

Current trends in the husbandry and veterinary care of tortoises

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Presented to the BCG symposium at the Open University, Milton Keynes on 25th March 2017

Introduction

Tortoises have been kept as pets for centuries but have recently gained even more popularity now that there has been an increase in the number of domestically bred tortoises.

During the 1970s there was the beginning of a movement to change the law and also the birth of the British Chelonia Group. A small group of forward thinking reptile keepers and vets began to realise that more had to be done to care for and treat this group of pets. They also recognized the drawbacks of the legislation in place under the Department of the Environment, restricting the numbers of tortoises being imported to 100,000 per annum and a minimum shell length of 4 inches (10.2cm).

Almost all tortoises were wild caught and husbandry and hibernation meant surviving through the summer in preparation for five to six months of hibernation. With the gradual decline in wild caught tortoises, this article compares the husbandry and veterinary practice then with today's very different husbandry methods and the problems that these entail.

Importation

Tortoises have been imported for hundreds of years. The archives of the BCG have been used to loosely sum up the history of tortoise keeping in the UK.

- ❑ A tortoise was bought for 2s/6d from a sailor in 1740 (Chatfield 1986)
- ❑ Records show as early as the 1890s tortoises were regularly being brought to the UK
- ❑ In 1951 250 surplus tortoises were found dumped in a street in London –an application for a ban was refused
- ❑ In 1952 200,000 tortoises were imported
- ❑ In 1978 the RSPCA prosecuted a Japanese restaurant for cooking a tortoise – boiled alive (Vodden 1983)
- ❑ In 1984 a ban on importation of Mediterranean tortoises was finally approved

Looking back in time: the BCG is born

In 1976 the inaugural meeting of the BCG was held by Derek Foxwell and Diane Tottle. A group of like-minded people recognized that there was no consolidated way to protect, learn and discuss all matters related to tortoises. The annual subscription was a heady £1. Interestingly, the first symposium was held in 1983, just before the ban on tortoise importation was finally passed in 1984.

Owners were being encouraged to participate in the journal, as well as contributions from well-known founder members such as Oliphant Jackson, Peter Holt and John Cooper. Topics covered in *Testudo* included:

- ❑ 'The death of Agnes' (Dodson 1978) in which chelonian veterinary treatment 40 years ago is described
- ❑ 'Weight loss of tortoises during hibernation' (White & White 1979)
- ❑ 'The results of weights and measurements on healthy and sick tortoises' (Jackson 1980) in which the original 'Jackson Ratio' idea was presented
- ❑ Worm infestations in tortoises (Holt 1980 & 1982)
- ❑ Chelonian diets – investigating pyramiding (Jackson 1982)
- ❑ The Horsfield's tortoise (Wright 1985)

Tortoises were very much loved and cared for by members of the public and there is no doubting that the tortoise as a pet was firmly ensconced in British society.

Hibernation

This is one of the most challenging times for a tortoise. Traditionally, tortoises in the UK were not kept with extra heat and light. Tortoises that lived further south tended to fare better than their northern counterparts due to the small increase in temperature, but there is not enough UV light in the UK between September and March to satisfy their requirements. Ideally, ambient temperatures during the tortoises' active period should be a minimum of 25°C.

It is imperative that the pre-hibernating tortoise eats enough to replace vitamins, proteins and fat deposits that will be lost over the winter. In order to overwinter, they are placed in a box that is insulated and put in a cool vermin-proof place. To maintain a state of hibernation the tortoise must be kept below 10°C and above zero. Freezing can result in serious damage to the tortoise and current trends in weather resulting in warmer winters make it much harder to keep the tortoise asleep in the traditional way.

Physiology of hibernation

Preparation is vital. During the weeks prior to hibernation, food should be withdrawn and the temperature gradually reduced. It is imperative that the stomach and the intestines are given enough time to empty. Food that is retained in the intestine can ferment with disastrous results.

As the temperature drops, the heart rate, which is completely dependent on temperature, starts to slow. Once the temperature is below 10°C the heart rate will be around six beats per minute. Respiration rate will also fall in line with the heart.

The blood supply to the kidneys is also cut off by 100%. This is a physiological reflex peculiar to reptiles and preserves the blood supply to the core (centre of the body). Finally, the intestines stop moving and the tortoise is ready for hibernation.

What could possibly go wrong? There are some common problems amongst traditionally hibernated tortoises.

Post-hibernation anorexia: Tortoises may struggle to gain weight during the summer months, which can often result in poor nutrition after hibernation. During hibernation fat-soluble vitamins are often used up leading to this condition (Fig. 1). Within 48 hours of being brought out of hibernation the tortoise should start eating, drinking and passing urine and faeces.

Frostbite: This can occur when the tortoise is not protected adequately during hibernation. Blood can freeze or be reduced to very low temperatures resulting in damage to the tissues such as the eyes, tail and head. As the temperature drops, the body tries to compensate for low temperature in the peripheral circulation. Vasoconstriction occurs sending the blood to the core. Initial injury is mediated by extracellular-tissue ice crystal formation. These crystals damage the cellular membranes, initiating the cascade of events that cause cellular death. As freezing continues, a shift in intracellular water to the extracellular space leads to dehydration, increased intracellular osmolarity, and eventually, intracellular ice crystal formation. As these ice crystals form and expand, the cell undergoes mechanical damage, which is irreversible. This can result in lens cataracts, corneal damage (Fig. 2) or even loss of limbs. Sadly this can also be fatal.

Mouth rot: This is an infection of the tissues of the mouth and tongue. The surface of the tongue becomes diphtheritic (Fig. 3), being covered in bacteria that can spread to the body and affect the blood, resulting in septicaemia and death. Hibernating tortoises that are sick or struggling with disease processes often have low white blood cells, resulting in increased risk of infection.



Fig. 1. An anorexic tortoise with an oesophagostomy tube in place for feeding.



Fig. 2. Frostbite has caused the corneal opacity in this tortoise's eye.



Fig. 3. The infected tongue of this tortoise with mouth rot is covered by a thick white deposit.



Fig. 4. The muscles have pulled this weak, fast-growing shell out of shape.

Poor Growth: Poor temperatures during the summer months followed by poor hibernation with fluctuating temperatures lead to incorrect growth. Secondary nutritional hyperparathyroidism (see later) is a condition where there is an imbalance between calcium and phosphorous. Increased growth can result in an odd shaped shell (Fig. 4) where the muscles are stronger than the bone. Calcium is removed from the bones in order to satisfy the need for growth, resulting in spongy bones (Fig. 5).

Tortoise keeping today

The problems that are seen today reflect the way that the tortoises are kept. There are a much larger number of very small tortoises being kept as pets. These are invariably home bred or tortoises imported from Europe, to which differing CITES regulations apply, as follows:

Hermann's tortoise	<i>Testudo hermanni</i>	Annex A	Certificate required
Spur-thighed tortoise	<i>Testudo graeca</i>	Annex A	Certificate required
Marginated tortoise	<i>Testudo marginata</i>	Annex A	Certificate required
Horsfield's tortoise	<i>Testudo horsfieldi</i>	Annex B	No certificate
Leopard tortoise	<i>Stigmochelys pardalis</i>	Annex B	No certificate
Sulcata tortoise	<i>Geochelone sulcata</i>	Annex B	No certificate
Indian star tortoise	<i>Geochelone elegans</i>	Annex B	No certificate
Red-footed tortoise	<i>Geochelone carbonaria</i>	Annex B	No certificate

Husbandry techniques are also different nowadays, with most individuals being kept in tortoise tables or vivaria. It is the author's opinion that the level of suffering has risen exponentially. There are no laws protecting these vulnerable infants. Sales are indiscriminate and there is no basic minimum of understanding by the prospective owners. Many of these pets are bought to satisfy children as they are small and 'easy to keep'. A BVZS (British Veterinary Zoological Society) survey found that the average initial cost of buying a reptile compared to a dog was about the same. Around £600 would buy a good vivarium/table top with full heating and UV lighting compared to the average price of a puppy. This is where the comparison ends. Maintenance costs to keep the reptile pet are much, much lower and many never see a vet.

Vivarium versus tortoise table

Very small tortoises have different requirements from the larger and more substantial adult.

Vivaria: These are much easier to heat as they have four walls, a roof and a floor, preventing heat from escaping. All the parameters are easier to control: heat, humidity and UV light – though humidity can rise above 70% if the substrate is too wet, making the air moist and loaded with bacteria and



Fig. 5. In this case the spongy bone means the tortoise's shell is easily depressed. Note the oesophagostomy tube in place.

fungal spores. Also on the negative side, tortoises will often bang against the glass in an attempt to get out.

Tortoise tables: For very small tortoises these are not ideal. They are extremely difficult to heat because of the failure to stop the warmth from escaping. Heat is vitally important to these vulnerable infants as growth, heart rate, intestinal transit time and urine production are all controlled by the ambient temperature. It is often misunderstood that in the winter months in Britain, unless the central heating is on 24 hours a day, the average room temperature is around 15°C. Again, because there is no ceiling to limit the escape of water vapour, humidity is hard to control. Also, the UV light must be no more than 30cm away from the tortoise and cover the length of the table. Tortoise tables have their place. It has been observed that many tortoises seem to accept the tortoise table better than a vivarium and seem to be less distressed (e.g. banging against the glass). However, there are so many variants to maintaining optimal husbandry conditions in this situation.

Common conditions seen in today's tortoises

Chronic rhinitis: This is a condition that is seen commonly in tortoises, particularly after hibernation when the white blood cells are at their lowest

level. There are a few differentials for this condition such as Herpesvirus or Mycoplasma. Chronic rhinitis (Fig. 6) is often caused by a poor immune system, poor husbandry and a low level bacterial infection. Saliva can also be pushed into the nostrils from the open choanae in the mouth (the natural cleft palate).

Overgrown beak: This is seen commonly in Mediterranean tortoises that are not hibernated. Fast growth with excellent nutrition and UV light can, without the natural restrictions of hibernation, lead to some very exaggerated cases. The little tortoise in figure 7 came in to be put to sleep because he had 'stopped eating yesterday'.

Dog attack: The tortoise's main form of defence is the hardness of the shell and the ability to withdraw the head and legs. The knock-on effect of poor husbandry with a soft shell is that these tortoises are unable to defend themselves. A Staffordshire bull terrier can have a biting point pressure of 1500 pounds. A soft shell is less able to protect the tortoise.

Nutritional secondary hyperparathyroidism: This is a dreadful condition where the tortoise uses the skeleton to provide calcium to make the heart and muscles work. Chronic low temperatures, insufficient diet and poor UV provision all lead to tortoises with a soft and spongy skeleton (Fig. 5). It is possible to treat these individuals, the few that are brought to the veterinary surgery, but many die one or two years later with kidney failure. This is thought to be a direct result of the effect of parathyroid hormone on the kidneys leading to kidney damage.

Calcium is vital to the body. It gives structure to the bones by forming calcium salts with other compounds and is involved at a cellular level in allowing the heart muscle and other striated muscle to contract. Calcium enters the body through the diet. Once in the body it needs to be absorbed through the small intestine. It can only be absorbed if Vitamin D3 is present at this point. Vitamin D3 acts like a key to let the calcium into the bloodstream.

Vitamin D3 itself is made when cholesterol is changed to a precursor of vitamin D in the skin by UV light. Tortoises cannot change Vitamin D2 to Vitamin D3 as mammals can and they also have a very poor storage of Vitamin D3 in the liver compared to mammals. The two are irrevocably linked. Calcium is needed for the body to function and it cannot function without Vitamin D3.

If the requirements are not met by diet and UV light, the body has to use precious stores of calcium from the bone. In turn this leads to spongy bone.



Fig. 6. Chronic rhinitis with a bilateral nasal discharge. This can progress to pneumonia as tortoises cannot cough to remove mucus.



Fig. 7. Reduction of the massive overgrowth of this lower beak was followed by physiotherapy to aid opening of the mouth.

Reproductive problems:

FEMALES

Pre-ovulatory ovarian stasis is a condition seen in females where the follicles never quite make it to eggs. The follicles grow and absorb vital fats and nutrients leading to generalized deterioration of the female. Infections are very common in the follicles, often leading to sepsis, fatty liver syndrome and death.

Egg binding is where fully formed, shelled eggs are unable to pass. This can occur for a number of husbandry reasons: uterine torsion, over-sized eggs and even eggs passing into the bladder.

A prolapse occurs when part of the reproductive system passes through the vent leading to vascular shock, infection and serious damage or death if not corrected.

MALES

The male tortoise has two internal testicles and also a phallus. This is different from a penis as it is more like a folded tube with an open groove running down the middle. Only sperm is transmitted through the phallus, unlike the mammalian penis that transmits both urine and sperm. Damage to the phallus is common during mating whereby it is traumatized either by bite wounds or crushing wounds. The phallus often needs to be removed surgically.

Constipation: This is probably one of the most common conditions seen in veterinary practice. Chronic low temperatures lead to low intestinal motility. This leads to over-absorption of water and drying of the faeces, which in turn can lead to intestinal fermentation with disastrous results. Inappetence leads to poor weight gain, fatty liver syndrome and chronic poor health.

Conclusion

Many of the tortoises that are still seen today in practice belong to a generation where the tortoises were all wild caught, but were young adults at the time. Hibernation and summer survival have been a rhythm for over 40 years. The health issues of these tortoises revolved around the husbandry. Common conditions seen were post hibernation anorexia and chronic rhinitis.

Today, there is a very different picture. Many of the tortoises that are being bought are very small and vulnerable. Their needs are very different to the adult tortoises from the 1970s. Husbandry requirements are much harder to meet and this results in some very common conditions such as nutritional secondary hyperparathyroidism.

It is the author's opinion that the tortoises of the 1970s, when kept well, had fewer health issues. Applying the knowledge gained over the years should mean that extra heat and light be offered, increasing the amount

being fed and overall nutrition and improving the health and well-being of these elderly tortoises. Nowadays, very small tortoises with new owners seem to have much more basic and life-threatening conditions, all of which are preventable.

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