, healthy snakes shed their skin in one piece. Dysecdysis may be associated with external parasitism or inappropriate humidity.

**Common Problems revealed at Physical Examination**

i. **Lumps in snakes**

Lumps occur frequently in snakes for many reasons. Abscesses occur in most parts of the body. Swelling 25% along the snout/vent length in *Morelia spp*. May indicate cardiac enlargement. The author has also seen a case of a fatty tumour in the precordial fat pad causing a similar swelling. Granulomata caused by ascarid infestation are common in the stomach and proximal small intestine. They have a higher incidence in wild caught snakes and those fed live or “wild” prey items. Hypertrophic gastritis due to cryptosporidiosis is mainly seen in elapids and presents as a mid-body swelling. Sparganosis is common in wild caught snakes especially elapids and colubrids (frog eaters). Lesions usually appear as small raised lumps in the subcutis. They occur more commonly in the distal body. Tumours occur but are not common. Prey items and eggs can be detected by patient palpation and good history taking.

ii. **Cloacal region**

Cloacal infection may occur after mating. The cloaca is usually swollen, inflamed and covered in a crusty discharge. Abscessation of the hemipene sulcus and associated gland may be noted.

iii. **Mouth**

Oral examination is carried out by holding the head in the right hand (for those who are left handed) and gently pulling down on the ventral skin using the thumb and middle finger to expose the gingivae. A probe may be introduced by the left hand and used to lever the mouth open in order to inspect the glottis and pharynx. Cotton buds should not be used as they catch on the small, delicate teeth.

Stomatitis may be graded as follows:

1. early – petechiation of the gingivae and ptyalism
2. mild – swollen and malodorous gingivae, occasional pockets of pus
3. severe – abscessation and exposure of underlying bone

Check for purulent or cheesy material on the glottis. This may indicate respiratory disease.

iv. **Head and eyes**

- Inspection of the head and eyes may reveal the presence of mites. They often hide in the periorbital region and the heat sensing pits of pythons. Normally the conjunctivae are not visible. Hypertrophy of the conjunctival tissue is usually a sign of *Ophionyssus natricis* infestation.
• Retained spectacle (post ecdysis) and subspectacular abscess occur commonly.

v. Ecdysis

All reptiles have a periodic sloughing of the superficial, keratinised epithelium. This is termed “ecdysis” and an abnormal slough is called “dysecdysis”.

1. Crocodilians: These slough small, pieces continually. As the old scales are worn away, they are replaced.

2. Snakes: These usually slough the skin in one piece, including the spectacles covering each eye. The skin takes on a dull sheen 1-2 weeks prior to ecdysis. The spectacles become a milky blue colour (similar to that seen with keratitis in a mammal) and the snake has poor vision. Many become more flighty or aggressive because of their vision deficit. Most snakes will reuse food at this time. After 4-7 days, the spectacles clear and the slough begins 4-7 days later. The slough begins with the snake rubbing its nose and chin on a rough surface. This dislodges the skin from around the mouth and lips. The snake then crawls out of its sloughed skin, turning it inside out. Snakes that lack a rough surface in their enclosure may have difficulty shedding and will become quite distressed. Dysecdysis is characterised by the skin coming off in pieces and shredding or single scales being shed.

3. Lizards: These have periodic sheds of large sections of the skin in pieces over several days. They also require a rough surface (log or rock) to rub against to assist in dislodging the skin pieces.

4. Chelonians: The skin covering the head, neck and limbs is shed in a similar fashion to lizards. The upper epithelium of the scutes of the shell are shed 1-2 at a time and then replaced.

Frequency of ecdysis varies with food availability, species, age, growth rate and ambient temperature in its environment. When the reptiles are eating regularly (Spring, Summer and early Autumn) they grow more quickly and will slough more often – as frequently as once a month.

The skin after a slough, has a shiny, lustrous appearance. This becomes duller as it shows signs of wear and tear.

5. Body Weight

This is an extremely useful tool in health assessment. The reptile should be placed upon a set of scales (either triple beam balance or small electronic scales) and an accurate measurement taken. I find it useful to place them in a cloth bag during this procedure. This minimises struggling and panic. Objective weight measurement can be used as a regular monitor to assess the reptile and should be recorded on the reptile’s file or card. As an in-hospital tool, objective measurement is an excellent prognostic indicator for a reptile receiving treatment. Weight loss is always a sign of a poor prognosis.

As well it is useful to make a subjective assessment of the reptile’s general condition after palpating the body wall muscles. With time and experience this can be used to determine the optimum weight for an individual reptile. This is a useful skill for clients to develop as a general health assessment tool.

6. Snout: Cloaca Measurement (Body Length)

A measuring tape should be placed along the ventral aspect of the snake. Determine the distance from the snout to the cloaca. Also determine to distance to any abnormal structures or masses. This is a useful means of locating normal structures and identifying any abnormal masses or structures you may encounter.
Diagnostic Approach to Abnormal Internal masses in Snakes

- Snakes often develop anorexia. On physical examination you may discover an internal mass. This may be difficult to identify as you are uncertain if it is normal or abnormal.
- Common causes: tumours; intestinal impaction; retained eggs or foeti; abscesses or granulomas.
- Snakes organs are elongated and overlap each other as they are distributed along the coelomic cavity.
- The position of most organs is constant within each species as a proportion of the total body length. It is quite variable between species. McCracken\textsuperscript{1,2} studied several species of snakes to make a table to allow more accurate determination of normal organ positioning. This is a useful method of determining the source or organ involved in a problem.
- The initial aim is to determine if the mass in intra or extra-intestinal.

**History\textsuperscript{1}**

- How long has the mass been present?
- Any changes in the size of the mass since detected? Impactions should not increase.
- Any other health problems been detected recently?
- Date of last meal and defaecation? Faeces should pass within 1 week of feeding.
- What is the ambient temperature and water availability in its enclosure? Inadequate ambient temperature, humidity and drinking water, following feeding may cause constipation.
- Physical Examination: Are there any other problems present? Is there excess fluid or gas in the GIT.
- Measurement: determine snout-vent length and compare it to snout-mass length (measure to anterior aspect of the mass). Determine the ratio of snout-mass:snout-vent. Compare this to the table developed.
- Palpation: Assess hardness, texture, discreteness and ability to move. If it will advance caudally, it is likely to be in the GIT or oviduct.
- Radiology: Plain radiographs followed by Contrast studies if indicated.
- Initially the mass should be treated as obstipation unless proven otherwise. Deliver paraffin oil via a stomach tube or per rectum depending on the location of the mass. Allow the snake to have a soak in warm water for several hours. Try gentle heloni to move the mass caudally.
- If there is no movement within 3 days, perform double contrast radiography. Use 5ml/kg barium Sulphate and 45ml/kg air via a stomach tube. If the mass is demonstrated in the GIT but does not move after 2-3 days more conservative therapy, perform an exploratory coeliotomy.
- If the mass is demonstrated to be outside the GIT, try the following steps:
  - Fine needle aspirate
  - Check for cryptosporidiosis
  - Perform Blood tests to assess the renal system (particularly Uric Acid)
  - Endoscopy, via the oesophagus if mass is anterior to the pylorus.
- Perform an exploratory coeliotomy.

**As a general Rough guide:**

| Cranial Third: Oesophagus, Heart, Trachea |
| Middle Third: Lungs, Liver, Stomach, Cranial Air Sac. |
| Caudal Third: Pylorus, Duodenum, Intestines, Kidneys, Gonads, Body fat, Cloaca |

<table>
<thead>
<tr>
<th>Organ</th>
<th>Position (expressed as % of total length snout-vent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart</td>
<td>22 – 33</td>
</tr>
<tr>
<td>Lungs</td>
<td>33 – 45</td>
</tr>
<tr>
<td>Air Sac</td>
<td>45 – 65</td>
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<tr>
<td>Liver</td>
<td>38 – 56</td>
</tr>
<tr>
<td>Stomach</td>
<td>46 – 67</td>
</tr>
<tr>
<td>Intestines</td>
<td>68 – 81</td>
</tr>
<tr>
<td>Right Kidney</td>
<td>69 – 77</td>
</tr>
<tr>
<td>Left kidney</td>
<td>74 – 82</td>
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<tr>
<td>Colon &amp; Cloaca</td>
<td>81 – 100</td>
</tr>
</tbody>
</table>

7. Determination of Gender

**CHELONIA**

Gender may be determined in most Australian side-necked turtles by physical examination. The tail is longer in males compared with females. The plastron in males is concave caudally. Females have a uniformly flat plastron. The caudal notch of the plastron is more v-shaped in the male. Male helonians have a single penis.

**SQUAMATA**

**Lizards**

Blue-tongued lizards are difficult to sex. Exteriorisation of the hemipenes is possible by an experienced operator. Male bearded dragons have two hemipene bulges either side of the ventral tail base just caudal to the cloaca. Females have a midline swelling. Male water dragons and other larger agamids have prominent femoral pores on the medial femoral skin, similar to iguanas. Radiography of mature male varanids (monitors) detects small ossifications of both hemipenes. Absence of this feature may indicate a female or immature male.

**Snakes**

Tail shape and the prominence of spurs (vestigial hindlimbs) are sometimes used to determine the sex of snakes. Probing of the hemipene sulci just caudal to the cloaca is a more accurate method. A variety of probes, ranging from commercially available products to nasolacrimal catheters (metal) and crop needles are useful. Snakes should only be probed for diagnostic, commercial or breeding reasons. The procedure may be traumatic and inaccurate in young animals.
Probing Method

Two handlers are required for larger snakes. One person holds the front end and the other person holds the distal end “belly up” with one hand about 10 cms cranial to the cloaca. Gently introduce the sterilised (alcohol will do) and lubricated probe into one of the hemipene sulci which run down either side of the tail. Males – probe – 10-12 subcaudal scales. Females – probe – 4 subcaudal scales. These lengths are only estimates. Probing depths may vary for different species eg *Morelia amethistina*, the female has deep pockets, 6-8 scales.

8. Basic Diagnostic Procedures

The focus for this section is on procedures rather than different diagnostic tests and laboratory analysis (i.e. histopathology, haematology, biochemistry).

8.1 Blood collection (and intravenous injection sites)

Chelonia

In most side-necked turtles the left jugular vein is used. The subcarapacial method\(^7\) has also been described but is not used commonly.

Squamata

The ventral caudal tail vein is used for bleeding and intravenous injection in most lizards (skinks, dragons, monitors). This route is also commonly used in snakes. Blood collection by cardiac puncture and the palatine veins (large pythons) has also been described,\(^8,9\) but is not recommended by the author in conscious animals. The heart is often difficult to locate in snakes. In most cases a one millilitre tuberculin syringe and 25 gauge needle are adequate for venipuncture. A three millilitre syringe and 23 gauge needle may be used in pythons larger than 3 kg and large monitors.

8.2 Cloacal wash

A small amount of warm saline may be introduced into the cloaca to obtain a diagnostic sample. Protozoa and the ova of other endoparasites may be detected by direct faecal analysis.

8.3 Tracheal wash

A transtracheal aspirate is useful for microbiological and cytological analysis in cases of respiratory disease. The glottis in turtles, snakes and monitors is conveniently situated in the rostral part of the mouth. The technique is identical to that used in small mammal medicine.

8.4 Radiology

Radiology is a useful diagnostic aid. For example, it is essential for gender determination in varanidae, assessing gravid turtles and MBD in lizards. The latter may be graded over the course of treatment using a step wedge device (PT-11 Penetrometer [Esco-Speedmaster, Oklahoma]). Fractures of the carapace, plastron and limbs in chelonia and limb fractures in lizards are also routinely radiographed. Fine detail mammography film is useful in small reptiles.

8.5 Other

Ultrasound, computerised tomography and MRI are used in the USA, UK and Europe as diagnostic tools to varying degrees. Their usefulness appears limited in everyday reptile practice.
8.6 Endoscopy

Endoscopy is commonly used in reptile practice in the USA and UK, especially in iguanas and increasingly in chelonia. Previously endoscopy was used mainly as a diagnostic tool to examine and biopsy internal organs but recently it has been used for local, targeted medical therapy and minimally invasive surgical procedures. In Australia where snakes are more popular, there appears to be less demand for endoscopy. Palpation, transcutaneous biopsy and coeliotomy are more commonly used for diagnostic purposes.

Summary

Physical examination and diagnosis in reptiles can be challenging, physically and intellectually. First principles from mammalian veterinary practice are easily adapted to the class Reptilia. Extensive knowledge of the normal animal is essential in order to recognise the abnormal.

References


Shea G, Senior lecturer in Veterinary Anatomy, University of Sydney, personal communication.


1. Introduction

The most common cause of disease in captive reptiles is incorrect or poor husbandry. A sound knowledge of reptile husbandry is required by the veterinarian in order to diagnose and treat diseases appropriately. Environmental and dietary needs must be considered carefully. Specific requirements of some species of reptiles will be mentioned. The emphasis in this lecture will be on husbandry and not therapeutics.

2. Husbandry

The eight H’s of husbandry:

- Heat
- Hide
- Humidity
- Health
- Hygiene
- Healthy appetite
- Habitat
- Handling

2.1 Heat (and light)

2.1.1 Heat

Reptiles are ectothermic vertebrates that regulate body temperature by behavioural and physiological processes. Reptiles should be housed at temperatures similar to field conditions, providing temperature variation within the enclosure that allows the animal to choose its thermal environment (thermoregulate).

A thermogradient or “mosaic” is achieved by having sufficient room to place heat sources strategically within the enclosure. Two main types of heating are used by herpetologists, radiant (lamps, ceramic globes) and convective (heat mats, tape).
“Hot rocks” are not recommended as heat sources. Snakes will tend to bask on them for extended periods occasionally sustaining burns. This occurs more often in snakes that have recently undergone ecdysis (sloughing). It has been shown that large reptiles rely primarily on radiant heat sources for thermoregulation whereas smaller species tend to depend on convective sources. Terrestrial or ground dwelling snakes such as Childrens pythons (*Antaresia childreni*) prefer subfloor heating. Ambient room temperature should be stable and not place undue stress on the thermogradient in the vivarium. Mistakes are commonly made when enclosures are kept in rooms subject to temperature extremes.

### 2.1.2 Preferred Body Temperature (PBT)

The preferred body temperature is the temperature at which metabolism is optimal. The preferred optimal temperature zone (POTZ) is the range that allows the reptile to achieve its PBT. Preferred body temperature (PBT) varies with species. See Table 1 for the PBTs of commonly kept Australian species.

#### Table 1. Preferred Body Temperature of Common Reptile Species

<table>
<thead>
<tr>
<th>Species</th>
<th>PBT °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Longneck Turtle</td>
<td>26</td>
</tr>
<tr>
<td>Saltwater Crocodile</td>
<td>33</td>
</tr>
<tr>
<td>Children’s Python</td>
<td>30-33</td>
</tr>
<tr>
<td>Water Python</td>
<td>34</td>
</tr>
<tr>
<td>Carpet/Diamond Python</td>
<td>29-33</td>
</tr>
<tr>
<td>Amethystine Python</td>
<td>33</td>
</tr>
<tr>
<td>Green Tree Python</td>
<td>32</td>
</tr>
<tr>
<td>Eastern Bluetongue Lizard</td>
<td>28-32</td>
</tr>
<tr>
<td>Shingleback Lizard</td>
<td>33</td>
</tr>
<tr>
<td>Cunningham Skink</td>
<td>33</td>
</tr>
<tr>
<td>Bearded Dragon</td>
<td>35-39</td>
</tr>
<tr>
<td>Lace Monitor</td>
<td>35</td>
</tr>
<tr>
<td>Gould’s Monitor</td>
<td>37</td>
</tr>
</tbody>
</table>

### 2.1.3 Thermostats

Some reptile owners do not recognise the difference between a thermostat and a thermometer. It is important that they realise that the readings on most thermostats are only a guide. Thermostats must be calibrated for individual enclosures using a thermometer.

### 2.1.4 Ultraviolet light

Ultraviolet light is essential for the synthesis of vitamin D₃ and calcium metabolism. Among the commonly kept Australian species, eastern water dragons and bearded dragons need ultraviolet supplementation when kept indoors (UVB 280-315 nm). Ultraviolet light sources need to be
replaced according to manufacturer’s instructions. There is some discussion as to whether the diamond python (*Morelia spilota spilota*) requires UVB supplementation in captivity.

2.2 Hide

All captive reptiles need somewhere to hide. Items such as toilet rolls or small cardboard boxes are ideal for hatchling snakes and the smaller terrestrial varieties. When soiled, simply replace them. Porcelain hides and inverted flower pots are also popular. These structures must be waterproof and easy to disinfect. Certain species are more secretive compared with others e.g. *Antaresia spp* (Childrens pythons).

Large vivaria should be furnished with several hides in a variety of positions in order to facilitate thermoregulation. Hides can be used as an aid to handling. This is especially relevant to more aggressive or venomous species. The entrance to a favourite shelter may be blocked securely and then used to transport the reptile.

2.3 Humidity

Humidity requirements vary with species (40-80%). For example, the environment of a green python (*Morelia viridis*) needs to be much more humid than that of the inland bearded dragon (*Pogona vitticeps*). All snakes need a large water bowl for bathing and drinking. The humidity of a vivarium can be controlled by altering the size of the surface are of the water bowl (a larger bowl or tip the bowl on its size to change the surface area exposed. Always place it at the cooler end of the exhibit, except in cases where a rapid increase in humidity is required. In these cases a heat lamp or mat may be placed under the water container to aid evaporation. All vivaria, dry and humid, should be adequately ventilated.

**Table 2. Preferred Humidity of Common Reptile Species**

<table>
<thead>
<tr>
<th>Species</th>
<th>Preferred Humidity %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shingleback Lizard</strong></td>
<td>As low as possible</td>
</tr>
<tr>
<td><strong>Bearded Dragon</strong></td>
<td>30-40</td>
</tr>
<tr>
<td><strong>Eastern Bluetongue Lizard</strong></td>
<td>30-40</td>
</tr>
<tr>
<td><strong>Carpet/Diamond Python</strong></td>
<td>30-40 (Coastal)</td>
</tr>
<tr>
<td><strong>Children’s Python</strong></td>
<td>40-75 (moderate)</td>
</tr>
<tr>
<td><strong>Amethystine Python</strong></td>
<td>60-80</td>
</tr>
<tr>
<td><strong>Shortneck Turtles</strong></td>
<td>60-80 (pond present)</td>
</tr>
<tr>
<td><strong>Water Python</strong></td>
<td>60-80 (pond present)</td>
</tr>
<tr>
<td><strong>Eastern Water Dragon</strong></td>
<td>60-80 (pond present)</td>
</tr>
<tr>
<td><strong>Common Longneck Turtle</strong></td>
<td>60-80 (pond present)</td>
</tr>
<tr>
<td><strong>Green Tree Python</strong></td>
<td>55-100 (pond present)</td>
</tr>
</tbody>
</table>

2.4 Health

The health of the captive reptile is inextricably linked to the husbandry practices employed. So this is the most important area to explore when trying to determine why a reptile is ill. You need
to discuss all aspects of the reptile’s husbandry to assist in preventing the ill-health from recurring. Client’s may find this unnecessary as they feel they are providing “best care” for their pet, but your role is to explain the importance of this information.

2.5 Hygiene

Good hygiene is dependent upon the use of an appropriate substrate and good disinfection and cleaning practices.

2.5.1 Substrate

Substrates vary according to the special needs of a species. Newspaper or butchers paper is suitable for arboreal species such as diamond and carpet pythons. Terrestrial species such as Childrens pythons and blue-tongued lizards do best on pelleted newspaper “kitty litter” products. Hatchling and small pythons should not be fed in containers with pelleted newspaper substrate. Pellets may be inadvertently swallowed, causing intestinal obstruction. The feeding area should be a separate container lined with paper. Bearded dragons thrive on fine sand. Gravid females need a suitable substrate for digging and oviposition. Artificial turf, bark chips and dirt are unsuitable and provide good media for bacterial and fungal growth.

2.5.2 Water quality

The commonest cause of disease in captive turtles is poor water quality. Water should be tested daily using a standard aquarium kit, measuring pH, ammonia levels, nitrites and nitrates. Minor skin ailments will heal if the turtle is removed from the water for a short period. It is preferable to feed turtles in a separate tank. This will avoid contamination of the water with food particles.

2.6 Healthy appetite

Dietary needs vary greatly in Australian herpetofauna, depending on species, size and state of maturity. Blue-tongued lizards start off life as insectivores and molluscivores and gradually become more omnivorous in their feeding habits. Bearded dragons similarly begin as insectivores and as they mature develop a taste for vegetables and some fruits. All Australian snakes are carnivorous. Python hatchlings will eat small pinkie mice. As they grow food items should be larger (pinkie-fuzzy-weaner mice-adult mice-rats) and feeding intervals further apart. Hatchlings are generally fed every 4-5 days, while an adult python may be fed every 1-2 weeks. Small lizards need to eat daily or at least every second day. Adult lizards are usually fed every 2-3 days.

Turtles will normally only eat in water. Some may be trained to accept food out of water. Usually reptiles are fed no more than 20% of their body weight at a time. All mammalian prey items must be prefrozen (preferably 4 weeks at least) for animal welfare reasons and to limit parasitism. Never feed snakes together in the same vivarium. Assisted feeding may be necessary at times. Smaller snakes can be fed pinkies with gentle pressure, patience and lubrication. Larger snakes may be tube fed with canine or feline invalid diets such as Hills a/d. Long crop needles or a variety of sizes of stomach tubes are used. Turtles are more difficult to “assist feed” due to the length of their necks and a tendency to regurgitate. Lizards may be fed food items by hand if necessary. Guitar plectra are useful for opening the mouths of turtles and some lizards.

2.7 Habitat - Huge or small?

Novice reptile keepers frequently make the mistake of transferring a hatchling or small snake to a large vivarium (often one that a proud and “serpent- deprived as a youngster” Dad has built). Snakes should always be housed so that they can stretch to their full body length but very large enclosures may make it difficult for a small reptile to thermoregulate. Recommended vivarium
sizes\textsuperscript{4,5} are included in Table 2. Small plastic pet containers are sufficient for hatchling pythons. Subfloor heating is usually provided by heatmats or tape. According to some authors the size of the cage may not be as important as how it is furnished.\textsuperscript{7}

2.8 Handling

Reptiles, especially snakes and small lizards should not be overhandled. Snakes should not be handled for at least 3 days after eating due to the risk of regurgitation. Hands should be washed before touching reptiles to limit the spread of disease and to be rid of any mammalian scent. A snake will strike instinctively if it can smell mammals. Frequently reptiles are brought to the clinic draped around the arm of their owner and not in a container. This can be stressful for the snake and non reptile owning clients in the waiting room. Such a practice is to be actively discouraged.

3. Common conditions associated with poor husbandry

3.1 Anorexia

Anorexia is a sign and not a disease. Reasons for anorexia may be physiological or medical.\textsuperscript{8} It is imperative that a thorough history is taken paying particular attention to diet and heating of the vivarium. Physical examination and further diagnostics will help to differentiate between a primary environmental problem and a medical one.

3.2 Stomatitis

Stomatitis is probably the most commonly seen condition in captive pythons. The snakes are usually inappetant. In early stages it can present as petechiation and ptyalism. More severe forms of the disease involve gingival swelling, abscession and exposure of underlying bone. Reptiles will not eat when affected. All orders are affected. Aetiology is poor or inappropriate husbandry, especially suboptimal vivarium temperatures, or in the case of chelonia, poor water quality. Severe cases in snakes will need surgical debridement as well as antibiotic therapy.

3.3 Mites

The snake mite, \textit{Ophionyssus natricis}, has a very short life-cycle. Snakes infested with mites may exhibit dysec dysis (difficulty sloughing skin) and spend long periods soaking in their water bowls. Mite infestation is directly related to poor hygiene and quarantine practices.

3.4 Internal parasitism

Ascarid infestation (\textit{Ophidascaris moreliae}, \textit{Polydelphis anoura}) is common in pythons, especially those sourced from the wild or fed live prey items of dubious provenance. Cestodes, \textit{Strongyloides spp}. Pentastomids, oxyurids, \textit{Capillaria spp.} and \textit{Rhabdias spp.} also occur. Bearded dragons are frequently affected by ascarid infestation. Worms may be seen in the pharynx of affected lizards. Symptoms of endoparasitism vary according to the organ systems affected.

3.5 Skin infections – blisters – ventral necrotic dermatitis

Skin infections are usually caused by excessive humidity, inappropriate substrate, suboptimal temperatures or poor hygiene (or all of the above). Early stages of the infection may appear as
localised lesions or blistering of single scales. As the disease progresses the skin may slough in patches and become greasy and malodorous.

3.6 Abscess

Abscess formation occurs in any reptile but is more common in animals kept in poor conditions where vivarium temperatures are suboptimal, substrate is not ideal and hygiene is poor. Abscesses may form after haematogenous spread of pathogens or due to a more direct cause such as nematode migration or wound infection. Pythons and turtles seem to be more prone to this condition than other reptiles.

3.7 Metabolic bone disease (MBD)

Metabolic bone disease can be a confusing condition to diagnose, especially in small lizards. Affected reptiles often twitch or have hindlimb and tail paresis and are misdiagnosed as neurological problems. Usually there is a history of being fed calcium deficient diets such as crickets that are not “gutloaded” and mealworms (fast food for reptiles – very high fat content). Ultraviolet light is essential for the production of vitamin D₃ in the skin. Eastern water dragons and other agamids are prone to MBD. The author has also seen a severe case of MBD in a common eastern blue-tongue fed a diet of mince and lettuce. Snakes are not usually affected due to their habit of eating whole prey items.

3.8 Respiratory disease

Respiratory disease of various aetiologies occurs in all orders of the class Reptilia. Pythons affected usually display mouth breathing, upper respiratory stridor and anorexia. Turtles and lizards are also commonly affected. Juvenile blue-tongues frequently show upper respiratory disease. Epiphora, blepharitis, sneezing and a decreased appetite are the usual signs. Cases often respond to increased vivarium temperature without antibiotic therapy. Ophidian paramyxovirus (OPMV) is an important cause of respiratory disease in captive reptiles in the UK and USA. OPMV has recently been reported in snakes in Australia.

3.9 Obesity

Certain species are more prone to obesity and associated problems. Bearded dragons (P. vitticeps and P. henrylawsonii) will overeat and “fatten up” especially around the neck and tail base. Black-headed pythons (Aspidites melanocephalus) and womas (Aspidites ramsayi), two species that are mainly reptile eaters in the wild, are at risk of hepatic lipidosis in captivity when fed a fatty diet of rodents and day-old chicks. Prey quantities and frequency of feeding need to be carefully monitored in these species. The author has also seen this condition in jungle carpet pythons (Morelia spilota variegata).

3.10 Dystocia

Dystocia occurs more frequently in pythons and chelonia. The author has also seen dystotic frilled lizards (Chlamydosaurus kingii), inland bearded dragons (Pogona vitticeps) and lace monitors (Varanus varius). Dystocia may occur as a sequelum to injury, debilitation or disease in reptiles. Lack of appropriate substrate for oviposition may also lead to the condition. Injured female turtles should always be radiographed to determine if they are gravid and observed closely for difficulties with egg-laying. Pythons are frequently affected. Occasionally a python will lay most of her eggs except for the last one or two. The major cause of dystocia in pythons appears to be of the non-obstructive type. Many factors may be involved, including the lack of a proper...
nesting site, suboptimal vivarium temperature, dehydration and poor physical condition (poor muscle tone, obesity).

### 3.11 Disposition-related voluntary hypothermia

Disposition-related voluntary hypothermia describes a condition mainly seen in captive lizards and snakes. Reptiles may sometimes choose the coolest part of the vivarium instead of the warmest and remain there, seemingly unable to thermoregulate. This type of hypothermia appears to be an environmentally-induced shut-down rather than a disease-induced shut-down. There may be a history of stress-related behaviour or poorly furnished enclosures. In the experience of the author this problem occurs most commonly when snakes are placed in vivaria that are too large.

### 4. Welfare Issues

#### 4.1 Live feeding

There is no need to feed live sentient animals (amphibian, reptile, avian, rodent) prey items to reptiles. Herpetoculturists should be educated by veterinarians as to the animal welfare and health issues involved in this practice.

##### 4.1.1 Rat bites

Rat bite wounds are unfortunately seen too often in captive pythons. It is the sign not only of a careless, non-caring keeper, but also a lazy one. Rats may inflict deep tissue damage at multiple sites over a very short period of time. Often the snake is sick or hypothermic (see 3.10). Bites usually occur when the owner puts a rat in the vivarium and then leaves both snake and rodent to their own devices. The solution is simple; feed dead, prefrozen prey.

##### 4.1.2 Frozen prey items

Prey items should be prefrozen for at least one month in order to limit the risk of parasitism, both internal and external. Thawing out is usually done by placing the prey in lukewarm water, towelling it dry and either holding it in the hand or gently blow-drying it to warm it up.

#### 4.2 Hygiene, disinfection and quarantine

Too often reptile owners will add a new snake to their collection without paying attention to quarantine procedures. A period of three to six months should be recommended, depending on species and disease risk. Clients should be educated as to proper hygiene and disinfection practices. The health status and welfare of collections can be ruined by a hasty or nonexistent quarantine period and substandard disinfection.

#### 4.3 Rostral abrasions

Rostral abrasions occur frequently in agamids (dragon lizards) kept outdoors. It is especially common in eastern water dragons kept in aviary style enclosures. Distressed animals rub their noses on the wire as they exhibit “escape” behaviour. A solid opaque barrier should be placed around the enclosure at ground level to discourage this behaviour. Ensure that cage furnishings and shelter is also adequate.
4.4 Eastern water dragons

Eastern water dragons (*Physignathus lesurii*) are overrepresented in cases of metabolic bone disease. These lizards are an attractive and popular pet for the novice reptile keeper.

It is distressing for the animal, owner and veterinarian to see small lizards (often less than 10 grams in body weight) suffering from MBD. It is timely that these reptiles were “reclassified” and only available to experienced keepers.

**Summary**

A sound knowledge of reptile husbandry is essential in order to diagnose and treat captive reptiles. Reading and consulting with herpetologists and reptile veterinarians will enable you to build on your experience.

**References**


Birds and Exotics: What to do in an emergency – How to keep them alive.

The emergency cases seen in birds and exotics are similar to those seen in dogs and cats and the basic principles for treatment apply. In many instances the ‘emergency’ is actually the terminal stage of a disease process undetected by the owner.

The Avian Patient

Emergency care for birds has been neglected until recently because it is an area that is poorly understood. It is outside the scope of this paper to discuss all the emergencies that may occur in birds. My aim is to discuss techniques that I find successful, that is to offer you a protocol that works for me.

From a practical point of view, you can safely assume that all obviously sick birds are dehydrated, hypothermic and nutritionally deficient. Many avian patients, who appear ill at initial presentation, can be classified as emergencies.

Treatment considerations at this stage depend upon:

- the severity of the bird’s condition,
- the nature of the disease, and
- the owner’s willingness to allow treatment.

Preservation Reflex

Birds exhibit a preservation reflex. They are capable of hiding symptoms of illness to a greater extent than the other animals we are accustomed to treating. With few exceptions, the avian patient is still the equivalent of a bird in the wild. Many pet birds are unaccustomed to close contact with people other than their owners.

Client Perception of Emergency

Most ‘emergency’ cases are actually the terminal stage of a disease process the owner has missed because the bird did not exhibit obvious signs of disease. To avoid this there is a need for the education of clients to closely scrutinise each bird once daily and to develop an appreciation for any subtle changes that may occur.

In other cases clients will react quite strongly to certain clinical signs that they are convinced represent an emergency. Any sign of blood causes many people to panic and results in a visit to the Veterinary Hospital. Occasionally the bird will present because of ‘uncontrolled’ haemorrhage. This is commonly from a broken feather or claw and is easily controlled by local pressure or application of a styptic such as ferric chloride or silver nitrate once any feather remnants have been removed. If any of the quill remains in the feather follicle it continues to allow bleeding by capillary action along the shaft, because the keratin shaft does not collapse to assist clotting, as tissue would.

Birds have good tolerance of the loss of up to 10% of their circulating blood volume. In some cases they will tolerate up to 30% blood volume loss and still be able to recover. To obtain a rough estimate of blood volume, use 10% of body weight a guide. Birds have a much more rapid regeneration of blood cells, than mammals, as they have a more rapid turnover due to a
relatively short life-span of erythrocytes - 28 to 45 days. To assess the true blood loss situation it is necessary to perform a PCV on the day after the blood loss occurs, as they can shunt blood around their circulatory system very effectively giving rise to a false PCV if performed on the same day that haemorrhage occurs.

In the case of a blood transfusion being required, it is commonly accepted that it is preferable to collect blood from a donor within the same taxonomic group. I have used Galah blood for all the parrots I have transfused because it is easily obtainable. There have been reports of people using pigeon blood for parrots with success and no complications.

**Principles of Emergency Treatment**

Proper management of an avian emergency begins with the initial contact with the veterinary hospital - usually over the telephone to the receptionist. Careful questioning and relaying correct instructions will help your diagnosis. The client should bring the bird in the cage without cleaning it. Any medications should also be brought in. Once you have been notified, begin preparation for the arrival:

- Prepare warm intravenous fluids.
- Prepare a warm environment.
- Prepare any specific medications or equipment indicated by the telephone conversation.
- Notify staff to expect the bird and expedite its admission.

**Once the patient arrives perform triage:**

Take the history while you perform a distant examination of both the bird and the cage. Identify and assess the importance of any obvious or acute problems. Decide if the bird is capable of tolerating the stress of restraint and close examination. Check the ABC of cardiopulmonary resuscitation: **Airway, Breathing and Circulation.**

- Assess posture, degree of alertness.
- Auscultate heart: Heart Rate & Rhythm.
- Assess any trauma and plan any surgical intervention required.
- Develop a diagnostic and therapeutic plan to match patient’s condition
  
  e.g.: Dyspnoea or cardiac/respiratory arrest – consider:
  
  - inserting endotracheal tube or cannula into caudal abdominal air sac
  - positive pressure ventilation
  - intermittent pressure on keelbone to massage heart
  - Adrenaline 1:1000 dose = 0.5-1.0mg/kg intravenous, intratracheal, intracardiac or intraosseous
  - Doxapram Hydrochloride - 5-10mg/kg intravenous, Intramuscular or subcutaneous

If the bird is critically ill or in shock, initial treatment is only supportive. Place the bird in a humidicrib after administering intravenous or subcutaneous fluids and other medications as indicated.

In selected cases it is preferable to anaesthetise the bird with Isoflurane to minimise stress during initial treatment and sample collection. In my opinion, the use of Isoflurane is safer than manually restraining a stressed and potentially compromised patient. Once the bird is anaesthetised, an intravenous or intra-osseous catheter can be applied, and other samples such as blood, crop wash or swabs from choana and/or cloaca can be collected, and radiographs taken. (The volume of blood collected should not exceed 1% of the bird’s bodyweight). The bird’s pre-treatment body weight should be recorded.
Initial Treatment for Emergency Cases

Drugs given to stabilise the patient include:

- Hartmanns (lactated Ringers Solution)
- given slowly I/V as a bolus dose of 1 - 3 mL/100g (higher dose for larger birds.)
- colloid solutions (dextrans, plasma, hetastarch) may be preferable to LRS as an initial therapy if no dehydration exists e.g. trauma
- corticosteroids. e.g. Dexamethasone 2 - 8 mg/kg I/V or I/M
- Iron Dextran 1 mg/100g I/M (for anaemic patients)
- antibiotics I/V or I/M as indicated (see Appendix 4).

1. Antibiotics should only be used if a bacterial infection is suspected.
2. Tetracyclines have been reported to cause immunosuppression (Gerlach, 1986) and are really only indicated in cases of chlamydophilosis. The tetracycline of choice is Doxycycline. Sensitivity tests are necessary to confirm that the antibiotic, that is initially used, is appropriate.
3. Rosskopf (1987) states that in his experience, in avian medicine, the most successful combination of antibiotics is Piperacillin and Amikacin, although more recently this has been replaced by Enrofloxacin in many cases.
4. It is difficult to obtain Amikacin in Australia so I have used Piperacillin in several cases, and found it quite reliable in cases of a suspected bacterial infection with no guide to sensitivity.
5. Piperacillin is no longer available as a stand alone drug in Australia, so I now use Tazocin® (a combination of Piperacillin and Tazobactam. Tazobactam potentiates penicillins in the same way Clavulanic Acid does in Clavulox).
6. In cases of suspected psittacosis the drug of choice is Doxycycline or Azithromycin - both have been used with good success.

Basic Diagnostic Tests

Once the bird has stabilised basic diagnostic samples can be collected. Useful diagnostic samples are:

- Blood for a PCV, WBC and Differential Count.
- Biochemical Tests as indicated by the clinical signs.
- Choanal and/or cloacal swabs for a Gram stain + Culture & Sensitivity if indicated.
- Faecal sample for examination by faecal flotation and saline smear (Both should be done).
- Crop wash and wet smear cytology or Gram stain as indicated.
- Tests to assess chlamydophila status, if suspected.
- Are radiographs indicated, or should they be delayed?

Supportive Care for Emergency Patients

To minimise handling time, aim to give any initial supportive treatment at the same time as the diagnostic samples are collected. Have all equipment and medications prepared before you restrain the bird.
Once the bird is stabilised, use the history and physical examination to determine the organ systems involved. This aids in planning treatment or further diagnostic tests that may be required.

A bird admitted to hospital needs to be provided with the following (Doneley, 1996):

1. Warmth/Supplemental Heat
2. Fluid Therapy
3. Nutrition
4. Minimal Stress
5. Oxygen Supplementation
6. Daily Body Weight Recording
7. Quarantine

1. Warmth/Supplemental Heat

The metabolic rate of birds is much higher than mammals. This results in a higher core body temperature, usually around 38-42°C (100-108°F). Most ill birds will have lost weight from a reduction in fat and muscle tissue. This greatly affects their ability to retain heat. As well, ill birds are prone to hypothermia, as they are not eating and their metabolic processes are reduced. We can compensate for this by increasing the ambient temperature to 25-35°C (80-90°F). Heat must be supplied directly, either using commercial hospital cages, humidicribs, light bulbs, heating pads, heat lamps or a heated room. It is most important that you provide a humid heat or the bird will only dehydrate even more. Humidity must be maintained at around 60-70% to prevent dehydration. A humid environment can be provided by placing an open dish of water in the cage, with the bird. The most important factor in determining the humidity of the enclosure is the exposed surface area of the water dish, not the volume or depth of the water. A combination, digital thermometer/hygrometer is useful to assist in determining the level of humidity being provided. It can be obtained from electronic stores such as “Dick Smith” or “Tandy”.

Whenever, an external heat source is provided it is important to monitor the patient for signs of hyperthermia:

Hyperextension of the neck
Feathers held tightly to the body - gives the bird a sleek appearance.
Rapid panting.
Holding the wings away from the body (abduction).

As a guide, Philip (1981) produced the following ambient temperature recommendations based on the bird’s Thermoneutral Zone. This is the range of temperature over which the bird’s metabolic rate does not alter significantly in response to changes in environmental temperature. We can use the Lower Critical Temperature of the thermoneutral zone and the relationship it has to the current body weight:

<table>
<thead>
<tr>
<th>Body Weight (g)</th>
<th>Temperature Range °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 50</td>
<td>29 - 33</td>
</tr>
<tr>
<td>51 - 200</td>
<td>25 - 29</td>
</tr>
<tr>
<td>201 - 500</td>
<td>20 - 25</td>
</tr>
<tr>
<td>501 - 1000</td>
<td>18 - 23</td>
</tr>
<tr>
<td>1000 +</td>
<td>15 - 20</td>
</tr>
</tbody>
</table>
2. Fluid Therapy

A well-balanced and calculated fluid therapy regime is the mainstay of any supportive therapy. Use 2 ½% dextrose in Lactated Ringer’s Solution by gavage unless the bird is moribund or in shock, in which case Lactated Ringer’s Solution is given intravenously.

3. Nutrition

As most ill birds are anorexic, some form of nutritional support is essential for their recovery. Illness and stress combine to cause an increase in the bird’s metabolic rate. As they are anorexic, there is an increase in gluconeogenesis and glycolysis, with protein used as the main energy source. This leads to a condition described by aviculturists as “going light”, due to the obvious atrophy of the pectoral muscles. Nutritional support is necessary in order to reverse this process until the disease is under control and the bird is eating normally.

**Nutritional support** can be given either enterally or parenterally.

**Enteral support** is usually given by passing food directly into the crop via the mouth with a feeding tube. Force-feeding can be performed once the bird is stabilised and the acute problems are controlled. I find the simplest general food is a combination of 50:50 high protein baby cereal with strained baby food (e.g. Beef & Vegetable or fruit) or one of the commercial hand-rearing formulas. Homemade recipes can be used, but may be imbalanced and often lack consistency. The volume of food provided is that required to fill the crop to ½-2/3 of its capacity. This is provided 2-3 times daily or as the crop empties. Supplemental feeding is administered by one of my nurses through a large feeding tube.

In some cases a pharyngostomy tube can be passed through the oesophagus into the proventriculus. In large birds it is possible to place a duodenal feeding catheter into the proximal duodenum.

A record is kept on the bird’s card, of volume and number of times food is given. This is combined with daily weighing to assess response.

**Total Parenteral Nutrition (TPN)** is the intravenous infusion of all essential nutrients, including amino acids, lipids, carbohydrates, vitamins, electrolytes and minerals. Although in its infancy in avian medicine, it is indicated in cases of gastrointestinal stasis, vomiting, head trauma, malabsorption and maldigestion. It can be given by either an intravenous or intraosseous catheter - preferably by continuous infusion, to minimise irritation to the vascular endothelium that can arise when there is intermittent, high concentration bolus dose therapy.

Patients receiving TPN require monitoring of serum Biochemistry and electrolytes as often as possible. As well, they should receive a full physical examination and weighing on a daily basis.

As soon as possible the bird should be encouraged to eat normally, with a wide range of foodstuffs offered. This is not the time, however, to try and correct a nutritionally inadequate diet. This can wait until the bird is fully recovered and at home. In the meantime, multivitamin injections may be used to correct gross deficiencies, if you feel this is indicated.

4. Minimal stress

Stress is an important factor to consider when dealing with birds. Wild or aviary birds are unaccustomed to close human contact, and companion birds may be stressed by being out of their usual environment and away from the person to whom they have bonded. Every effort made to minimise stress will help the bird’s recovery. Provide a visual barrier (towel or cloth) as a cover to protect the bird from sudden frights. Have all food and water dishes within easy reach of the bird.
Preferably the birds should be housed away from dogs and cats, in a quiet, low traffic area of the hospital.

Hospital cages should be placed at human chest height or higher, as birds are likely to be stressed by the presence of unfamiliar objects above them or people peering down at them. Never place a bird in a cage on the floor, as this is extremely stressful for the patient.

Most birds are too ill to perch, so none may be needed. Provide food and water in dishes that are accessible. This is usually on the floor of the cage or next to a perch if one is being used. Dishes, perches and other cage furniture need normal daily cleaning and maintenance.

Consider the light pattern you are providing for your patient. If the bird is extremely stressed it may benefit from a darkened cage or room, but once stabilised, a constant light source may encourage them to eat, particularly at night when surrounding movements and noise are minimal.

All medications and treatments must be considered prior to catching your bird, so that all necessary equipment and drugs are ready and only a minimal time is spent in restraining the bird.

5. Oxygen Supplementation

This may be required in some cases on a longer term basis. I recommend you consider having a simple oxygen chamber in your practice. These are particularly useful for dyspnoeic patients. I use a small perspex box, but these can be substituted with plastic pet carriers available at most pet shops. To supplement oxygen, concentrations of 40-50% are recommended, but only for short periods - up to 12 hours. It is important to be aware that high oxygen concentrations over a longer period can cause toxicity, leading to lethargy, anorexia, respiratory distress and death.

Oxygen can also be delivered by a facemask for short periods during restraint or anaesthesia while administering treatment. Supplying 50mL/kg/minute via a facemask provides approximately 40% Oxygen saturation.

Oxygen therapy is contra-indicated in patients with severe anaemia, or those in circulatory collapse. These patients need fluid therapy or blood transfusions to assist tissue oxygenation.

Daily Body Weight Recording

The records of daily body weight changes are a useful prognostic indicator and help to answer the question of whether the current treatment regime working.

You should expect to have a steady daily weight gain after 1-2 days of treatment. This weight change indicates that the treatment is appropriate and is successful. Consistent weight loss or a failure to gain weight, calls for a reassessment of the diagnosis and/or treatment. The bird may need more aggressive nutritional support.

To record a bird’s body weight, use an accurate gram scale, fitted with a perch or a lightweight container. I use an electronic kitchen scale purchased at a local department store. Flighty birds should be wrapped in a towel or other suitable container before being weighed.

Weigh the birds at the same time each day, preferably before the start of the day’s treatment or any food supplementation.

7. Quarantine

You need to consider that some avian diseases, such as Psittacosis or Salmonellosis, are extremely contagious (both to other avian patients and to people). Any bird with an illness you suspect may be contagious should be isolated from other avian patients. This can be
achieved by having separate wards, cages with solid partitions between them, or even a separate cage in another room.

**What to Do Until you Have a Diagnosis**

Emergency medicine in birds is based upon the same principles used in other animals. By modifying these principles after considering the peculiar anatomy and physiology of birds, we can design a successful emergency protocol to keep our patient alive until we have a definitive diagnosis.

Learn the common diseases and signs for the species that commonly present to your practice (refer to Appendix 1).

**Flow Chart**

To summarise, the basic protocol I find most successful is:

1. Collect a good history while performing a quick examination.
2. Determine which diagnostic samples are appropriate.
3. Control hypothermia with a warm humid environment.
4. Control haemorrhage.
5. Control dehydration and/or shock with Lactated Ringer’s Solution.
6. Administer Dexamethasone IV or IM, if indicated
7. Administer antibiotics if indicated.
8. Provide a quiet, peaceful area.
9. Once stabilised categorise illness to determine further treatment or other diagnostic tests required.
References and Further Reading


Air Sac Catheterisation

The avian respiratory system is unique in having air sacs that act as extensions of the lungs into areas such as the abdominal cavity, neck and humerus. This gives birds their unique two-step respiratory cycle - air goes through the lungs into the caudal abdominal air sacs on inspiration, and then back through the lungs again on expiration. Any bird presented for acute respiratory distress should be suspected of having a tracheal obstruction. An alternate airway, bypassing the tracheal obstruction, can be created by introducing a catheter to maintain an opening into an air sac.

This technique can be life-saving as it allows for rapid relief of upper respiratory tract obstructions. It can also be used for the maintenance of anaesthesia, particularly for head and neck surgery where the ET tube in the mouth is obstructive. As well it can be used to allow for insertion of your endoscope down the length of the trachea.

Suitable catheters can be made from:
- a shortened endotracheal tube
- a piece of I/V giving set
- a shortened urinary catheter or intravenous catheter

In parrots the most common air sacs to be catheterised are the left caudal thoracic or the abdominal air sac. The approach is similar to that used for surgical sexing - an approach between the ribs and the femur. In waterfowl and raptors the interclavicular air sac can also be used.

Steps in inserting an air sac catheter into the left abdominal air sac:

The bird should be given a general anaesthetic, if possible.
Place the bird in right lateral recumbency.
Pluck feathers from the flank and do a standard surgical skin preparation of the site.
Incise the skin over a 2-4 mm area as for surgical sexing.
Use a pair of mosquito forceps or scissors to blunt dissect between the muscles of the abdominal wall to enter the caudal thoracic air sac.
Use the jaws of the mosquito forceps as retractors to hold the skin incision open.
Place a nick in the air sac wall separating the caudal thoracic and abdominal air sacs.
Insert the catheter into the abdominal air sac.

Confirm the patency of the air sac by:

holding a glass slide over the end of the catheter to check for condensation,
place some fibres of cotton wool or a small feather at the exposed end of the catheter and watch for movement with each expiration.
Place a butterfly shaped tape to the catheter
Suture the catheter in place.
The catheter can usually be left in place for 3 - 5 days.
The common complications seen with catheters in the avian patient are similar to those seen in other animals - catheter occlusion and thrombophlebitis.

Nebulisation

Nebulisation is indicated for many respiratory problems. It may be delivered with or without supplemental oxygen. When using a nebuliser, consult the manual to assess the effectiveness and penetration of the respiratory system by determining the size of the particles it will
produce. Particles must be less than 3 micrometers to penetrate to the air sacs and lungs. Particles between 3-7 micrometers will be deposited onto nasal and oropharyngeal mucosal surfaces and in the trachea.

It can be used as a vehicle to deliver antibiotics or other medications to a patient, with minimal interference, and is less likely to stress the patient. Many intravenous antibiotics can be diluted in saline for nebulisation.

The same chamber as described for use in supplemental oxygen therapy is suitable for nebulisation delivery. The recommended time for exposing a patient to nebulisation is 10-30 minutes.

As birds lack a diaphragm and have minimal ciliated epithelium lining the respiratory passages, it is not recommended to use mucolytic agents, as the bird is unable to develop an effective cough.

A disadvantage of nebulisation is that it does not cause any drug levels in the blood and so it needs to be supported by systemic therapy. It may also frighten and stress any bird that has a nervous temperament.

**Avian Fluid Therapy**

**Avian Fluid & Electrolyte Dynamics**

Avian fluid and electrolyte dynamics are very similar to that of mammals with the exception that birds possess different kidney function and a cloacal water resorption system. As well, some birds have salt glands.

Salt glands have been found in cormorants, herons, gulls, pelicans, flamingoes, wild and domestic ducks and geese, penguins, terns, skimmers, albatrosses, roadrunners, ostriches and other ratites, most falconiform birds of prey, budgerigars and desert partridges. In these birds the salt gland and not the kidney is the chief regulator of NaCl in the body, removing 60-85% of the total NaCl removed from the body. This allows these birds to drink salt water and still be able to remove quantities of salt that is more than the kidneys can cope with and only use about one-third the amount of water that the kidney would use - this is of importance in arid areas. This is controlled by a feedback mechanism on the adrenal, via the pituitary, which causes a release of Cortisol. This acts directly on the salt gland to excrete salt as well as elevating blood glucose levels, which also appears to enhance salt excretion. Any stress factor, which causes the adrenal gland to excrete Cortisol, will also positively influence the salt gland.

An adult bird’s total body water approaches 50-70% of its total body weight.

The daily water requirement is 5-30% of their body weight when the bird is in a thermoneutral state. The water requirement is inversely related to body size and is satisfied by either ingestion (drinking, or water in food) or by oxidative metabolism of foodstuffs.

Absorption of free water from the intestines is passive, occurring secondary to the active absorption of Na+. Maximal absorption of glucose or glycine is dependent upon concurrent high sodium absorption. Acetate, bicarbonate and certain amino acids also promote the sodium absorption. Hence the addition of acetate, glucose, glycine, Na+ to commercial oral rehydration fluids, actively promotes more water absorption in the mid to upper small intestine.

The respiratory, urinary and gastrointestinal systems, as well as the salt glands, are responsible for the regulation of electrolytes.

The avian kidney is composed of mammalian and reptilian subunits. The glomeruli are smaller and less in number than in mammals. The degree of filtration through the glomeruli
is directly related to blood pressure. The rate of filtration through avian glomeruli is 1-2mL/min/square metre of body surface area while in mammals the rate is 50-70 mL/min/square metre. Water is passively resorbed following active Na+, other electrolytes and glucose resorption. As much as 99% of the urine water may be resorbed during periods of dehydration or as little as 6% during periods of excess body water. The avian antidiuretic hormone, Arginine vasotocin, does not influence resorption in the reptilian type urinary tubules, only in the mammalian tubules.

Many people have been of the opinion that avian kidneys, because or their primitive reptilian component, are less efficient than the mammals. However, the opposite is true as birds actually have a lower total water turnover in mLs/day and so are more suited to conserving body water (as seen in Table 1).

Table 1 Comparison of Total Water Turnover (After Evans, 1984)

<table>
<thead>
<tr>
<th>Intake (mL/day)</th>
<th>Mammals</th>
<th>Birds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking</td>
<td>99.0M .90</td>
<td>59.0M .67</td>
</tr>
<tr>
<td>Metabolic</td>
<td>12.6M .75</td>
<td>14.1M .72</td>
</tr>
<tr>
<td>Preferred</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Loss (mL/day)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaporation</td>
<td>38.8M .80</td>
<td>24.2M .61</td>
</tr>
<tr>
<td>Faeces</td>
<td>39.6M .63</td>
<td>-</td>
</tr>
<tr>
<td>Urine</td>
<td>60.9M .75</td>
<td>27.0M .86</td>
</tr>
<tr>
<td>Total Turnover</td>
<td>123M .80</td>
<td>115M .71</td>
</tr>
</tbody>
</table>

Fluid Therapy and Acid-Base Balance

In many texts regarding treating a critically ill bird, mention is made of the need for fluid therapy, but in most cases no actual guidelines are given.

The old rule of thumb was 5-10% of body weight by the oral, subcutaneous or intramuscular route. Several papers have been written about the use of indwelling intravenous catheters and their advantages versus disadvantages (Sims, 1983, Altman, 1984). Over the years I have followed these recommendations but never felt fully comfortable or happy with the results. Over recent years I have been reassessing my approach to fluid therapy and while I feel that it still has some way to go I present my current thoughts and experiences.

Redig (1984 b) pioneered the use of ‘bolus’ intravenous fluid therapy as the method of choice because of the following advantages:

It obviates the complications of indwelling catheters
It permits the rapid administration of large volumes of fluids
It provides great therapeutic effect to the birds without any adverse side-effects.

He recommends that the rate of delivery be determined as being as fast as you can push the fluid through a 23-25 gauge needle for most birds, or a 20 gauge needle for raptors.

I have found this method to be quite successful but prefer to use a 26-30 gauge needle as there is less post-injection peri-vascular haemorrhage. The major complication of serial intravenous injections is the presence of clots and ‘blown’ veins. Extreme care is required to prevent this. I have found most success in pinching the area of injection rather than just local pressure. However I am the first to admit that this still remains a frustrating problem even
with the best technique. Harrison (1985) suggests that inhalation anaesthesia with Isoflurane each time fluids are given is the least stressful method for his patients and he recommends several anaesthetics daily is the current recommendation.

In many cases I use the intravenous route to stabilise the bird for the first 24-48 hours and then resort to oral fluids by ‘crop needle’. For me this is extremely successful, as I prefer to use Isoflurane only when it is required.

Martin et al. (1987) demonstrated that there was little difference between the use of Lactated Ringer’s solution given orally or subcutaneously. In addition, they found that the most beneficial choice for rehydration therapy in pigeons was 5% dextrose administered orally, where the intravenous route was unavailable or impractical. Since this time I have avoided the stress of using injections and prefer to use a crop needle to deliver the fluids into the crop of all but the most severe cases I treat. There is less stress to the bird and the technique can be performed single-handed.

**The most important changes to my technique have been:**

- the calculation of daily fluid requirement
- regular weighing of patients to allow more accurate monitoring of patient response
- the use of the oral route in all but the most severe cases.

**Calculation of Fluid Requirement**

This is done exactly the same as for mammals and is comprised of three components.

1. **Fluid deficit (dehydration)**
2. **Daily maintenance**
3. **Ongoing losses**

1. **Fluid Deficit** is an assessment based on some practical assumptions. Dehydration can be assumed to be present in any bird suffering from trauma or infectious disease. Redig (1984 b) has a suggested table of levels of assumed dehydration (see Table 2) but I find this is usually not applicable to most of the small birds I am dealing with. In most situations it is not harmful to assume a level of 10% dehydration for most of the birds that are brought into a veterinary practice. A precise quantity of fluid required to correct dehydration is not crucial since periodic re-evaluation of the patient’s response to therapy will permit the initial estimate to be revised as necessary.

   **e.g.**
   
   present weight = 150g  
   assume deficit = 10%  
   fluid deficit = 150 x 0.10  
   = 15g

   Since 1mL weighs 1g, fluid deficit = 15mL

   Disruption of the acid-base balance usually accompanies dehydration. Redig (1984 b) suggests the use of the Harleco CO₂ apparatus to measure bicarbonate levels. In most situations this can be averted by using clinical signs and a knowledge of the pathophysiological changes likely to be occurring in certain disease conditions (see Table 3).

   As a general rule, the birds I am dealing with are too small to allow successful collection of blood for serial tests or initial tests for baseline assessment, so I am left to use clinical judgment and a consideration of pathophysiology to determine any treatment. Table 3 demonstrates that most of the patients we see would be expected to be in a state of metabolic acidosis. In this situation, the use of Lactated Ringer’s solution will counter the acidosis by
the uptake of two hydrogen ions for each lactate ion metabolised in the liver (Yoxall and Hird, 1980).

**Table 3a** General guidelines for fluid administration (after Redig 1984 b)

<table>
<thead>
<tr>
<th>Clinical signs</th>
<th>Fluid</th>
<th>Route</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>New admissions with traumatic injuries</td>
<td>Hartmanns/D5W Oral Electrolyte solution</td>
<td>Oral</td>
<td>10-20mL/kg b.i.d.</td>
</tr>
<tr>
<td></td>
<td>(Lectade, Gatorade etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anorexia with no vomiting</td>
<td>as above + high calorie supplement by gavage (Energel, Polyaid, Emerald)</td>
<td>Oral</td>
<td>10-20mL/kg b.i.d.</td>
</tr>
<tr>
<td>Anorexia with vomiting (Alkalosis)</td>
<td>Normal Saline or Ringer’s Solution + KCl</td>
<td>IV, IM, Intraosseous</td>
<td>Calculate (Deficit + Maintenance + Losses)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subcutaneous</td>
<td></td>
</tr>
<tr>
<td>Severe anaemia with compensatory hyperventilation (Alkalosis)</td>
<td>Normal Saline or Ringer’s Solution</td>
<td>IV, IM, Intraosseous</td>
<td>Calculate (Deficit + Maintenance + Losses)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subcutaneous</td>
<td></td>
</tr>
<tr>
<td>Emaciated (Acidosis)</td>
<td>Lactated Ringer’s Solution</td>
<td>IV, IM, Intraosseous</td>
<td>Calculate (Deficit + Maintenance + Losses)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subcutaneous</td>
<td></td>
</tr>
<tr>
<td>Traumatic injury with blood loss (Acidosis)</td>
<td>Lactated Ringer’s Solution</td>
<td>IV, IM, Intraosseous</td>
<td>Calculate (Deficit + Maintenance + Losses)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subcutaneous</td>
<td></td>
</tr>
<tr>
<td>Most diseases (Acidosis)</td>
<td>Lactated Ringer’s Solution</td>
<td>IV, IM, Intraosseous</td>
<td>Maintenance (50mL/kg/day)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subcutaneous</td>
<td></td>
</tr>
</tbody>
</table>

The only modification to the above table is that I prefer to use the oral route of administration whenever possible.

**Table 3b** Clinical signs of dehydration in raptors (after Redig, 1984 b)

<table>
<thead>
<tr>
<th>% Dehydration</th>
<th>Clinical Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 5%</td>
<td>Not Detectable</td>
</tr>
<tr>
<td>5-6%</td>
<td>Subtle loss of skin elasticity ‘Tenting’ of dorsal surface of toe/foot Loss of brightness and roundness of eyes Possible dry mucous membranes</td>
</tr>
<tr>
<td>10-12%</td>
<td>‘Tented’ skin stays in place ‘Muddy’ colour to scales of feet Dry mucous membranes Coolness to extremities Depressed Rapid heart rate</td>
</tr>
<tr>
<td>12-15%</td>
<td>Extreme Depression Shock Near death</td>
</tr>
</tbody>
</table>
2. **Daily Maintenance** of fluid intake must be carried out in all the birds we treat. Most of the authors I consulted estimated a maintenance requirement of 50mL/kg/day to be adequate. In some cases you need to adjust the bird’s present weight to an estimated “Normal” weight to do your calculations. In most of the smaller birds this is probably unnecessary.

<table>
<thead>
<tr>
<th>Present weight</th>
<th>= 150gm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated dehydration</td>
<td>= 10%</td>
</tr>
<tr>
<td>Estimated normal weight</td>
<td>= 150 + (150 x 10%)</td>
</tr>
<tr>
<td></td>
<td>= 150 + 15</td>
</tr>
<tr>
<td></td>
<td>= 165g</td>
</tr>
<tr>
<td></td>
<td>= 0.165 kg</td>
</tr>
</tbody>
</table>

Estimated maintenance = 50 x 0.165 = 8.25mL

3. **Ongoing contemporary losses** in most cases is not a significant factor unless the bird is passing copious amounts of fluid in vomitus or polyuria. In this case an educated guess will suffice.

**Electrolytes**

- **Bicarbonate** may need to be added where severe acidosis is suspected or documented. A safe rule of thumb is to administer 1meq/kg at 15-30 minute intervals to a maximum of 4 meq. Give the first dose I.V. and the remainder subcutaneously to prevent too rapid a shift in pH.

N.B. Commercially available 8.4% bicarbonate solution contains 1 meq/mL.

- **Potassium** imbalances may occur. **Hyperkalemia** can be assumed in cases of severe tissue injury or extreme catabolic states. The amount of potassium in Lactated Ringer’s solution is usually not sufficient to aggravate the problem. The use of calcium gluconate (0.5mL/kg) and oral glucose will facilitate the movement of potassium across the cell membrane to avoid any problems. **Hypokalemia** is usually only present with persistent vomiting and alkalosis. In these suspected cases use Ringer’s solution I.V supplemented with 0.1-0.3 meq/kg of KCl diluted in 10mL of Ringer’s solution and given subcutaneously.

**Monitoring Fluid Therapy**

- **Short-term** - Close observation is necessary to assess how the bird is tolerating your technique. Anxiousness, restlessness and dyspnoea are likely indicators of circulatory collapse. In raptors, heart rate and rhythm as well as respiratory rate can be observed. To date there have been no problems of this sort in any of my patients. Despite the use of rapid ‘bolus’ injections. This does not seem to be a problem with the oral route of administration.

I like to see a profound diuresis within the first 24 hours to show that there are no renal complications and that there is no sequestration of fluids.

- **Long-term** - Initially I tried to use PCV and TPP to assess this. However this is usually not practical in anything other than large raptors (Redig, 1984a). For me a successful means is to notice a general improvement in the bird’s demeanour - they will begin to struggle more when caught - and their eyes regain their brightness.

This method was too subjective and also unreliable. To allow a more objective assessment, we purchased a triple beam balance (capable of measuring down to 0.1 gm) and now maintain a daily body weight record for each bird. This has since been replaced by a set of electronic digital kitchen scales. We expect to see a daily net increase in body weight - in some of the
smaller birds this can be as little as 0.5 gm. In our hands this would appear to be an extremely sensitive prognostic aid.

Redig recommends weighing the bird before and after each bolus injection. Failure to lose weight between each administration is suggestive of sequestration of fluids.

All birds are weighed by being placed into a thick paper bag (to provide a dark environment), the weight of which is subtracted from the total weight. These are cheap and easily disposable to allow maintenance of a hygienic technique.

**Oral Route of Administration**

With this route, the calculations are performed as usual then the final volume required is divided into several (usually 4-6) convenient volumes administered throughout the 24-hour period. The maximum volume administered into the crop is based upon filling the crop to 50-66% of its maximum volume. In this way regurgitation is less likely (See table 4).

**Table 4. Maximum volume administered into the crop**

<table>
<thead>
<tr>
<th>Species</th>
<th>Volume (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finch</td>
<td>0.1 - 0.5</td>
</tr>
<tr>
<td>Canary</td>
<td>0.2 - 0.25</td>
</tr>
<tr>
<td>Budgerigar</td>
<td>0.5 - 1.0</td>
</tr>
<tr>
<td>Cockatiel/Quarrion</td>
<td>2.0 - 4.0</td>
</tr>
<tr>
<td>Small Parrot (Conure)</td>
<td>3.0 - 6.0</td>
</tr>
<tr>
<td>Medium Parrot (Galah, Amazon)</td>
<td>10.0 - 15.0</td>
</tr>
<tr>
<td>Large Parrot (Cockatoo)</td>
<td>20.0 - 25.0</td>
</tr>
<tr>
<td>Macaw</td>
<td>25.0 - 35.0</td>
</tr>
</tbody>
</table>

To make administration and calculation of fluid therapy simpler, we use a wall chart that has a range of weights with ready calculations of volumes for Maintenance, First 24 hours and 2nd and 3rd 24 hours of therapy (see table 5). This volume is adjusted according to the bird’s response and its weight changes.
Table 5. Calculation for avian fluid therapy

<table>
<thead>
<tr>
<th>Weight (g)</th>
<th>Maintenance (mL)</th>
<th>1st 24 Hrs</th>
<th>2nd &amp; 3rd 24 Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>1.00</td>
<td>2.00</td>
<td>1.50</td>
</tr>
<tr>
<td>25</td>
<td>1.25</td>
<td>2.50</td>
<td>1.875</td>
</tr>
<tr>
<td>30</td>
<td>1.50</td>
<td>3.00</td>
<td>2.250</td>
</tr>
<tr>
<td>35</td>
<td>1.75</td>
<td>3.50</td>
<td>2.625</td>
</tr>
<tr>
<td>40</td>
<td>2.00</td>
<td>4.00</td>
<td>3.000</td>
</tr>
<tr>
<td>45</td>
<td>2.25</td>
<td>4.50</td>
<td>3.375</td>
</tr>
<tr>
<td>50</td>
<td>2.50</td>
<td>5.00</td>
<td>3.750</td>
</tr>
<tr>
<td>55</td>
<td>2.75</td>
<td>5.50</td>
<td>4.125</td>
</tr>
<tr>
<td>60</td>
<td>3.00</td>
<td>6.00</td>
<td>4.500</td>
</tr>
<tr>
<td>65</td>
<td>3.25</td>
<td>6.50</td>
<td>4.875</td>
</tr>
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Bibliography

COMMON AVIAN EMERGENCY PRESENTATIONS

1. BIRD IN ADVANCED STAGE OF DISEASE

This is the most common emergency presentation encountered in practice as it may be seen with many diseases.

History

- Bird has been sick for a variable time - depending on the client’s powers of observation.
- The bird will have a range of problems such as ‘sitting in the corner’ or ‘on the floor of the cage’.
- The Bird may be described as ‘being off-colour’ or ‘not himself’.
- The droppings may be ‘loose and green’.

Clinical Signs

- Typically the bird will be on the floor of the cage.
- It will be fluffed up, have both eyes closed and will have a rapidly bobbing tail with exaggerated respiratory movements.
- The droppings may or may not be present. Disregard droppings passed during the transport to the hospital as they will be soft and contain excessive levels of liquid due to the stress of travelling. Try to identify the droppings that have been typical of the previous 24 hours.
- This suite of signs may be described as: ‘SBL’ - Sick Bird Look.

Treatment

- Any specific medication resulting from clinical examination & clinical pathology tests.
  Many of these birds will not have a specific diagnosis initially. Treatment is aimed at stabilising them. So I routinely provide:
  - broad-spectrum antibiotic
  - fluid therapy – in extreme cases, this may be provided by dribbling the calculated volume of a glucose/electrolyte solution into the beak without manually restraining the bird
  - warm, humid, minimal stress environment
  - possible oxygen supplementation
  - on-going therapy once a specific diagnosis is available.

2. RESPIRATORY DISTRESS

History

- Differentiate between acute or chronic onset.
- loss of body condition is usually a sign of chronic disease
- Differentiate between primary respiratory disease and disease outside the respiratory system
Primary Respiratory Disease
- Infection (e.g. bacteria, fungi, parasites, chlamydophila, mycoplasma)
- Toxins (e.g. PTFE - Teflon)
- Trauma or inhaled foreign body
- Neoplasia

Disease outside the Respiratory System
- Enlarged abdominal organ (e.g. thyroid, liver, kidney, gonad)
- Excess Coelomic fluid (e.g. egg peritonitis, liver disease, cardiac disease)
- Neoplasia
- Mass in oropharynx or crop (e.g. trichomoniasis, goitre)

Clinical Signs
Localising the lesion within the respiratory system may be difficult, the following guidelines may help:

1. Shallow & frequent respiratory effort
   - Signifies lung involvement often without air sac involvement
   - Pneumonia (rare)
   - Pulmonary oedema or congestion

2. Deep & heaving respiratory effort
   - Upper airway obstruction
   - Air sac consolidation
   - External pressure on air sacs (tumours, fluid)

3. Gaping or Mouth Breathing
   - Disease in any section of the respiratory system
   - Secondary sign with many diseases of other organ systems
   - Heat stress

4. Staining of feathers above nares (unilateral or bilateral?)
   - Rhinitis or sinusitis
   - Unlikely to cause respiratory distress by itself

General Signs
- Open-mouth breathing
- Rapid, exaggerated respiratory movements
- Tail-bobbing & body rocking with each breath
- Audible wheezing
- Voice changes, loss of singing
- Assess droppings for signs of other disease
- Yellow or bright green urates - liver disease
- Haematuria - renal disease or heavy metal toxicosis
- Large bulky droppings - space occupying lesion in abdomen
Treatment
- Avoid excessive handling, these birds are extremely stressed. Physical examination and administration of therapy may be fatal.
- Provide oxygen supplementation prior to handling and examination
- Nebulisation
- Consider placing an abdominal Air Sac Catheter, in position
- Begin Fluid therapy cautiously. Beware overhydration and pulmonary oedema

3. HAEMORRHAGE

History
- Blood in the cage or local environment.

Clinical Signs
- Differentiate the many causes - is it severe or mild blood loss?

1. Mild blood loss
- Attack from a predator (cat, dog, other bird etc.)
- Damaged blood feather
- Claw trauma
- Tongue laceration
- Egg laying

2. Severe blood loss
- Heavy metal toxicosis (Frank haematuria in Galahs, some cockatoos and Amazon parrots)
- Gastrointestinal bleeding
- Genitourinary bleeding
- Coagulopathy
- Cloacal papilloma
- Cloacal prolapse
- Infection (polyomavirus, circovirus, many bacteria)

Treatment
- Control haemorrhage
- Locate source of bleeding
- Begin aggressive fluid therapy (intravenous, intraosseous if possible)
- Monitor the PCV at least once daily for 4 days or until it begins to rise
- Administer blood, as a transfusion, if PCV <15%
- Parenteral antibiotics
- Vitamin K if indicated
4. TRAUMA

Trauma is not common in cage birds, but more common in wild and native birds. Cases of Concern will have at least one of the following:

- Severe haemorrhage
- Severe respiratory distress
- Gross signs of CNS involvement
- Visible and extensive physical trauma

History

- Not always available or reliable
- Bird has been entangled in a cage toy/wire etc.
- Self-mutilation (especially galahs and cockatoos)
- Bird attacked by another animal (cat, dog or wild bird - Raptor, Currawong, Butcherbird etc.)
- Injury secondary to a fright (window collision, hit by door, cage fell over)
- Free-flying bird injury - these may not be immediately apparent or may take up to 48 hours to develop (may not be seen by client and initial presentation is “he has been quiet for the past 24-48 hours”).

Clinical Signs: - perform the physical examination gently and with minimal handling

- SBL - hunched over, fluffed up, depressed, may be on floor of cage or on perch.
- May have significant respiratory effort/movement
- Presence of haemorrhage on feathers or cage environment
- May have CNS involvement
- Ataxia/circling, if bird attempts to walk
- rapid lateral movement of head or head held at a strange angle/position
- unable to stand
- limb paresis or paralysis
- convulsions
- poor to nil resistance to handling
- Non-specific changes to droppings - may contain slight increase in urates and urine or decrease in number
- Wounds with or without significant bruising and haemorrhage
- Limb fractures palpable
- Feather loss

Treatment

1. Severe or persistent haemorrhage

- Encourage haemostasis
- Digital pressure applied to bleeding points (up to 5 minutes as birds have poor intrinsic pathways and rely more on the extrinsic factors for coagulation).
- Apply pressure bandage to limbs, if indicated
- Pluck out bleeding quill remnant and apply digital pressure to feather follicle.
• Ligation if indicated
• Restore Circulatory Volume
• Infuse isotonic fluids (IM breast muscles; IV or IO)
• Transfusion if practical and available
• Broad-spectrum Antibiotics
  • Clavulox, Enrofloxacin, Piperacillin, Amikacin, Cephalosporins (Appendix 4)
• Heated, humidified environment (Humidicrib) with Oxygen supplementation

2. Suspected CNS involvement
• Corticosteroids (Dexamethasone 2-4 mg/kg IM, IV bid)
• Furosemide (2.0mg/kg IM, SC sid-bid)
• Broad-spectrum antibiotics (Appendix 4)
• Isotonic fluids (IM breast muscles; IV or IO)
• Place in a dark moderate to cool environment (No Humidicrib) with oxygen supplementation

3. Fractured limbs
• Stabilise haemorrhage, shock and CNS problems first
• Wings respond well to a figure-of-8 bandage to stabilise them in a normal posture.
• Non-compound fracture - Bandage and splint to cover injury and stabilise fracture to prevent skin perforation until bird has stabilised enough to consider surgery.
• Compound fracture needs more immediate attention - broad-spectrum antibiotics, balance risk of immediate surgery against infection and persistent trauma of fracture and soft tissue structures

4. Cat Bites
• Cats and many other mammals carry Pasteurella multocida in their saliva. This is quite lethal to birds and can cause a fatal septicaemia within 24-48 hours.
• Any bird that has been attacked by a cat should receive broad-spectrum antibiotics as indicated for Pasteurella. This should be done even if the skin is intact, as the bird may ingest the Pasteurella while preening its feathers that are covered with cat saliva. Antibiotic therapy should be maintained for a minimum of 3 days. Recommended antibiotics include: Clavulox, Amoxycillin, Piperacillin or Piperacillin-Amikacin.

5. Tongue laceration
• The tongue is a muscular structure with a very well developed vasculature that bleeds profusely and does not cauterise well. This can be a difficult case to manage.
• This can be a difficult problem to treat, as haemorrhage is difficult to control. Some authors prefer to restrain a conscious bird and hold the beak open with gauze bandages and then suture the laceration. I find this extremely difficult, as I cannot stabilise the tongue well enough to place the sutures well. I prefer to anaesthetise the bird with Isoflurane (it must be held with its head ventrally to avoid inhalation of blood clots as they may occlude the trachea). I suture the laceration with 4/0 Dexon or PDS. Ferric chloride can be applied to the tongue to assist coagulation, if required.
5. SEIZURES

History

- Exposure to toxins (e.g. lead, zinc, galvanised wire, some insecticides)
- Trauma
- Concurrent disease - Septicaemia, Hepatic encephalopathy
- Hypocalcaemia (in Parrots especially the African Grey Parrot)
- Hypoglycaemia (in raptors but not parrots)
- Neoplasia (especially Budgerigar)
- Heat Stroke
- Vitamin Deficiency (review diet - what is provided & what bird eats)
- Embolus (e.g. yolk stroke in an egg-laying hen)
- Epilepsy (more common in Red-loomed Amazon, chickens, Peach-face Lovebird)

Clinical Signs

- Lethargy & depression
- Convulsions
- Ataxia
- Unable to stand and/or walk

Treatment

- Diazepam (0.5mg/kg bid-tid)
- Supportive Care
- IV, IO, IM or SC fluids
- Calcium EDTA 35mg/kg IM bid x 5 days, cease 3 days then repeat as required
- Vitamins A, D3 and E (10,000 IU Vit A & 1,000 IU Vit D3 / 300g body weight IM each 7 days)
- Parenteral Calcium
  - Calcium glutionate 25mg/kg PO bid
  - Calcium gluconate 50-100mg/kg Slowly IV or IM (diluted)
  - Calcium lactate 5-10mg/kg IM each 7 days
  - Calcium levulinate 75-100mg/kg IM, IV.
- Long-term control with Phenobarbitone 1-2mg/kg PO bid, titrated to effect

6. EGGBINDING

History

- First Egg laid
- Chronic multiple egg laying (Cockatiels, finches, Canaries)
- Passed abnormal or malformed eggs in the past
- Poor diet, deficient in calcium and/or Vitamin D3
Clinical Signs

- Lethargy, depression, weakness
- Sitting on floor of cage (Budgerigars have a penguin-like posture)
- Tenesmus & Bleeding from the vent
- Leg paresis
- Distended abdomen - often egg is easily palpated
- Rapid RR
- Droppings are either absent or very large (4-5 times usual size)

Treatment

1. **Conservative Approach**
   - Warm, humid environment
   - Fluid therapy
   - Broad-spectrum antibiotics (Appendix 4)
   - Parenteral Calcium
     - Calcium glubionate 25mg/kg PO bid
     - Calcium gluconate 50-100mg/kg Slowly IV or IM (diluted)
     - Calcium lactate 5-10mg/kg IM each 7 days
     - Calcium levulinate 75-100mg/kg IM, IV.
   - Prostaglandin to dilate the uterovaginal sphincter
   - PGE2 (Dinoprostogone gel) 0.2mg(1mL)/kg intracloacally on the uterovaginal sphincter
   - Oxytocin - 5 IU/kg, repeat each 30minutes if required
   - Recommended to use once uterovaginal sphincter has been dilated, i.e after application of Dinoprostogone gel as above.

2. **Ovocentesis**
   - If egg cannot easily be manipulated out of cloaca
   - Aspirate egg contents through an 18ga needle and collapse the egg
   - Approach per cloaca initially or if egg cannot be reached this way, aspirate through abdominal wall.

3. **Laparotomy and surgical removal of egg.**
   - Take care these are often a severely compromised patient and a poor anaesthetic candidate. Spend some time with fluid therapy and pain relief to prepare these patients for surgery.

7. **CLOACAL PROLAPSE**

History

- Chronic Diarrhoea, cloacitis, enteritis
- Egg laying +/- Dystocia
- Cloacal Papilloma
Clinical Signs
- Tenesmus
- Staining of vent feathers with faeces and/or blood
- Cloacal tissue protruding from vent (with or without an egg attached)
- Do faecal examination (flotation + smear in warmed saline) and Gram stain to detect parasites and bacterial infections.

Hints and Tips
*To differentiate cloacal prolapse from cloacal papilloma:*
- Papilloma mucosa has cauliflower appearance, where prolapse mucosa usually has a moist, glistening appearance.
- Use vinegar on a cotton swab, apply to mucosa, papilloma will turn white, prolapse is unchanged.

Treatment
- Assess bird’s general condition, many of these are going into shock
- Supportive care
- Fluid therapy
- Parenteral broad-spectrum antibiotics
- Corticosteroids (Dexamethasone 2-4 mg/kg IM, IV bid)
- Surgery - with Isoflurane anaesthesia if patient is capable
- Often the tissue is significantly dehydrated - bathe and rehydrate with saline
- Control bleeding if required
- Remove the egg if it is entrapped in the tissue
- Thoroughly cleanse tissue and assess viability
- Replace or resect prolapsed tissue
- Place purse string suture or transverse sutures in vent, to assist in retaining the prolapsed tissue. To allow the correct tension with a purse-string suture, I usually place a glass thermometer into the cloaca and then tighten sutures onto this. When the thermometer is removed, faeces and urates can still escape past the sutures.

![Purse-string suture](image1.png)  ![Transverse Sutures](image2.png)
Hints and Tips

For most parrots I prefer to use two transverse sutures to approximate the lips of the vent, because the vent is an ovoid shape and these sutures retain the shape better than a purse-string which tends to make the shape circular and not ovoid.

8. ACUTE SEPTICAEMIA

History

- Acute onset
- History of a stressful event within previous 24 hours
- Rapid decline in bird’s condition - these birds can die within 6-12 hours
- Bacteria commonly involved:
  - *E coli*
  - *Salmonella*
  - *Yersinia*
  - *Staphylococci & Streptococci*
  - *Pasteurella*

Clinical Signs

- Sick Bird Look (lethargy, depression, fluffed up, on floor of cage, trembling, eyes closed)
- Good body condition
- Bird is weak and has minimal resistance to handling
- Droppings changes are variable
- Often increased urates and urine
- Faeces loose and small volume
- Urates may be off-white to green or yellow
- May demonstrate organisms with Gram stain of a blood smear - may be difficult to detect, often diagnosis is an educated guess.

Treatment

- Broad-spectrum antibiotics for at least 4 days (Appendix 4)
- Fluid therapy (isotonic fluids IV, IM, IO)
- Warm, humid environment
- Oxygen supplementation should be considered

9. BURNS

History (varies with location of the burn)

- Crop: Hand fed baby with crop burn - food heated in microwave and not mixed thoroughly
- Cutaneous/Topical: Free-flying pet lands on stove, fire or hot water
- Oral: Ingesting or feeding on: hot food from the owner’s table or caustic chemicals
Clinical Signs
- Signs vary with extent of injuries and tissues involved
- Usually they are depressed and fluffed up.
- Affected tissues erythematous and swollen

Treatment
- General supportive care
- Broad-spectrum antibiotics (Appendix 4)
- Fluid therapy (isotonic fluids IV, IM, IO)
- Corticosteroids (Dexamethasone 2-4 mg/kg IM, IV bid)
- Warm, humid environment and monitor for signs of shock
- Pain Relief (Appendix 3)

Specific Treatment

1. Crop Burn
- Nutritional support (hand-feeding) while fistula heals
- Postpone closure of fistula until eschar has sloughed and tissue necrosis has resolved. This may be 2 weeks or more
- Surgical closure - two layer, inner crop tissue inverting, 4/0 Dexion or PDS

2. Cutaneous/Topical Burn
- Apply an antibiotic cream (e.g. Silvazine®) or antibiotic/corticosteroid lotion (e.g. Neocort®) to the affected areas. Take care to not apply an excessive amount or to damage the feathers. Take care with applying any topical medication containing corticosteroids as there have been reports of birds absorbing enough to cause problems as they are very sensitive to corticosteroids.

3. Oral Burn
- Flush the mouth with saline - take care to not cause inhalation of fluid - flush with only small volumes and hold the head ventrally while flushing to encourage good drainage.
- Offer nutritional support
- Add glucose to the drinking water - aim for 5% concentration (1 heaped teaspoon of Glucodin® powder per 100mL drinking water)
- Offer soft foods only that are easily ingested
- Commercial Hand-rearing mix made up to normal concentration
- Madeira or similar plain cake
- Hard-boiled or scrambled egg, grated cheese
- Moistened breakfast cereal or baby food (Farex® etc.)
- Strained baby food (vegetables etc.)
- Soft fruit (grated apple, grapes, kiwifruit, plums etc.)
10. HEAT STRESS

History
- High range ambient temperature
- Bird exposed to direct sunlight and minimal shade provided in bird’s cage
- Lovebirds appear to be more prone to this problem, especially in flock situations where there is stress or competition.

Clinical Signs
- Rapid RR
- Panting with mouth open and neck extended
- Drooping of wings that are held away from the body and partially extended
- Prostrate on floor of cage
- Feathers held tightly
- Convulsions
- Bird feels hot and has poor tolerance of handling

Treatment
- Place in a cool environment
- Apply a cool water misted spray to the bird
- Gavage with cool water (room temperature - not too cold)
- Cool water enema
- Spray alcohol mist onto wing web or body - take care it is not ingested.

11. POISONINGS

The common means of toxin exposure are ingestion, inhalation or skin contact. Unless the bird is observed being exposed to a specific toxin, it is often impossible to identify the problem. Factors that play a role in determining the outcome of a toxin exposure include: patient size; duration of exposure and quantity of toxin.

History
- observed or possible exposure to a toxin

Clinical Signs
Extremely variable depending on the toxin

Treatment

1. Supportive care
- Warm, humid environment
- Fluid therapy (isotonic fluid IM, IV, IO)
- Supplemental oxygen if indicated

2. Reduce full absorption of toxin
   Cutaneous
• Wash the bird thoroughly in warm soapy water, then rinse several times.
• Beware chilling.

Ingestion
• Aspirate crop contents if it is a recent exposure
• Gavage with crushed activated charcoal slurry
• Gavage with laxative e.g. Psyllium (Metamucil® 0.5 teaspoon per 60mL water or baby food)

3. Reduce secondary injury
• Prevent self-injury from convulsions
• Place in a protected environment (padded cage, towel or stockinette)
• Sedative as required
  – Diazepam (0.5-1.0mg/kg IM bid-tid)
  – Pentobarbitone Sodium (3.0-5.0mg/100g IM, IV.) Give to effect. Do not exceed 5.0mg/kg
# APPENDIX 1

Common Avian Diseases/Emergency Conditions as Seen By Species
(based upon Rosskopf, 1987)

# SBL = Sick Bird Look, i.e. non specific signs of a sick bird
## Clearview is a *Chlamydia* detection kit from Oxoid

## AUSTRALIAN PARROTS

<table>
<thead>
<tr>
<th>Clinical Signs</th>
<th>Syndrome</th>
<th>Tests</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wounds</td>
<td>Fighting</td>
<td>Observation</td>
<td>Antibiotics, sutures</td>
</tr>
<tr>
<td>Injured fledgling</td>
<td>Wall Crashing</td>
<td>Observation</td>
<td>Antibiotics, Dexamethasone, Supportive therapy</td>
</tr>
<tr>
<td>Depression, SBL#</td>
<td>Bacterial infection</td>
<td>Gram, C&amp;S, Haematology</td>
<td>Antibiotics, Supportive therapy</td>
</tr>
<tr>
<td>Upper Resp. Infection + SBL</td>
<td>Chlamydia suspect</td>
<td>Gram, C&amp;S, Haematology, Clearview##</td>
<td>Doxycycline, Enrofloxacin, Supportive therapy</td>
</tr>
<tr>
<td>SBL, weight loss, Deaths in aviary</td>
<td>Parasite infestation, usually Ascarids</td>
<td>Faecal exam.</td>
<td>Ivermectin, Supportive therapy</td>
</tr>
</tbody>
</table>

## BUDGERIGARS

<table>
<thead>
<tr>
<th>Clinical Signs</th>
<th>Syndrome</th>
<th>Tests</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBL, weight loss, Swollen abdomen, Dyspnoea, Polyuria</td>
<td>Neoplasia (usually in birds &gt;1 year old)</td>
<td>Haematology, cytology of abdominal aspirate</td>
<td>Supportive therapy. Euthanasia if required</td>
</tr>
<tr>
<td>Unilateral paralysis</td>
<td>Gonadal or renal tumour Nephritis</td>
<td>Radiograph, Abdominal aspirate cytology</td>
<td>Supportive therapy</td>
</tr>
<tr>
<td>Lameness, non-weight bearing</td>
<td>Fractured bone</td>
<td>Physical examination, Radiograph</td>
<td>Splint/Surgery, Supportive therapy</td>
</tr>
<tr>
<td>Limping, Polyuria, Swelling joints of foot/legs</td>
<td>Gout/kidney failure</td>
<td>Signs, joint aspirate</td>
<td>Antibiotics, NSAIDS, Allopurinol</td>
</tr>
<tr>
<td>Scale/crust on face, legs, vent or periocular</td>
<td>Cnmidocoptes</td>
<td>Signs, skin scraping</td>
<td>Ivermectin, Supportive therapy</td>
</tr>
<tr>
<td>SBL, polyuria</td>
<td>Diabetes mellitus</td>
<td>Urinalysis, Blood Glucose</td>
<td>Insulin, Supportive therapy</td>
</tr>
<tr>
<td>SBL, polyuria</td>
<td>Pseudodiabetes</td>
<td>Urinalysis, Blood Glucose</td>
<td>Supportive therapy</td>
</tr>
<tr>
<td>Clinical Signs</td>
<td>Syndrome</td>
<td>Tests</td>
<td>Treatment</td>
</tr>
<tr>
<td>----------------</td>
<td>----------</td>
<td>-------</td>
<td>-----------</td>
</tr>
<tr>
<td>SBL, vomiting</td>
<td>Bacterial infection, Trichomoniasis</td>
<td>Crop wash &amp; Gram stain</td>
<td>Antibiotics, Supportive therapy</td>
</tr>
<tr>
<td>Vomiting, lipomas present, obesity, lipaemia</td>
<td>Hypothyroidism, Goitre, Iodine deficiency</td>
<td>Signs, Crop wash, Diet history</td>
<td>Thyroxine, Iodine supplement</td>
</tr>
<tr>
<td>Fledgling mortality approx. 7-14 days age</td>
<td>Papovavirus/ Polyomavirus</td>
<td>Post mortem examination and histopathology</td>
<td>Supportive therapy</td>
</tr>
<tr>
<td>Weight loss, loose droppings, pruritus</td>
<td>Giardiasis</td>
<td>Faecal examination</td>
<td>Imidazole antibiotics (Metronidazole, Dimetridazole, Ronidazole, Carnidazole)</td>
</tr>
<tr>
<td>Upper Respiratory Infection, weight loss</td>
<td>Atypical Psittacosis</td>
<td>Faecal Gram stain Clearview Test</td>
<td>Doxycycline, Enrofloxacin, Supportive therapy</td>
</tr>
<tr>
<td>SBL, straining/tenesmus</td>
<td>Obstetric problem, Egg Binding</td>
<td>Physical examination, Haematology, Radiograph</td>
<td>Calcium, Oxytocin, Aspirate/collapse egg, Antibiotics, Supportive therapy</td>
</tr>
</tbody>
</table>

**CANARY**

<table>
<thead>
<tr>
<th>Clinical Signs</th>
<th>Syndrome</th>
<th>Tests</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBL</td>
<td>Bacterial infection Septicaemia</td>
<td>Physical examination Faecal Gram stain, C&amp;S</td>
<td>Antibiotics, Supportive therapy</td>
</tr>
<tr>
<td>Malformed feathers, Subcutaneous swellings</td>
<td>Feather cysts</td>
<td>Physical examination</td>
<td>Surgery/ablation</td>
</tr>
<tr>
<td>URTI, Dyspnoea, Squeaking</td>
<td>Air sac mite</td>
<td>Signs, Transilluminate trachea</td>
<td>Ivermectin/Moxidectin Enrofloxacin, Doxycycline, Supportive therapy</td>
</tr>
<tr>
<td>Scabs/lesions on face, eyelids and feet</td>
<td>Canary Pox</td>
<td>Signs</td>
<td>Antibiotics, Supportive therapy</td>
</tr>
<tr>
<td>SBL, Toe loss</td>
<td>Dry gangrene (Aflatoxin)</td>
<td>Signs</td>
<td>Antibiotics, Surgery, Supportive therapy, Change food/diet</td>
</tr>
<tr>
<td>SBL, Straining/tenesmus, Sudden death</td>
<td>Egg binding</td>
<td>Signs, Radiograph</td>
<td>Calcium, Oxytocin, Aspirate/collapse egg, Antibiotics, Supportive therapy</td>
</tr>
</tbody>
</table>
**COCKATIEL**

Apply same signs as for the Budgerigar as well as:

<table>
<thead>
<tr>
<th>Clinical Signs</th>
<th>Syndrome</th>
<th>Tests</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow plaque in mouth</td>
<td>Candidiasis</td>
<td>Gram stain of exudate/plaque</td>
<td>Nystatin, Ketoconazole</td>
</tr>
<tr>
<td>Chronic SBL, bleeding, mental retardation, low disease resistance</td>
<td>Lutino Cockatiel Syndrome</td>
<td>Signs</td>
<td>Symptomatic treatment Supportive Therapy</td>
</tr>
<tr>
<td>Acute dyspnoea</td>
<td>Inhaled seed Tracheal foreign body Aspergillosis</td>
<td>Signs</td>
<td>Abdominal Air sac catheter, Antibiotic, Nebulisation, Supportive therapy</td>
</tr>
</tbody>
</table>

**COCKATOOS**

<table>
<thead>
<tr>
<th>Clinical Signs</th>
<th>Syndrome</th>
<th>Tests</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBL, Beak deformity Feather loss/dystrophy</td>
<td>PBFD, Psittacine Circovirus</td>
<td>Signs, Biopsy, PCR, HA + HI (Haemagglutination + Haemagglutination Inhibition Tests)</td>
<td>Supportive therapy, treat concurrent disease</td>
</tr>
<tr>
<td>Crushed beak, Severe wounds elsewhere on body</td>
<td>Aggressive mate</td>
<td>Signs</td>
<td>Beak surgery, Antibiotics, Dexamethasone, Supportive therapy</td>
</tr>
<tr>
<td>Self-mutilation, Atypical aggression</td>
<td>Behavioural abnormality</td>
<td>Signs</td>
<td>Behavioural therapy MPA</td>
</tr>
<tr>
<td>SBL</td>
<td>Bacterial infection or septicaemia, Chlamydia</td>
<td>Faecal Gram stain, C&amp;S, Haematology, Clearview</td>
<td>Antibiotics, Supportive therapy</td>
</tr>
<tr>
<td>SBL, Vomiting</td>
<td>Trichomoniasis</td>
<td>Crop wash, wet mount, Gram stain</td>
<td>Imidazole antibiotics (Metronidazole, Dimetridazole, Ronidazole, Carnidazole), Supportive therapy</td>
</tr>
<tr>
<td>SBL, Vomiting, Tomato soup droppings</td>
<td>Heavy metal toxicity</td>
<td>Radiograph, Haematology</td>
<td>EDTA, Supportive therapy</td>
</tr>
</tbody>
</table>

**CONURES**

<table>
<thead>
<tr>
<th>Clinical Signs</th>
<th>Syndrome</th>
<th>Tests</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBL</td>
<td>Bacterial/Chlamydia infection</td>
<td>Faecal Gram stain, C&amp;S, Haematology, Clearview</td>
<td>Antibiotics, Supportive therapy</td>
</tr>
<tr>
<td>SBL, Dyspnoea, Epistaxis, Coughing Blood, Melena</td>
<td>Conure Bleeding Syndrome</td>
<td>Signs, Haematology</td>
<td>Antibiotics, Ca/Vit K inj, Supportive therapy</td>
</tr>
</tbody>
</table>
## LOVEBIRDS

<table>
<thead>
<tr>
<th>Clinical Signs</th>
<th>Syndrome</th>
<th>Tests</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBL, +/- Diarrhoea +/- Polyuria</td>
<td>Bacterial/Chlamydia infection</td>
<td>Faecal Gram stain, C&amp;S, Haematology, Clearview</td>
<td>Antibiotics, Supportive therapy</td>
</tr>
<tr>
<td>Wounds</td>
<td>Fighting</td>
<td>Signs</td>
<td>Surgery, Antibiotics, Control bleeding</td>
</tr>
<tr>
<td>SBL, Coma</td>
<td>Heat stress</td>
<td>Signs</td>
<td>Water bath, Dexamethasone, Supportive therapy</td>
</tr>
<tr>
<td>Severe self mutilation esp. base of tail and wing web/dorsal shoulder</td>
<td>Lovebird Pox</td>
<td>Signs</td>
<td>Collar or Neck-brace Antibiotics, Anti-viral creams</td>
</tr>
<tr>
<td>Severe self mutilation esp. base of tail and wing web/dorsal shoulder</td>
<td>Pruritic Polyfolliculosis</td>
<td>Polyfollicles (multiple shafts in a follicle)</td>
<td>Collar or neck-brace Homeopathic treatments (Australian Bushflower essences)</td>
</tr>
</tbody>
</table>

## FINCHES

<table>
<thead>
<tr>
<th>Clinical Signs</th>
<th>Syndrome</th>
<th>Tests</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBL</td>
<td>Bacterial infection or septicaemia</td>
<td>Faecal Gram stain, C&amp;S, Haematology</td>
<td>Antibiotics, Supportive therapy</td>
</tr>
<tr>
<td>SBL, Weight Loss, Mortalities</td>
<td>Trichomoniasis</td>
<td>Cytology (wet mount) Post-mortem exam</td>
<td>Imidazole antibiotics (Metronidazole, Dimetridazole, Ronidazole, Carnidazole), Supportive therapy</td>
</tr>
<tr>
<td>SBL, Chronic Weight loss, Mortalities, segments protruding from cloaca</td>
<td>Tapeworm infestation</td>
<td>Signs, Post-mortem exam</td>
<td>Praziquantel, Supportive therapy</td>
</tr>
<tr>
<td>SBL, Straining/tenesmus, Abdominal swelling</td>
<td>Egg bound</td>
<td>Signs, Radiograph</td>
<td>Calcium, Oxytocin, Aspirate/collapse egg, Antibiotics, Supportive therapy</td>
</tr>
<tr>
<td>Dyspnoea, Weight loss, Squeaking (esp. Gouldian)</td>
<td>air sac mite</td>
<td>Signs, Transilluminate trachea</td>
<td>Ivermectin/Moxidectin, Enrofloxacin, Doxycycline, Supportive therapy</td>
</tr>
<tr>
<td>Toe Loss</td>
<td>Aflatoxin</td>
<td>Signs, Physical examination</td>
<td>Remove material/surgery antibiotics, change food</td>
</tr>
<tr>
<td>Chronic weight loss, Passing whole seed</td>
<td>Gizzard worm infestation</td>
<td>Signs, Faecal exam</td>
<td>Levamisole, Ivermectin/Moxidectin (variable response), Supportive therapy</td>
</tr>
</tbody>
</table>


# APPENDIX 2

## Emergency Drug Doses

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dosage/Directions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allopurinol</td>
<td>1 x 100mg tab crushed in 10mL water give 1 drop q.i.d.</td>
</tr>
<tr>
<td>B-Complex inj.</td>
<td>0.1mL/100g s.i.d for 5 days</td>
</tr>
<tr>
<td>Calcium Syrup</td>
<td>Budgerigar: 2-5 drops each hour, Cockatoo: 1-2mL per hour</td>
</tr>
<tr>
<td>Dexamethasone</td>
<td>0.2-0.8mg/100g</td>
</tr>
<tr>
<td>Diazepam</td>
<td>0.05mL/454g (of 5mg/mL solution)</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>2.5-5.0mg/100g PO s.i.d or 7.5-10.0mg/100g IM once each 7 days</td>
</tr>
<tr>
<td>Calcium EDTA</td>
<td>25-100mg/kg b.i.d until asymptomatic then b.i.w for 4-6 weeks</td>
</tr>
<tr>
<td>Enrofloxacin</td>
<td>3mg/100g b.i.d. per os or IM</td>
</tr>
<tr>
<td>Ivermectin</td>
<td>200-1000 g/kg per os or IM</td>
</tr>
<tr>
<td>Ketoconazole</td>
<td>2.5mg/100g b.i.d.</td>
</tr>
<tr>
<td>Levamisole</td>
<td>4mg/100g</td>
</tr>
<tr>
<td>Moxidectin</td>
<td>200mcg/kg per os</td>
</tr>
<tr>
<td>MPA</td>
<td>3mg/100gm IM</td>
</tr>
<tr>
<td>Nystatin</td>
<td>300,000 IU/kg each 8-12 hours</td>
</tr>
<tr>
<td>Oxytocin</td>
<td>0.01-1.0mL IM</td>
</tr>
<tr>
<td>Piperacillin</td>
<td>10mg/100g</td>
</tr>
<tr>
<td>Praziquantel</td>
<td>0.25 x 23mg tablet per kg</td>
</tr>
<tr>
<td>Vitamin K</td>
<td>0.2-2.5 mg/kg body wt</td>
</tr>
</tbody>
</table>
## APPENDIX 3

### Analgesic Drugs Reported in the Literature3,4

<table>
<thead>
<tr>
<th>Class</th>
<th>Medication</th>
<th>Dose</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opioid</strong></td>
<td><strong>Morphine</strong></td>
<td>2.5-30 mg/kg IM</td>
<td>in Galliformes</td>
</tr>
<tr>
<td></td>
<td>Butorphanol (Torbugesic®)</td>
<td>Most birds1-4 mg/kg IM Raptor 1-2 mg/kg Af Grey, Cockatoos &amp; Cockatiels 1-3mg/kg Amazons &amp; Macaws 2-4mg/kg</td>
<td>analgesia lasts 3-8 hours. Usually repeat each 6 hours. If patient is sleepy or ataxic, adjust the dose down</td>
</tr>
<tr>
<td></td>
<td><strong>Buprenorphine</strong></td>
<td>0.01-0.05 mg/kg IM, may need dose as high as 0.2mg/kg for parrots</td>
<td>clinical duration 8-12 hours.</td>
</tr>
<tr>
<td><strong>Alpha-adrenergic Agonist</strong></td>
<td>Xylazine</td>
<td>1-4 mg/kg IM</td>
<td>up to 10 mg/kg in small psittacines</td>
</tr>
<tr>
<td></td>
<td>Detomidine</td>
<td>0.3 mg/kg IM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Metomidine</td>
<td>0.1 mg/kg IM</td>
<td></td>
</tr>
<tr>
<td><strong>Alpha-adrenergic Agonist Reversal</strong></td>
<td>Yohimbine</td>
<td>0.1 mg/kg IV</td>
<td>used in raptors</td>
</tr>
<tr>
<td></td>
<td>Tolazoline</td>
<td>115 mg/kg IV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Atipamezole</td>
<td>no dose available</td>
<td></td>
</tr>
<tr>
<td><strong>Anti-inflammatory Corticosteroids</strong></td>
<td>Dexamethasone</td>
<td>1-2 mg/kg IM</td>
<td>there is a concern re immunosuppressive effects of corticosteroid</td>
</tr>
<tr>
<td></td>
<td>Betamethasone</td>
<td>0.1 mg/kg IM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Methylprednisolone Acetate</td>
<td>0.5-1.0 mg/kg IM</td>
<td></td>
</tr>
<tr>
<td><strong>Anti-inflammatory Non-steroidal</strong></td>
<td>Flunixin meglumine</td>
<td>1.0-10 mg/kg IM sid</td>
<td>high dose (10 mg/kg) to budgerigars caused transient regurgitation and tenesmus</td>
</tr>
<tr>
<td></td>
<td>Meclofenamic Acid</td>
<td>2.2 mg/kg PO sid</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acetylsalicylic Acid (Aspirin)</td>
<td>5.0-10.0 mg/kg PO sid to bid</td>
<td>Does not appear to be effective</td>
</tr>
<tr>
<td></td>
<td>Meloxicam</td>
<td>0.1mg/kg sid IM or PO</td>
<td></td>
</tr>
<tr>
<td><strong>Other drugs</strong></td>
<td>Diazepam</td>
<td>0.5-2.0 mg/kg IV or IM</td>
<td>Provide skeletal muscle relaxation</td>
</tr>
<tr>
<td></td>
<td>Midazolam</td>
<td>1 mg/kg IM</td>
<td>Provide skeletal muscle relaxation</td>
</tr>
<tr>
<td></td>
<td>Methocarbamol</td>
<td>50 mg/kg IV bid</td>
<td>for muscle relaxation</td>
</tr>
<tr>
<td></td>
<td>Metomidate</td>
<td>5-15 mg/kg</td>
<td>Hypnotic premedicant</td>
</tr>
<tr>
<td></td>
<td>Bupivicane &amp; DMSO (1:1)</td>
<td>apply topically to cut surfaces</td>
<td>Applied to chicken beaks immediately after trimming</td>
</tr>
</tbody>
</table>

* The other drugs listed above are not analgesics but used concurrently with analgesics they do appear to decrease pain perception
PAIN MANAGEMENT PROTOCOL

Pre-Surgical – to be administered no less than 30 minutes before and 2 hours prior to surgery
Butorphanol 10mg/ml injectable solution (e.g. Torbugesic®), dose is 1mg/kg = 0.01ml/100g. For birds under 100g dilute 1:10 with saline and give 0.1ml/100g IM.

Post-Surgical – to be administered immediately post-surgically
Give all species Meloxicam at 0.2mg/kg PO = 0.004ml/100g. For birds under 100g dilute 1:10 with saline and give 0.04ml/100g

Take Home Medication
Unless otherwise directed, all species are to go home on Metacam Oral 0.2mg/kg twice daily i.e. 0.02ml/kg once daily for at least 10 days.
The protocol above is used by Dr Bob Doneley, West Toowoomba Vewterinary Surgery as the basis of pain control in his hospital.
# APPENDIX 4

**Antibiotic Use Pending Culture & Sensitivity Results**  
*(based upon Harrison et al. 1986)*

<table>
<thead>
<tr>
<th>Clinical Signs</th>
<th>Gram Stain Results</th>
<th>Antibiotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressed, emaciated, polyuric</td>
<td>Normal or slightly low number of bacteria</td>
<td>Amoxycillin +/- Clavulanic Acid</td>
</tr>
<tr>
<td>Depressed, emaciated, polyuric</td>
<td>High % Gram negative</td>
<td>Amikacin + Piperacillin</td>
</tr>
<tr>
<td>Polyuric</td>
<td>Low % Gram positive</td>
<td>Piperacillin + Probiotic</td>
</tr>
<tr>
<td>Respiratory signs or eye disease in Cockatiels</td>
<td>Normal</td>
<td>Lincospectin, Piperacillin, Enrofloxacin, Doxycycline</td>
</tr>
<tr>
<td>Respiratory signs or eye disease in Neophema/Polytelis</td>
<td>Normal</td>
<td>Doxycycline or Enrofloxacin Injection</td>
</tr>
<tr>
<td>Chlamydiosis suspect</td>
<td>Low bacterial count</td>
<td>Doxycycline or Enrofloxacin + Probiotic</td>
</tr>
<tr>
<td>Chlamydiosis suspect</td>
<td>Low % Gram positive + high % Gram negative</td>
<td>Doxycycline or Enrofloxacin + Amikacin + Probiotic</td>
</tr>
</tbody>
</table>
Reptiles Techniques

**Blood collection**: Blood is collected from different sites in different species.

<table>
<thead>
<tr>
<th></th>
<th>Jugular Vein</th>
<th>Dorsal Coccygeal Sinus/Vein</th>
<th>Ventral Coccygeal Vein</th>
<th>Dorsal Cervical Sinus</th>
<th>Cardiac Puncture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chelonian</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Lizard</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snake</td>
<td></td>
<td></td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Crocodilian</td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>

**Blood collection (and intravenous injection sites)**

Collect volumes up to 0.6% of body weight in chelonians and up to 0.9% in other reptiles.

Store the blood in heparin microtainers and perform tests as indicated by your clinical examination.

**Chelonia**

In most side-necked turtles the left jugular vein is used. The subcarapacial method has also been described but is not used commonly.

**Squamata**

The ventral coccygeal vein is used for bleeding and intravenous injection in most lizards (skinks, dragons, monitors). This route is also commonly used in snakes. Blood collection by cardiac puncture and the palatine veins (large pythons) has also been described but is not recommended in conscious animals. The heart is often difficult to locate in snakes. In most cases a 1 ml tuberculin syringe and 25 gauge needle are adequate for venipuncture. A 3 ml syringe and 23 gauge needle may be used in pythons larger than 3 kg and large monitors.

**Ventral Coccygeal Vein: tips for collection**

- Lizards have a Chevron bone over haemal canal
- Hold snake or lizard so last 1/3 of tail hangs vertically
  - or bend over a table
- Need 2 People
  - Handler hold snake vertically
  - ventral aspect away from holder
  - TAIL MUST BE STRAIGHT
  - Hindlimbs restrained alongside tail
• Place needle 25-33% proximal tail in males
  • more proximally in females – no hemipenes
  • Insert needle in in cranial direction, midline
  • at approx 80°, parallel to long axis of body
  • Pause until stops struggling
  • Advance until strike bone, draw back
  • If no blood, need to “walk” needle cranially along bone until drops deeper between 2 chevron bones
  • Advance until strike bone, may need to withdraw slightly to collect blood

**Cloacal wash**

Using a red rubber catheter, a small amount of warm saline may be introduced (inject and aspirate several times) into the cloaca to obtain a diagnostic sample. The urodeum lies ventrally and the coprodeum is dorsal in the proximal cloaca. Protozoa and the ova of other endoparasites may be detected by direct faecal flotation and analysis. Do not force the catheter as you may damage to cloacal or coelomic tissues - use plenty of lubricant (K-Y gel or similar).

**Tracheal wash**

A transtracheal aspirate is useful for microbiological and cytological analysis in cases of respiratory disease. The glottis in turtles, snakes and monitors is conveniently situated in the rostral part of the mouth. The technique is identical to that used in small mammal medicine.

**Radiology**

Chelonians will usually sit on the cassette for radiography. Three views should be taken for proper assessment: Dorso-ventral, horizontal lateral and horizontal anteroposterior.

Crocodiles, lizards and snakes need to be taped (stickytape, masking tape, Micropore® etc.) to the cassette to position them correctly. An alternative is to anaesthetise them with Isoflurane or Alfaxan® IV/IM. The standard 2 views are taken. Snakes are best taken with the stretched out position as the coiled view is not usually useful for diagnosis. Use X-ray marking tape to signify distance from nose and which end is anterior for ease of reading.

Radiology is a useful diagnostic aid. For example, it is essential for gender determination in varanidae, assessing gravid turtles and Metabolic Bone Disease in lizards. The latter may be graded over the course of treatment using a step wedge device (PT-11 Penetrometer [Eseco-Speedmaster, Oklahoma]). Fractures of the carapace, plastron and limbs in chelonia and limb fractures in lizards are also routinely radiographed. Fine detail mammography film is useful in small reptiles.

Develop an exposure chart for reptiles on your machine to make good diagnostic radiographs.

**Other Imaging Techniques**

Ultrasound, computerised tomography and MRI are used in the USA, UK and Europe as diagnostic tools to varying degrees. Their usefulness appears limited in everyday reptile practice.
Endoscopy

Endoscopy is commonly used in reptile practice in the USA and UK, especially in iguanas and increasingly in chelonia. Previously endoscopy was used mainly as a diagnostic tool to examine and biopsy internal organs but recently it has been used for local, targeted medical therapy and minimally invasive surgical procedures. In Australia where snakes are more popular, there appears to be less demand for endoscopy. Palpation, transcutaneous biopsy and coeliotomy are more commonly used for diagnostic purposes.

Intravenous catheter placement: This is used in the Cephalic vein of larger lizards and is useful for medication and fluid therapy. Animals are best sedated with Alfaxan®. The catheter is placed with sterile technique and cut-down as in other animals, on the dorsal distal aspect of the foreleg. The catheter can be secured with Superglue®, suture or Micropore® tape.

Intraosseous catheters can also be used in small lizards in the femur, tibia or humerus.

Fluid Therapy:

Oral fluid medication is useful in reptiles that are warmed correctly. Similarly, subcutaneous and intra-coelomic fluids are not absorbed well in cool animals. I will always warm any patient prior to delivering fluids. If they are not warmed they are unable to efficiently absorb enteral fluids. If the patient is less than 5% dehydrated, oral replacement is usually successful.

The principles of using crystalloid or colloid fluids in reptiles, is similar to that in dogs and cats. Any of the crystalloids are appropriate in reptiles. During anaesthesia and surgery deliver at 5-10 ml/kg/hr.

In mammals, fluids are most commonly directed towards restoring plasma volume, while in reptiles restoring intracellular fluid is equally important. The most common intravenous and intraosseous fluids used are Normasol, 0.9% saline, Hartmanns (Lactated Ringers solution - LRS) or LRS + 2.5% Dextrose. These expand the plasma volume but do not expand the intracellular space. So prolonged use can lead to hypokalaemia, so potassium supplementation may be required. The addition of potassium should not exceed 0.5 mEq/kg/hr unless serum electrolytes are being frequently measured.

There is also controversy as to the use of lactated fluids in reptiles because of the build-up of lactate. Generally the volume in commonly used fluids is not a problem unless the liver is end-stage.

Mildly hypotonic fluids are preferred for dehydrated reptiles:

- 2 parts (2.5% dextrose in 0.45% Saline) + 1 part (Ringer’s solution, LRS or Normosol))

Once rehydrated use hypertonic solutions such as LRS, Normosol, Ringers OR 2.5% dextrose in 0.45% NaCl for maintenance at 1-3% body weight daily.

Iv fluids are useful for severe dehydration or shock but locating and accessing a vein is usually not possible. Fluid delivery is usually SC or Intracoelomic (IP equivalent). Deliver a volume of 2-3% body weight daily until rehydrated.
Euthanasia

The most appropriate method is Pentobarbitone 150mg/kg either IV, intracardiac or intracoleomic. In many cases sedation or anaesthesia with Alfaxan® (2-4 mg/kg IV,IM), Zoletil® (25-50mg/kg IM) or Ketamine (100mg/kg IM) is recommended 20-30 minutes prior to using pentobarbitone. Pithing or injection of euthanasia solution directly into the brain is acceptable in an anaesthetized animal.

Many sick animal are hypothermic, so it is important that the euthanasia solutions must be delivered into an animal that is warmed to its normal temperature or the medications will not be absorbed effectively.

It is often a difficult task to determine if a reptile is indeed dead, so some reptile veterinarians recommend decapitation or freezing for 24 hours after all signs of life have gone.

Freezing is not an acceptable method as ice crystal formation in the tissues will cause pain and distress to the reptile. Decapitation and exsanguination are also unacceptable as they are inhumane. Many reptiles have a diving reflex and so can withstand significant hypoxia and decapitation does not cause the reptile to become immediately unconscious. These may be useful only in anaesthetized patients.

Any venomous reptile that has been euthanased can still pass venom to people that accidentally come into contact with its fangs. So it is strongly recommended that all venomous reptiles be decapitated (after apparent death) and the head be carefully transferred to a solid container, such as a urine collection jar, so it is no longer a risk factor when the dead reptile is handled.
Small Mammals

Ferrets

Rabbits

Rodents
Critical care at the front desk: dealing with difficult behaviours.
Robyn Edleston, Abby Brown, Bonnie Douglas, Casey Morrison

1. Introduction
The topic for this session is dealing with difficult behaviours and refers to both clients and their pets, how these might interact and when and how one might prevent these behaviours.
It is important to the practice, the client and the pet that we deal appropriately with these behaviours and the veterinary nurse can play a significant role.
Through communication and education the client will become loyal to the practice, they will have confidence in the ability of the staff to deal with their problems and will feel much less hesitant about approaching the clinic when problems are small (rather than waiting until the problem develops into a serious situation)
Word of mouth is your best form of advertisement.
Happy patient = happy client = happy staff . everyone’s a winner.

The session will take the form of a forum which means that we encourage interaction from you in the form of questions and comments. We have 3 speakers, all veterinary nurses with considerable experience in veterinary practice who will cover a particular aspect of dealing with difficult behaviours.
Our first speaker is Abby Brown who will talk about how we can get owners to become compliant, the importance of practice protocols for dealing with difficult behaviours and dealing with aggressive clients.

2. Abby:
Behaviour triage: A attitude .keep it positive, do not prejudge
B: behaviour:our behaviour towards the problem
C: care and concern for client, our patient and ourselves.

1. How to get owners to become compliant-
* Talk to client about what pet is suitable for them before they get a new pet and discuss why a particular breed/species would or would not be appropriate

- Free visit with their new pet with vet nurse for general discussion. May not be aware they have a problem eg jumping up, urinating, learn to trust in nurses ability and knowledge
2. When there is a problem
   If training is required refer if your clinic does not offer it.
   Remember the pet is our patient and we have no right to use force.
   Have proper protocols in place for dealing with different behaviour problems for dogs and cats
3. Aggressive clients
   - regarding their pet’s behaviour
   - dealing with payments
Our second speaker is Bonnie Douglas who will talk about problem behaviours in dogs and cats and how she deals with these by way of a selection of case studies.

3. Bonnie:
   Problem dogs: general approach
   Case Studies:
   Bella Nichols: fear and compliance
   Storm Mitchell: entire male
   Amber Carwood: territorial
   Bella Gerathy: bad previous experience
   Problem Cats: general approach
   Louise Abra
   Talis Lord
   Phantom Cattell: Jekyll and Hyde

   Third speaker Casey Morrison will talk about prevention of difficult behaviours (When and how we can prevent them from occurring – how to nip it in the bud)

4. Casey
   Puppy preschool
   Dog training classes
   Agility?
   Kitten kindy?

5. Tips and Tricks
The administration of appropriate types and quantities of intravenous fluids is the cornerstone of emergency therapy and critical care. The primary concern in a patient presenting as an emergency is to check for evidence of poor tissue perfusion. This is an indication of circulatory shock.

The aim of emergency fluid therapy is to re-expand the effective blood volume in order to maintain perfusion to the major organs and hence adequate oxygen delivery.

Circulatory shock

There are three types of circulatory shock and they may occur simultaneously. All result in poor perfusion of body tissues and inadequate oxygen delivery.

1. Hypovolaemic Shock is the most common form of shock and occurs as a result of blood volume loss due to haemorrhage or severe dehydration.
2. Cardiogenic Shock can occur as a consequence of cardiac failure (e.g. Dilated Cardiomyopathy), with poor cardiac function resulting in hypoperfusion of body tissues.
3. Vasodilatory Shock is a result of generalised vasodilation resulting in pooling of blood in the vascular space and very low blood pressure. (causes include septicaemias and anaphylactic reactions).

Diagnosing Circulatory Shock

Regular examination of the cardiovascular system gives vital information. There may initially be some compensatory responses by the body which may make the animal appear more stable than what they actually are. For example in hypovolaemic and cardiogenic shock there is frequently marked activation of the sympathetic nervous system which results in elevations in heart
rate and peripheral vasoconstriction in an attempt to maintain blood pressure and perfusion. This protective response may make patients seem more stable than what they truly are.

**Nursing Care for Patients in Circulatory shock**

Regular monitoring of all vital signs is essential to a successful outcome in order to differentiate those patients who are deteriorating from those that are responding to treatment. Most patients will have a depressed mental state which may continue to deteriorate. Hypothermia if present must be recognised and treated. Oxygen therapy is **always indicated**.

Clinical signs for the three forms of Circulatory Shock can be summarised in the following table.

<table>
<thead>
<tr>
<th>CLINICAL SIGNS</th>
<th>Hypovolaemic and Cardiogenic Shock</th>
<th>Vasodilatory shock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Rate</td>
<td>Tachycardia (rapid HR) and end stage severe bradycardia (slow HR)</td>
<td>Tachycardia</td>
</tr>
<tr>
<td>Pulse strength</td>
<td>Weak becoming absent</td>
<td>Bounding (due to dilated blood vessels)</td>
</tr>
<tr>
<td>Mucous Membranes</td>
<td>Pale becoming white</td>
<td>Bright red (hyperaemic)</td>
</tr>
<tr>
<td>Capillary Refill Time</td>
<td>Prolonged</td>
<td>Rapid (as blood pooling in vessels)</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>May initially be normal due to sympathetic response then decline</td>
<td>Low</td>
</tr>
<tr>
<td>Temperature of Extremities</td>
<td>Cool (vasoconstriction)</td>
<td>Warm (vasodilation)</td>
</tr>
</tbody>
</table>
Comparing Cats to Dogs

The basic principles of emergency fluid therapy apply to both with some important differences. Cats often don’t present with tachycardia in response to circulatory shock and may be bradycardic without it suggesting a worse prognosis (bradycardia in dogs is suggestive of a worsening “shock” state). Cats have small blood volumes so are at much greater risk of fluid overload so extra care is needed when calculating and administering fluid doses. Cats are very prone to hypothermia (Active warming is essential in improving survival outcomes in cats).

Body Fluid Compartments

Before commencing intravenous fluids it is important to consider where that fluid will go. Roughly 60% of bodyweight consists of water of which 2/3 is intracellular and 1/3 extracellular (Interstitial fluid and plasma). Total blood volume is roughly 8% of bodyweight and plasma roughly 5% of bodyweight. Movement of fluid depends on how permeable (ie permitting passage) the barriers are and the concentration of molecules in each compartment. Water will tend to move into an area with a higher concentration of molecules (called osmosis). Blood vessel walls are permeable to water and electrolytes but not protein. The proteins (esp albumin) within blood vessels retain fluid with them and hence maintain blood volume (oncotic pressure). Cell membranes are only freely permeable to water. Across cell membranes the movement of water is dependent upon the relative concentrations of the fluids inside compared to around the cell.

Administering Emergency Fluids

With patients in Circulatory Shock fluid administration should be rapid with an aim to complete fluid resuscitation within 10-15 minutes. In terms of intravenous access short length and large diameter catheters are ideal and normally the Cephalic or Lateral Saphenous veins are used. If vascular collapse makes
peripheral veins impossible to access then the Jugular vein may be used. In very small neonates an intraosseous route into the medullary cavity of the Humerus, Femur or Tibia may be considered if venous access is impossible.

**Types of Fluids**

Three types of fluids may be used for emergency therapy and combinations of these may be used to enhance the benefits. They are:

1. **Isotonic Crystalloids** which have the same concentration of solutes as the blood and hence the same osmotic pressure.
2. **Colloids** (synthetic and natural) which supply oncotic pressure.
3. **Hypertonic Saline** which creates high osmotic pressure in the vascular space.

**Isotonic Crystalloids** (example Hartmann’s and 0.9% Sodium Chloride)

These are solutions containing small molecules that will pass freely out of the blood vessels and are capable of entering all body compartments. Due to the fact that these solutions “leak” from the blood vessels only about 1/5 of total volume given will remain in blood vessels. “Shock doses” of 90ml/kg given in bolus increments of 20-40ml/kg with regular reassessment are suggested. It is possible to give repeated boluses if a relapse is seen but consideration should be given to the possibility of ongoing blood loss. Rapid expansion of blood volume with crystalloid fluids may worsen blood loss.

**Benefits of Isotonic Crystalloids** –
They are inexpensive and readily available with a wide range of uses, not just in emergency resuscitation. In addition assuming renal function is adequate any excess fluid or solutes will be excreted in urine.

**Potential Problems with Isotonic Crystalloids** –
The benefit of intravascular expansion may be short lived with fluids redistributed within 1-2hrs. With repeated boluses there is a risk of interstitial oedema, dilution of RBCs and dilution of clotting factors.
**Colloids** (Examples – Dextran 70, Hetastarch are synthetic colloids, whole blood and plasma are natural colloids).

Colloids contain large molecules which do not pass out of normal blood vessels and as a result expand the intravascular space due to increasing the oncotic pressure. They are given in conjunction with isotonic crystalloids. “Shock doses” of 20ml/kg given as boluses of 5-10 ml/kg are suggested.

**Benefits of Colloids** –
Because of the low volumes used resuscitation can be achieved rapidly. In addition intravascular expansion lasts many hours beyond what is seen in crystalloids with benefits seen up to 12 hours later. Colloids may be of extra benefit if the patient is severely hypoproteinaemic in order to increase oncotic pressure.

**Potential Problems with Colloids** –
Despite in theory having many benefits for emergency fluid resuscitation there is no convincing evidence that colloids give better overall results for patients in circulatory shock compared to crystalloids. In addition synthetic colloids can cause an acquired coagulopathy. Colloids are also expensive and not multi-purpose.

**Hypertonic saline** (Example 7% saline).

Hypertonic saline causes a very rapid expansion of the intravascular compartment after administration. It creates a huge osmotic gradient and draws water into the vascular space from the interstitial compartment and from endothelial cells (lining the blood vessel walls) and red blood cells. A “Shock dose” of 4-7ml/kg of 7% hypertonic saline over 20 minutes is suggested.

**Benefits of Hypertonic Saline** –
Very small volumes of hypertonic saline are needed to perform fluid resuscitation. Improvements may also be seen in cardiovascular function with better myocardial contraction, some peripheral vasodilation and improved peripheral blood flow. Hypertonic saline may also help normalise cell function to recover from the hypoxic events of Circulatory Shock. It may be of extra benefit in those patients who present with brain trauma injuries and penetrating wounds.

**Potential Problems with Hypertonic Saline** –
Hypertonic Saline is short acting if used alone with benefits lasting less than 1 hour. The administration of Hypertonic Saline may result in bradycardia and arrhythmias (abnormal heart rhythms). It CANNOT be used if the patient is
dehydration as it pulls water from the interstitial and intracellular sites. Hypertonic saline should not be used if the patient has marked electrolyte disturbances due to its high sodium and chloride levels.

**Which Fluid is best for each type of Circulatory Shock?**

Isotonic crystalloids are most commonly used either alone or in combination due to the fact that they are readily available, cheap and are suitable for most patients presenting in Circulatory shock.

**Hypovolaemic Shock**

Hypovolemic shock occurs when more than 25% of intravascular volume is lost. Before commencing fluid therapy for Hypovolaemic shock we need to determine if the patient is also dehydrated. Dehydration refers to an insufficient amount of body water to maintain normal function affecting both the intracellular and extracellular fluid compartments. Severe dehydration can lead to Hypovolaemic shock but **hypovolaemic shock can occur without dehydration.** An accurate assessment of the hydration, electrolyte and total protein levels of the patient will determine our choice of fluids and the rate and duration of administration. After we treat an animal for Hypovolaemia shock there will still be a need for ongoing intravenous fluids if they are concurrently dehydrated.

In Hypovolaemic shock isotonic crystalloids are most commonly used and may be combined with hypertonic saline and colloids if the initial response to crystalloids is poor. If there is evidence of severe hypoproteinaemia (e.g. haemorrhagic gastroenteritis) extra consideration should be given to using colloids. Patients who have had severe haemorrhage or ongoing blood loss will need blood products (fresh whole blood, stored whole blood or packed red blood cells). The assessment of dehydration is summarised in the following table:
<table>
<thead>
<tr>
<th>DEHYDRATION PERCENTAGE</th>
<th>PHYSICAL ASSESSMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5%</td>
<td>Not detectable</td>
</tr>
<tr>
<td></td>
<td>May be history of water loss (vomiting or diarrhoea) or lack of water intake</td>
</tr>
<tr>
<td>6-8%</td>
<td>Mild to moderate.</td>
</tr>
<tr>
<td></td>
<td>Positive skin tenting test and oral mucous membranes are dry</td>
</tr>
<tr>
<td>10-12%</td>
<td>Marked. Eyes appear sunken in orbits, all mucous membranes appear dry, pronounced skin tenting and early signs of shock</td>
</tr>
<tr>
<td>12-15%</td>
<td>Circulatory collapse/ hypovolaemic shock</td>
</tr>
</tbody>
</table>

**Cardiogenic Shock**

In Cardiogenic shock there is poor delivery of oxygen to tissues due to heart failure. Patients will often present with distended jugular veins. In patients with heart failure it is vital **not** to administer intravenous fluids if they have evidence that their circulation is already “fluid overloaded”. The classic indication of this
would be pulmonary oedema secondary to congestive cardiac failure. Giving “extra” fluids in this situation will make the oedema worse. Small boluses of intravenous fluids may be given if there are no signs of fluid overload as may be seen in the initial stages of circulatory collapse with Dilated Cardiomyopathy.

In addition to the possible use of fluid therapy patients in cardiogenic shock need drugs to improve heart function (Positive Inotropes eg Dobutamine) as well as diuretics if there are indications of fluid overload (eg Frusemide).

**Vasodilatory Shock**

In Vasodilatory shock generalised vasodilatation results in poor tissue perfusion and may be seen as a consequence of septicaemias and anaphylactic reactions. Patients in Vasodilatory shock require very large doses of fluids due to the marked dilation of blood vessels that is occurring. Patients may also have protein loss through “leaking capillaries” due to the effect of septicaemias so colloids may help as part of the fluid resuscitation plan. In addition patients will often need drugs to help restore blood pressure (eg Dopamine).

**In Conclusion**

In Circulatory shock there is poor perfusion of body tissues leading to inadequate oxygen delivery. For most causes of circulatory shock prompt and aggressive intravenous fluid therapy is the basis of treatment. Essential nursing care involves ongoing and regular assessment of the patient’s vital signs. Oxygen therapy and active warming are other important nursing tools.

**References**