



Kelly Deane FdSc RVC C&GCertVNES

I have always had an interest in exotics and after my internship at ZSL London zoo I went on to work at the Beaumont Sainsbury animal hospital where I work with the exotics team full time.

Email: Kadeane1@gmail.com

The 'hibernation' process and post 'hibernation' care of tortoises

Kelly Deane FdSc RVC C&GCertVNES

Exotics Department, Beaumont Sainsbury Animal Hospital, London

ABSTRACT: Many species of tortoises do not hibernate but brumate. They may be too sick to undergo the process or awaken with illnesses. As nurses we need to care for these critical patients with species specific needs. This article aims to give a basic overview on the brumation process and how to nurse tortoises with post brumation complications.

Keywords: Hibernation; brumation; tortoises; critical care

There are very few species of animal that truly hibernate, which means spending the winter in a dormant state, dormice for example hibernate and if their nest were to flood they would not wake but would drown. This is often confused with brumation where an animal slows down or goes into a state of torpor for winter, which is the process some reptiles and other animals go through (Chitty & Raftery, Chapter 2 Husbandry, 2013). I will refer to this process as brumation from here on out. Before considering brumating a tortoise it is important to identify the species. Some species of tortoise do not brumate, these are the African dwelling species such as Indian star tortoises (*Geochelone elegans*) and African spurred (sulcata) (*Centrochelys sulcata*) which are common pet species. Correct husbandry is also essential for a good outcome during brumation. Poor husbandry such as all year garden living is not appropriate as the tortoise is exposed to predators and the outside temperatures vary too much.

More research is needed to investigate the benefits, if any, for brumating pet tortoises vs stopping them from brumation. It is however a natural process that they would undergo in the wild and is thought to slow their growth allowing them to grow more naturally.

Preparing the tortoise for brumation

Pre-brumation checks are important as it can take a lot of reserve from a tortoise and if

already debilitated then they may not emerge from brumation. A full history of the tortoise's husbandry is important as poor husbandry commonly causes illnesses, which can take advantage during the tortoise's vulnerable state. A full clinical exam should also be carried out checking for any current diseases including a weight check as it is advised that they weigh more than 200g to avoid mortality risks (Varga & Gott, 2012). It is advisable to do a faecal float and wet preparation test to check for any significant burdens of parasites which can be fatal during brumation as they will take advantage of the host's vulnerable state (Varga & Gott, 2012). Hydration is also important in the run up to brumation to prevent dehydration; it is advised that they are bathed twice a day the week before brumation as they take water up via their cloaca and store fluid in their



Figure 1. Microscopy of Pin worms and Pin worm egg, a common parasite in reptiles.



Figure 2. A tortoise having a bath before brumation.



Figure 4. Garden tortoise that had been attacked by a dog.



Figure 3. Fridge method for brumation.

bladder. Dehydration in animals producing uric acid can be particularly dangerous as the uric acid can crystallise in the blood and collect around organs, such as the kidneys; this is called visceral gout (Girling, Chapter 22 An Overview of Reptile and Amphibians Therapeutics, 2013). If the animal is not fit enough to go through the process then it should be postponed for next year or until the animal is well enough. Patients recovering from illness, surgery or with healing wounds should also not be brumated. Ensuring that the animal has adequate heating and UV will stop them from going into brumation by mimicking summer day light lengths.

The brumation process

In the wild tortoises younger than a year may brumate for short lengths of time, in captivity it is advised that they are at least 2–3 years old and weighing more than 200g (Varga & Gott, 2012). Indoor brumation is usually mid-November to early March time (Boyer & Boyer, 2005). Tortoises will naturally start to slow down in October–November time due to the natural environmental cues of shorter day light lengths and a drop in ambient temperatures. Once all the pre-brumation checks are completed and it is appropriate to allow them to continue the process, remove external heat sources and allow them to acclimatise to room temperature for a week or so (Boyer & Boyer, 2005). Food should be tapered down and stopped at the end of October (Wright, 2004). If food is not stopped for at least a week, (two – three weeks if a big tortoise) before brumating it will stay in the stomach and rot. Continue to bathe twice a day in warm water until they are ready to be placed in their brumation set up. After they have acclimatised, place them into a cooler area where temperatures can be maintained between 2° and 9° until they slow down further or stop moving altogether, usually a further week or so. This indicates that it is time to place them into their brumation set up for the months to come where they should be ideally maintained at a temperature of 5° Celsius (Boyer & Boyer, 2005). Weigh the tortoise before brumating so you have a starting weight. Different method to safely brumate tortoises in a controlled way are detailed below.

The box method

This method of brumation is fashioned as a wooden box that is well insulated with Styrofoam™ boards. Holes covered with wire should be provided for aeration and a substrate of soil can be used or shredded newspaper (Boyer & Boyer, 2005). This method does have a risk of rats infiltrating the set up and can result in inadequate monitoring while brumating. Temperature probes measuring a maximum and minimum temperature should be used and monitored to ensure the temperature does not drop below freezing.

The refrigerator method

The tortoise can be placed in a plastic box and placed in a refrigerator during brumation. A small drinks fridge is advised but should not be used for storage of food or drink due to the risk of Salmonella contamination. This set up allows the temperature to be more easily controlled and prevents any rodents from getting in. Air is replenished daily when the fridge door is opened when checking on the tortoise allowing for ventilation. Maximum and minimum temperature probes should still be used and substrate as above (McArthur & Barrows, 2004).

Garden brumation

Many tortoises in the UK are garden tortoises that will self brumate as the weather gets cooler. This husbandry and method is not advised as there is a high risk

of predator attacks from animals such as rats, foxes or dogs. The temperature is also too variable, dropping below freezing resulting in ice crystals forming within their eyes or increasing to 10–15° causing early wake up resulting in using all glucose reserves. It is also more difficult to check them daily and they often wake with pneumonia, infections or do not wake at all.

Hibernation While in brumation it is important to check the tortoise daily, gently weighing them, checking for urination or wounds from rodents. Tortoises should not lose >8–10% of body weight while brumating and therefore is important to monitor their weight as it may be a result of fluid loss or high activity (Boyer & Boyer, 2005). Signs of movement can be seen by disturbed substrate and may mean that temperatures are not cool enough. If there is any illness or trauma detected during one of these checks warm the tortoise slowly back up to 27 degrees and have the patient assessed by a veterinary surgeon (McArthur & Barrows, 2004).

Ending brumation and post brumation nursing care

In the wild, an increase in temperature and daylight would stimulate the end of brumation for the tortoise this will not happen in the controlled set up, therefore



■ **Figure 5.** An Aldabra giant tortoise (*Aldabrachelys gigantea*) receiving epi-cealomic fluids.



■ **Figure 6.** A selection of sizes of metal gavage tubes used for assisted feeding.

this must be replicated when ending brumation usually around early March. Start by removing the tortoise from the brumation set up and letting them acclimatise to room temperature for several hours before placing them in their appropriate set up with appropriate heat and light turned on. Water should be offered first and bathing in warm water to hydrate them. Then food and water can be offered, succulent food such as

cucumber will help to continue hydration but then should be moved back onto their normal balanced diet. Tortoises will usually eat on the first day of emergence and should continue to be bathed until passing urates and faeces. If they do not eat within the first 7 days then this may indicate disease and should therefore be seen by a vet (Chitty & Raftery, Chapter 2 Husbandry: The Husbandry Review, 2013).

It is essential to rehydrate any starved reptile before providing food to prevent re-feeding syndrome. This is when food is given before the patient is hydrated. The calories and proteins from the food cause a rapid uptake of glucose from the blood stream into cells. The glucose takes phosphorous and potassium with it from the blood stream resulting in a life-threatening hypokalaemia and hypophosphatemia (Girling, Chapter 20 Reptile and Amphibian Nutrition, 2013). In order to hydrate the patient Vetark critical care® is a liquid that can be given orally before starting them on a liquid feed. Dehydration can be assessed by how sunken the eyes appear and patients should be bathed to encourage hydration. If over 5% dehydrated Hartmann's may be given epi-cealomic, landmarks for this route are in-between the neck and arm (see Figure 5). Take care to administer fluids slightly towards the plastron to avoid the lungs. If severely dehydrated fluids may be administered intravenously via the dorsal tail vein or the jugular. Fluid rates for reptiles are 20–25 ml/kg/day and may vary between species (Girling, Chapter 20 Reptile and Amphibian Nutrition, 2013). An intraosseous catheter (IO) can be placed in the



▲ Figure 7. Oesophageal tube in a tortoise.

plastrocarapacial junction where the pillar of the shell meets the plastron and fluids can be administered here (Girling, Chapter 22 An Overview of Reptile and Amphibians Therapeutics, 2013). This is a very slow route of administration so may not be advisable. Note that sedation and pain relief will need to be given in order to place an IO catheter which can have increased risk if the patient is already collapsed. Once hydrated stomach feeds may have to be given if not eating on their own. Liquid diets such as Emerald© herbivore may be given via a gavage tube. To do this, premeasure the tube against the plastron, the first fissure line is roughly how far down to go as this is where their stomach is, holding the head out and straight. Offering bright coloured foods such as red peppers may tempt the tortoise to eat by themselves.

However if the patient is not eating then long term care can include an oesophageal tube. This may be placed under sedation

or general anaesthesia and patients can go home with them in place for the owners to maintain and continue to feed. Medications may easily be given via the gavage tube or oesophageal tube. Healthy patients can receive 75% of their daily requirements in the first 24/48 hours of care. More debilitated tortoises however should receive 40–75% initially and build this value up over a few days (Donoghue, 2005). Calculating the calories to give to the patient can be done with the following calculation 'Basal Maintenance Rate = $K (BW^{0.75})$ '. K is the constant which is 10 for reptiles and BW is the body weight in kilograms. This sum however is the minimal energy requirement to function, they will therefore require more for wound healing or illness (Girling, Chapter 22 An Overview of Reptile and Amphibians Therapeutics, 2013).

A full health check should be carried out after brumation. The mouth should be checked for any mouth rot and faecal

testing can be done to reassess parasite burdens. A blood sample may be taken from the jugular vein for a complete blood analysis. If hospitalised it is essential to have heat and UV lamps; as an ectothermic species metabolic function will depend on the environmental temperature not to mention aiding in the uptake of vitamin D. Maintaining the temperature at the preferred optimum temperature zone (POTZ) is essential. Without being at this temperature they are unable to perform normal bodily functions such as digestion, metabolism of drugs and wound healing.

Conclusion

Addressing husbandry is essential when discussing with owners how to brumate. Pre-brumation clinics are a good way to educate owners to ensure the best welfare is given to our patients. Pre-brumation checks will establish whether the patient is healthy enough to brumate and if any husbandry corrections need to be made. Nursing sick post brumation tortoises is similar to nursing any dehydrated and anorexic patient. As with all patients the main considerations should be warmth, analgesia, fluid therapy and nutrition (oxygen therapy is not applicable in reptiles).

References

- Boyer, T.R., & Boyer, D.M. (2005). Chapter 7 Turtles, Terrapins and Tortoises. In D.H. Mader, *Reptile Medicine and Surgery Second edition* (pp. 88–89). Florida: Saunders Elsevier.
- Chitty, J., & Raftery, A. (2013). Chapter 2 Husbandry. In J. Chitty, & A. Raftery, *Essentials of Tortoise Medicine and Surgery*. Oxford: Wiley.
- Chitty, J., & Raftery, A. (2013). Chapter 2 Husbandry: The Husbandry Review. In J. Chitty, & A. Raftery, *Essentials of Tortoise medicine and surgery* (pp. 50–54). Chichester: Wiley Blackwell.
- Donoghue, S. (2005). Chapter 18 Nutrition. In D.R. Mader, *Reptile medicine and surgery* (pp. 277–278). Florida: Saunders Elsevier.
- Girling, S. (2013). Chapter 20 Reptile and Amphibian Nutrition. In G. Simon, *Veterinary Nursing of Exotic pets* (p. 294). Chichester: Blackwell Publishing Ltd.
- Girling, S. (2013). Chapter 22 An Overview of Reptile and Amphibians Therapeutics. In S. Girling, *Veterinary Nursing of Exotic Pets Second Edition* (pp. 319, 326–329). Chichester: Blackwell Publishing Ltd.
- McArthur, S., & Barrows, M. (2004). Chapter 5 General Care of Chelonians. In S. McArthur, R. Wilkinson, & J. Meyer, *Medicine and Surgery of Tortoises and Turtles* (pp. 102–104). Oxford: Blackwell Publishing Ltd.
- Varga, M., & Gott, L. (2012). Outpatient care and nurse lead clinics. In M. Varga, L. Gott, & L. Rachel, *BSAVA Manual of Exotic Pet and Wildlife Nursing* (p. 263). Gloucester: British Small Animal Veterinary Association.
- Wright, K.M. (2004). Chapter 4 Breeding and neonate care. In S.J. Girling, & P. Raiti, *BSAVA Manual of Reptiles Second Edition* (p. 41). Telford Way: British Small Animal Veterinary Association.