BASIC HUSBANDRY OF REPTILES
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Reptiles have a few basic needs which are common to all species. Understanding of these is essential to anyone involved with the veterinary care of these species and in giving advice to owners.

1) HEAT

Reptiles are not cold-blooded as many reptiles have body temperatures higher than some mammals. They are not poikilothermic as many reptiles can maintain their body temperature within well-defined limits. Some pythons are able to generate body heat to regulate the temperature of their eggs by shivering thermogenesis.

Important terms now used are:
• The Selected Body Temperature ($T_S$) – the temperature range within which a reptile is able to function.
• Optimal Temperatures ($T_O$) – the temperature at which a given bodily function is optimal. $T_O$ is higher in digestion, folliculogenesis or fighting off infection (Behavioural Fever).
• Voluntary Minimum ($V_{T_{min}}$) and Maximum ($V_{T_{max}}$) Temperature are the temperature limits a captive reptile will expose itself to. These lie at the extremes of the $T_S$.

When the temperature goes even further outside the ATR then Critical Minimum ($C_{T_{min}}$) and Maximum ($C_{T_{max}}$) Temperatures are reached, at which the reptile has become immobilised and will ultimately be unable to thermoregulate and will eventually die.

At least two heat sources are required. The primary heat source is used to raise the enclosure temperature to the lower end of the $T_S$. This is usually a heat mat, tubular heater, heat tape, ceramic bulb or a radiator elevating the temperature of the whole room. Ideally these sources are thermostatically controlled and include a night time drop in temperature. The secondary heat source is used as a basking site during the day. We do not (usually) recommend any underfloor heating such as heat mats but this does vary on the species considered. Hot rocks should NEVER be used as they provide focal areas of heat and can lead to severe burns. Measuring the temperatures with a maximum/minimum thermometer is vital.

2) LIGHTING AND PHOTOPERIOD

All reptiles are exposed to daily and seasonal photoperiodicity. It is important with captive reptiles to allow daily and seasonal light patterns appropriate to their natural cycle. It is essential that all reptiles are exposed to visual light and UV-a for behavioural reasons and also to UV-b for vitamin D$_3$ production. More recently metal halide bulbs that produce both visible light and UV-b have been marketed and are currently the best available. Exposure to sunlight in the U.K. is better than artificial sources, but this may be impractical due to the environmental temperature.

If not given appropriate lighting or diet then nutritional secondary hyperthyroidism (NSHP) is the end result.

3) RELATIVE HUMIDITY

It is important to identify the ranges needed and provide them. Humidity can be increased by providing water bowls placed on heat mats, dripping, misting or fogging systems in the vivarium. Waterfalls or damp substrate can also be utilised. A hand held water sprayer aimed at the reptile or enforced bathing can also elevate humidity at specific times. A reptile should not be subjected to a poorly ventilated enclosure in order to raise humidity. Relative humidity can be monitored by using a hygrometer or continuously monitored using electronic devices.

4) THE ENVIRONMENT AND SUBSTRATE

A vivarium should be as large as possible and complex in its nature. Provision of hides and logs (terrestrial species), substrates for burying (fossorial species), a pool area (aquatic species) and branches and height (arboreal species) are mandatory. Reptiles will not perceive a glass barrier and can do significant damage to their rostrum as a result. Glass tanks are designed for FISH. Wire mesh can also lead to facial trauma (especially snakes). A fibreglass, plastic or melamine enclosure provides visual security and can be modified to suit the needs of any reptile.
The substrate needs to be appropriate to avoid ingestion with subsequent impaction and straining. If a natural substrate is preferred then soil or leaf litter are suitable. Newspaper/Astroturf/Alfalfa bedding/Rabbit pellets/Newspaper based cat litter or dense carpet tiles are suitable artificial substrates. Newspaper is a good substrate as it allows faecal and urinary output to be monitored. Aboreal reptiles need a high enclosure with appropriate branches and basking sites high in the enclosure. In these set ups a vertical temperature gradient is required. Aquatic or semi aquatic species need a large area to swim in with a haul out area with a basking lamp. The water should be heated and thermostatically controlled. Nocturnal species will still benefit from a day/night cycle which could be reversed with a low wattage red lamp used to visualise the reptile. Plenty of hides will be required. Many snakes are kept in sweater boxes and this is of a major welfare concern. Although this allows a sterile environment for quarantine and easy visualisation of the snake (if venomous for example) they are not what we should be encouraging.

5) WATER
Reptiles drink by a variety of methods, by submerging their entire head underwater through to licking droplets from foliage (such as chameleons) Water should be presented to all reptiles continuously in an appropriate way such as a shallow bowl or a drip system over plastic plants. Bathing reptiles weekly in a cat litter tray or a plastic box (under supervision) is a good idea to maintain hydration. This water should be 25°C temperature. Warm water bathing also serves as a stimulus for voiding urates and faecal material. Weighing the reptiles both before and after a bath is a good way of assessing the degree of rehydration that has occurred.

6) FEEDING:
HERBIVOROUS LIZARDS AND CHELONIA: A variety of food sources should be offered. A variety of plants and leafy greens should make up a high percentage of the diet. Naturally grown weeds such as dandelion, grass, sow thistle, plantains, chickweed, milk thistles, sedum, honeysuckle, nasturtium flowers, hibiscus flowers or wild pansy are an exceptionally good food sources and would be far preferable to supermarket goods. Vegetables such as kale, spinach, broccoli, iceberg lettuce, romaine lettuce, cabbage, bok choi, turnip greens, endive, mange tout, spring greens, brussel sprouts, carrots, peppers, squash and tomatoes can be offered. Fruits such as apple, pear, strawberries and bananas can be offered. Higher protein foods such as beans, peas or pulses can be offered. Mushrooms are also eaten by some species. Commercially available pelleted diets can comprise a small amount of the diet. Supplementation with a vitamin/mineral powder with a high calcium to phosphorous ratio will be required. Any uneaten food should be removed and discarded to reduce the risk of autoinfection with faecal parasites.

OMNIVOROUS AND INSECTIVOROUS LIZARDS: Most omnivores encountered will be taking mostly invertebrate prey. Commercially available livefood such as crickets, locust, mealworms and waxworms are easily obtainable. Some owners also feed pinkie mice. Items such as woodlice, millipedes and earthworms are far better than commercially available livefood. Supplementation with a vitamin/mineral powder with a high calcium to phosphorous ratio is required. Gut loading the invertebrates with a high calcium diet (8% DM) is required for 48 hours prior to feeding. Providing dark leafy greens for the invertebrates to eat prior to feeding out is also helpful. Invertebrates can get hungry if left in the vivarium and substantial damage to sleeping lizards is possible. REMOVE all uneaten livefood. They are also an inadvertent vector for the transmission of faecal parasites and infections if left in the tank too long. Any livefood removed should not be re fed.

CARNIVOROUS LIZARDS AND SNAKES: These are fed whole mammalian prey and as a result vitamin and mineral deficiencies are rare. However supplementation of monitors is still advised. It is easy to over feed these species. As prey items get larger the frequency of feeding can reduce. Many large snakes only need to be fed every 3 – 4 weeks. Prey items should be thoroughly defrosted to BLOOD temperature before feeding. Handling of the prey should be avoided so that there is no confusion between human scent and the prey item. Otherwise the snake may be reluctant to feed or try to strike at or constrict the owner.

HOSPITALISATION
The essential aspects of reptile husbandry need to be modified slightly within the clinic. Facilities for hospitalisation do not need to be large or environmentally enriched. Instead they need to be functional, providing appropriate heat, light, humidity and be easily cleaned out. Plastic or melamine vivaria serve this purpose well. A spot lamp to provide a basking area and UV- b light should be provided. Disposable substrate such as newspaper should be used and this allows faecal and urine output to be monitored and collected for analysis. Disinfection between animals is mandatory. Water can be provided or the reptile can be taken out for bathing instead. In patients should be weighed daily. Electrolytes can be added to the bath to encourage rehydration.

Overnight the basking lamp should be turned off. The vivarium temperature should be kept at 21°C. Heat can be provided by keeping the entire room warm or due to a thermostatically controlled ceramic heat lamp or heat mat used within the vivarium. The basking temperature can be monitored by a thermometer. All heat sources should be guarded to prevent burns.

Larger animals or those requiring more specialised accommodation can be difficult to house appropriately in the clinic. Larger enclosures and more potent heat sources will be required. Rainforest species or semi aquatic species will fair better in an enclosed vivarium with a more even distribution of heat and higher humidity. This can simply be by placing a cat litter tray of damp substrate within the tank. Zoonotic diseases can be transmitted from reptiles. All individuals handling them should wear disposable gloves. Most shed Salmonella sp and/or Campylobacter sp.

FURTHER READING.
www.proteus.uk.net – Proteus reptile Trust – NVQ courses in herpetology
www.uvguide.co.uk – most current information regarding UV lighting.
BSAVA Manual of Reptiles. 2nd Edition Girling and Raiti, BSAVA.