

Reptiles: husbandry and common conditions

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Husbandry of reptiles

The most common cause of disease in reptiles is poor husbandry so a good knowledge of the requirements of common species (Table 1) is necessary before starting medical treatment. Most disease in reptiles kept as pets is caused by inadequate diet and incorrect housing conditions mainly due to owner ignorance. The keeping of reptiles by amateurs is a recent phenomenon and many owners buy reptiles from pet shops without even a basic knowledge of what their pet eats. The problem is then amplified because owners rely on information provided by the pet shop, which is often inadequate. Ideally, reptiles should only be kept by experienced handlers (herpetologists) who have taken time to learn about their pet's husbandry requirements before purchase. The owners must also be prepared to invest a lot of money in the right equipment which can be expensive.

Table 1: Common reptile species seen in practice

| |
|---|
| Snakes – Cornsnake, rat snake, milksnake, kingsnakes, royal (ball) python and Burmese python, common boa, garter snake |
| Lizards – Green iguana, water dragons, bearded dragons, leopard geckos, bosc monitors, veiled chameleons, basilisk, uromastix |
| Chelonians – Hermann's tortoise, spur thigh tortoises, red eared terrapin, yellow-bellied terrapin, map turtles, Horsfield tortoise |

Temperature

Reptiles are ectotherms. They are not 'cold blooded' but, unlike mammals, they are unable to generate their own body heat. They therefore rely on external heat sources and regulate their body temperature by behavioural means. In the wild, they bask in the sun to heat up and when they become too hot they seek shade or change their body shape. All reptiles have a 'preferred optimum temperature zone' (POTZ), which varies according to species and their native habitats (Table 2). Below this range they become inactive and above they quickly die. The POTZ for common species can be obtained from reference books.

Table 2: Examples of POTZ in reptiles

| Reptile | Habitat | POTZ |
|---------------------|--------------------------|---------|
| Spur thigh tortoise | Temperate Mediterranean | 20–27°C |
| Boa constrictor | Equatorial South America | 25–30°C |

The 'preferred body temperature' (PBT) is the temperature required for active functioning of the reptile's system – catching prey, digestion of food, breeding, etc. When a reptile is sick, they do not become pyrexia like mammals, instead they will seek out the higher end of their POTZ (so called 'behavioural fever'). In captivity, all reptiles must be provided with a temperature gradient to allow them to

thermoregulate. This is why the best vivariums are long - they allow for a cool and a hot end.

Housing

A glass tank (vivarium) is essential for all snakes, lizards and young chelonians as they require high ambient temperatures for optimal health (Figure 1). Although, in Ireland, tortoises have traditionally been kept outdoors, this practice is not suitable for reptiles from a Mediterranean climate. They can be kept in the garden during the summer but should be kept in a confined area with a heat lamp and ultra violet light once the temperature drops below 20°C.

Terrapins are semi aquatic – they need a heated water tank with a land area (dry dock) where they can haul themselves out and bask under an ultraviolet (UV) light. Terrapins only feed in water so either a water filter should



Figure 1: Lizards and snakes must be kept in a heated tank called a vivarium. Cage furniture like rocks, waterbowls and logs must be provided.

be provided or the terrapin be placed in a separate feeding tank to prevent water fouling. Although terrapins can survive in cold water, this is not the correct environment for these species.

Cage furniture suitable to the species habitat should be provided. For example, arboreal species need branches while water-loving species need a water bath. Shade cover and a hidey-hole should always be provided. Rocks/logs are important for many species (especially snakes to aid skin shedding).

Heating

The vivarium needs a primary heat source to provide ambient temperature. This can be provided by heat conduction via heat pads or radiant heat from infrared/ceramic lamps. The primary heat source should never be provided by a light bulb as the temperature will drop too much when this is turned off at night. Reptiles suffer very easily from thermal burns (see below) so it is very important that they have no direct contact with the heat source. Make sure there is wire mesh surrounding the heat lamp or protective covering over the heat pad. A thermometer should be placed at each end of the vivarium to make sure the temperature does not go outside the temperature range for the species.

A secondary heat source (hot spot) is needed to provide a basking area for the reptile to aid digestion, well being etc. This should be placed at the high end of the POTZ. A light source can be used for this because when it gets switched off it will simulate the cooling of night. This basking light must be positioned according to the species (Table 3).

Table 3: Positioning of hot spot according to species - examples

| Reptile | Species type | Site of hot spot |
|--------------------|--------------|-----------------------|
| Iguanas | Arboreal | Situated above branch |
| Red-eared terrapin | Semi-aquatic | Over dry dock |

Table 4: Relative humidity requirements according to species - examples

| Reptile | Habitat | RH |
|---------------|-----------------|---------|
| Leopard gecko | Desert | 20 –30% |
| Common iguana | Central America | 70-85% |

Humidity

Most reptiles need some degree of humidity for optimum health and to help them shed their skin (ecdysis). Low humidity in the vivarium is the most common cause of skin retention (dysecdysis). The relative humidity (RH) required will depend on the native habitat of the species (Table 4). Humidity can be maintained by mist-spraying the vivarium regularly and providing a shallow water bath (large for high humidity). During ecdysis, shedding can be aided by mist-spraying the animal with warm water, providing a humidity chamber (plastic carton with damp tissue chamber/sphagnum moss) or placing the reptile in a warm water bath for 10 minutes. The humidity can be monitored

via a hygrometer within the vivarium. Ensure the vivarium is also adequately ventilated as high humidity and poor ventilation predispose to fungal infections.

Lighting

Wild reptiles rely on the sun’s ultraviolet rays for their well being and to stimulate reproduction. Ultraviolet light is also essential for converting provitamin D3 to pre vitamin D3 in reptile skin and hence for calcium metabolism. It is especially important for all lizards and juvenile chelonians, as these species commonly suffer from metabolic bone disease in captivity. Snakes are less affected because they get adequate calcium from eating whole vertebrate prey.

The light should be sited within 30cm of the animal and the bulb changed every six months for full UV effect. As this artificial light cannot hope to mimic true equatorial sun it may be beneficial to give access to unfiltered sunlight (not through a window) during a hot summer.

The photoperiod should also be provided according to the species. Temperate species should have 15 hours daylight in summer and nine hours in the winter, with equatorial species getting a 12-hour day and 12-hour night. As mentioned above, the heat source should never be the same as the light source otherwise the vivarium would get too cold at night.

Nutrition

The diet will depend on whether the reptile is an omnivore, herbivore or carnivore. All snakes are carnivores while chelonians and lizards can be herbivores or insectivores, according to species. To avoid nutritional deficiencies, a vitamin/ mineral supplement designed for reptiles (e.g., ‘Vetark Nutrobal’ or ‘Arkvits’) is recommended.

- Lizards

Lizards can be herbivore, omnivore or insectivore (Table 5).

Table 5: Diets for common lizard species

| Reptile | Diet classification | Advised diet |
|---------------------|---------------------|---|
| Iguana Uromastyx | Herbivores | 95% vegetables (leafy greens); 5% fruit |
| Chameleon Geckos | Insectivore | Crickets, locusts, mealworms, waxworms |
| Water dragon | Insectivore | Crickets, locusts, mealworms, waxworms, occasional greens |
| Bearded dragon | Omnivore | Crickets, locusts, mealworms, waxworms, leafy greens, ‘pinkies’ |
| Monitors | Omnivore | Crickets, locusts, mealworms, waxworms, ‘pinkies’, eggs, greens |

- Snakes

Snakes are usually fed rats and mice in captivity (except garter snakes which are fish-eating). Juvenile snakes are fed neonatal mice called ‘pinkies’ and immature mice with first fur called ‘fuzzies’. Most snakes can learn to feed on dead

prey so the feeding of live prey should not be encouraged (it is illegal in the UK). Owners should be warned that if the snake is anorexic, live prey can turn predator and inflict quite severe and even fatal wounds on snakes

- Chelonians

Chelonians can be herbivore or omnivore (Table 6).

Table 6: Diets for common chelonian species

| Reptile | Diet classification | Advised diet |
|---|---------------------|---|
| Spur thigh tortoise Hermann's tortoise Horsfield tortoise | Herbivores | 80% garden forage, weeds; 15% vegetables; 5% fruit, succulents |
| Terrapins | Omnivore | 70-80% animal protein (liver, mealworms, low fat dog food pellets, turtle pellets); 20-30% leafy greens, aquatic plants |

- Frequency of feeding

Reptiles have a slow metabolism so do not need to eat as frequently as mammals and need time to digest their food. The frequency of feeding will depend on the species and size. Chelonians and lizards usually eat daily or every other day. Small snakes eat about twice weekly and large snakes about every 2-4 weeks. Reptiles need the correct PBT to digest their food – if they are kept at sub-optimal temperatures, they may become anorexic or regurgitate.

Water requirements

This will vary with species. For example, chameleons in the wild sip dew off leaves so will not drink from a waterbowl in captivity. They can either be misted with a warm water spray twice daily or provided with a drip feed water system or waterfall which allows water to drip onto foliage into a collecting water bowl beneath. Tortoises prefer to immerse their head while drinking so should be provided with a large shallow tray.

Zoonotic disease

Reptiles may excrete *Salmonella* species in their faeces. Members of the public most at risk are young children, the elderly or immunocompromised patients. The most likely species to be affected are carnivores like the red-eared terrapin so owners should be advised that, although the incidence of disease is low, reptiles do not make ideal pets for young children. Good hygiene, like hand washing post-handling and wearing gloves for cleaning out contaminated tank water, is essential. Reptiles should not be housed in bedrooms, kitchens or bathrooms or anywhere near food.

The sick reptile

Many (but not all!) reptile owners are quite ignorant of their pet's needs and will often have sought advice from petshops, the internet and the guy in the supermarket queue before seeking veterinary attention. By the time the reptile is presented to the veterinary surgeon it will be invariably dehydrated and may not have eaten for weeks/months. Reptiles are 'uricotelic' creatures meaning the



Figure 2: Savannah monitor lizard having a water bath treatment for dehydration.

end product of protein metabolism is urates and not urea. Urates are very insoluble so even the slightest degree of dehydration can lead to deposition of urate crystals (called tophi) and life threatening visceral or articular gout. Remember, a sick reptile should not be given any drugs or food until it is rehydrated. If it is debilitated it will not be able to digest its food and this may rot in the stomach. The correct PBT must also be provided to aid metabolism of food and medical treatment.

Methods of rehydration

- The simplest, and a very effective, method of rehydrating reptiles is warm water baths (Figure 2). Place the lizard or tortoise in a shallow tray and keep the water warm for 10 minutes. Snake must be placed in a secure container, as they are great escapologists.
- Oral fluids by stomach tubing – even if the reptile is anorexic it is very important to rehydrate before giving food. Reptiles are relatively easy to tube as the glottis is forward-placed and tends to be closed more often than open. Pass the tube dorsally along the hard palate. The tube should be well lubricated with KY jelly and pre-filled with fluid to avoid injecting too much air. All oral fluids must be warmed. Larger species may need a mouth gag (e.g., folded radiographic film, roll of bandage, paper clip or speculum) to stop them biting the tube or handler.

In snakes, a well-lubricated nasogastric tube can be used as a stomach tube - inserted it into the cranial third of the animal (site of stomach). Hold the snake vertically during, and for one minute after, feeding to avoid regurgitation as they have a weak cardiac sphincter. In lizards use a nasogastric tube or old intravenous drip tubing, depending on size. Pass to just behind caudal ribs (site of stomach). With chelonians, the stomach is positioned at mid plastron (lower shell). It can be difficult to extend the head in a lot of chelonians and requires time and patience. The head must be fully extended from the shell otherwise it may regurgitate. Reptiles can be given treatments such as 'Hartmanns' or 'Vetark Critical Care' orally at approx 4-10% of their bodyweight. If the reptile is very debilitated, care must be taken not to overload the gut on the first day or two.

When it comes to parenteral fluids, 2ml per 100g bodyweight is a rough guideline of the amount to give.

- Subcutaneous – difficult in snakes but can be done in



Figure 3: Dysecdysis due to poor humidity and dehydration - snakes get a cloudy blue cornea prior to shedding.

larger lizards. Poor absorption with severe debility.
Inject between the scales.

- Intravenous – can be done if the animal is collapsed and very dehydrated.
- Intracoelomic – reptiles lack a diaphragm so care must be given not to overload and compromise breathing.
- Intraosseous – often the only accessible route. Use an intraosseous needle or hypodermic needle into the proximal tibia.

With all injections, care must be taken with sterility as reptiles are prone to injection site abscesses. Scrub the injection site for one minute with a sterile toothbrush and povidine-iodine.

Common ailments seen in practice

Anorexia

The most likely cause of anorexia is poor husbandry (especially suboptimal temperatures). Lizards with metabolic bone disease usually present because of anorexia. Remember, large snakes only eat once every 2-4 weeks so don't expect them to eat daily! Encourage snake owners to keep a chart of feeding and ecdysis (skin shedding) and weigh animals at every check up. Reptiles also routinely become anorexic prior to ecdysis.

In diagnosing and treating this condition, obtain a detailed husbandry (especially regarding diet and temperature). Check also the animal's mouth and jaw (see below). Remember that the correct environmental temperature is vital for sick reptiles - if the practice does not have a heated vivarium, do not hospitalise. If there is severe weight loss, consider fluid therapy followed by liquid feeding. Many of the following diseases also cause anorexia.

Stomatitis (mouth rot)

Stomatitis, usually caused by gram negative bacteria (e.g., *Aeromonas* and *Pseudomonas*), is common in large snakes or in tortoises after hibernation. It can also be secondary to metabolic bone disease in lizards. The clinical signs include petechiation of the gingiva and palate and frothy saliva, with chronic cases showing ulcers and pus, leading to osteomyelitis of the mandible.

Stomatitis is usually secondary to poor husbandry – check the husbandry and cage hygiene. Treatment is as follows:

- Early cases – topical cleansing with cotton bud and povidine iodine or hydrogen peroxide and topical antibiotics.
- Advanced cases need aggressive treatment – sedation for culture and sensitivity, debridement of ulcers and thorough cleansing with topical cleansing with appropriate antibiotics and/or systemic injections if very bad. These cases are often severely anorexic and may need assisted feeding and vitamin supplementation (vitamins A and C)

Dysecdysis (slough retention)

All reptiles shed their skin on a regular basis. This will depend on the age, size and health status of the species. Snakes shed in one piece, lizards in sheets and chelonians piecemeal. The snake epidermis will go a dull colour a few days prior to shed and the scale covering the eye ('spectacle' or 'brille') turns blue. The snake will be anorexic until the shedding process is finished. Dysecdysis is a common symptom of ill health (Figure 3). The commonest causes are low relative humidity and general poor husbandry. Poor shedding can cause flakes of skin to get trapped around the digits of lizards leading to dry gangrene and loss of digits (many lizards seen in practice are missing toes!). In snakes, it causes subspectacular abscesses.

The correct relative humidity is important to prevent this condition - it should be approximately 50-70 % in most species (much lower in desert animals and higher in tropical rainforest species). Make sure the temperature is correct. Advise purchase of a hygrometer to avoid problems in the future. Soak the reptile in warm water for 10 minutes or provide a humidity chamber (plastic carton with damp tissue paper or sphagnum moss). Mist-spray the vivarium and the animal frequently using warm water. Provide cage furniture (e.g., rocks or logs) so they can rub against it to shed. Snakes can be encouraged to wriggle through a warm damp towel.

Abscesses

This is the commonest abnormal swelling in reptiles.

Reptiles do not have liquid pus like mammals because they lack the lytic enzymes required. Since the abscess will be solid with inspissated pus, it cannot be lanced and usually needs surgical removal. After putting the reptile under general anaesthetic, the abscess is excised in its capsule and the cavity flushed with povidine iodine.

Thermal burns

Reptiles have poor cutaneous sensation in their skin and do not recoil from excessive heat. Thermal burns are common with snakes lying on an unprotected heat pad or iguanas climbing too near to heat lamp (**Figure 4**). Mild burns can be treated with topical cleansing and sterile dressings. Deep burns need aggressive treatment with culture and sensitivity and debridement under general anaesthetic. Reptiles with deep thermal burns are often very dehydrated and septicaemic so must be stabilised prior to general anaesthetic. As repeated dressing changes will be necessary, treatment can be costly.



Figure 4: Thermal burns on a green iguana from direct contact with vivarium heat pad.

Nutritional disease

Nutritional osteodystrophy (metabolic bone disease) is the most common problem seen in lizards and is also common in juvenile chelonians (**Figure 5**). Lizards in captivity are frequently fed a diet that is totally deficient in calcium so assume that all small lizards have this problem unless proven otherwise! The most common causes of this condition are a lack of dietary calcium, the wrong calcium: phosphorous ratio (should be 1.5:1), lack of UV light and general poor husbandry (wrong temperature, diet etc.). When it comes to insectivores, many owners seem to believe that insects live on thin air and never actually feed them. Basically, if the prey is under-nourished the predator will be too. Insects like mealworms and crickets have a negative Ca:P ratio so extra calcium must be given. This can be achieved in two ways:

- Gut loading – feed the crickets a high calcium food with some fruit/vegetables for moisture (e.g., milk powder, porridge oats with a slice of apple). This should be supplemented with a vitamin/mineral powder ('Vetark Nutrobal' is good as it has a Ca:P ratio of 46:1).
- Dusting - prior to feeding, the crickets should be put in a plastic bag and lightly dusted with 'Nutrobal'.

Herbivorous lizards like the green iguana must be fed a



Figure 5: Severe (and terminal) nutritional osteodystrophy in a bearded dragon due to chronic lack of dietary calcium and UV light.

wide variety of mixed leafy greens with attention paid to foods high in calcium (e.g., dandelion, kale, clover). Juvenile chelonians are especially at risk because of the high calcium requirements for their shell during growth. Snakes do not suffer from calcium deficiency to the same extent because they eat whole vertebrate prey, which contain calcium. Juvenile and small snakes fed pinkies or fuzzies, which have no mineralised skeleton, must be supplemented.

To diagnose nutritional osteodystrophy:

- Check the husbandry – especially diet and access to UV light.
- Perform a good clinical examination - lizards often

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Figure 6: Yellow-bellied terrapin with aural abscess secondary to vitamin A deficiency.

present with fractured limbs or hindlimb paresis due to poor mineralisation of the bones. Limbs may appear swollen due to flabby muscles (often giving the appearance of plumpness), swollen mandibles ('rubber jaw'), dull colour to scales, anorexia and lethargy. Severe cases get hypocalcaemic tetany and seizures. Chelonians are often anorexic. The shell may appear soft, deformed and asymmetric and too small for the animal.

- Perform radiography - the best way of confirming the diagnosis. Generalised osteopaenia of the skeleton, particularly at extremities (the digits and lateral vertebral processes of tail), thin cortices to long bones with folding fractures can occur and there is often evidence of past healed fracture. Spinal deformities (compressed vertebrae, scoliosis, lordosis etc.) can also feature.

There are several parts to treating this condition:

- Educate the client regarding husbandry – especially diet and lighting. Warn the owner that treatment can be prolonged. If the case is advanced, and the owner cannot afford prolonged treatment, euthanasia may be the only humane option.
- Most cases are anorexic and dehydrated by the time they present to the vet. Do not rush to give calcium injections – calcium is very insoluble and, if given to a dehydrated animal, will cause gout.
- Rehydrate first, then start assisted-feeding by stomach tube (pureed vegetables, baby food if herbivore or Hills a/d/Feline concentrate if insectivore). Gentle handling is required. Severe cases may need 1-2 weeks of hospitalisation for regular assisted-feeding. Do not hospitalise if there are no vivarium facilities!
- Calcium supplementation – once rehydrated, give calcium orally for the first week and you can then progress to weekly calcium injections (100mg/kg). This gives you a chance to get the patient back for check ups and to monitor progress. A further radiograph should be made (at the same radiographic exposure) after six weeks to see if the bones are mineralising well.

Hypovitaminosis A

Along with nutritional osteodystrophy, this is the most common problem seen in terrapins. The lack of dietary vitamin A causes squamous metaplasia of the epithelium and skin and respiratory problems. Many traditional pet shop 'turtle foods' consist entirely of dried shrimp and lack calcium and vitamin A. Turtle pellets do have added vitamins / minerals.

Clinical signs – chemosis of the eyelids, (causing temporary blindness), oedema of skin of axilla and groin, prolonged anorexia, aural abscesses (Figure 6) and, often, respiratory signs.

Diagnosis – dietary history and clinical signs, if the diet is poor radiography may be necessary to screen for underlying metabolic bone disease (especially juveniles) and pneumonia

Treatment-

- Advise a varied and balanced diet – raw liver, trout pellets, whitebait, dried cat food, mealworms, turtle pellets plus vitamin supplement. Dried shrimp is not a balanced diet!
- Most cases of anorexia will need hospitalisation for assisted feeding as the reptile will not only have malnutrition but will not eat if it can't see. Chronic cases often have kidney damage so carry a poor prognosis.
- One or two injections of vitamin A can be given. Avoid 'Multivit' injection as it is designed for cattle and can be easy to overdose. To avoid hypervitaminosis A, weigh the animal and use vitamin A palmitate at dose of 5000 iu/kg i/m

Post hibernation anorexia

This is the common name for a number of illnesses occurring in chelonians after hibernation. It is traditionally seen in spring time with Greek tortoises (Hermann's and spur thigh) because these animals come from a Mediterranean climate. In their native habitat they build up fat reserves over the hot summer and hibernate

for only a few weeks. Unfortunately, our cold climate stimulates them to hibernate from November, to April. Underweight or elderly tortoises do not have enough fat reserves to cope with this. They can often survive the hibernation because their metabolism slows down but they rapidly become ill after emerging from hibernation.

Clinical exam - check for stomatitis and jaundiced mucous membranes (which can arise as a result of prolonged anorexia). Often frost damage has caused blindness and retinal disease. There may also be rhinitis and underlying respiratory disease.

Tortoises will not eat if they cannot see or smell.

Diagnosis – look at the time of year and the husbandry, take a full blood profile to check for underlying liver and kidney problems, take a faecal sample to check for parasites and carry out radiography to rule out pneumonia.

Treatment –

- Rehydrate with warm water baths twice daily to encourage the tortoise to drink.
- Vitamin A injections weekly (5000 iu/kg i/m) or oral supplements if there is underlying respiratory disease.
- Hospitalisation in heated vivarium at correct POTZ with stomach tubing with rehydration fluids and, later, pureed vegetables/baby food/Oxbow herbivore mix’.

These animals are often very debilitated and stomach tubing may be necessary for 3-6 wks or

longer. The owner can be encouraged to syringe feed at home and, if all else fails, consider pharyngostomy when fit for GA.

Long term – many of the Mediterranean species only hibernate because they cannot function when the outdoor temperature drops below their POTZ.

A short hibernation for a few weeks is fine but not the five months enforced by our climate. Juveniles, underweight or ill tortoises must never be hibernated.

Advise the owner about purchasing a heat lamp and using UV light to keep the tortoise awake and healthy over winter.

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