Massive *Tachygonetria* (Oxyuridae) infection in a Herman’s tortoise (*Testudo hermanni*)

**PRESENTATION**

The massive parasitation by *Tachygonetria* Oxyuridae parasites in a 15-year-old male Mediterranean or Herman’s tortoise (*Testudo hermanni hermanni*), weighing 560 g, is presented. The effectiveness of common treatment with fenbendazole is also discussed.

**HISTORY**

A male Herman’s tortoise (*Testudo hermanni hermanni*), from a rescue centre on Majorca Island (Spain), was referred to the CRARC (Catalonian Reptile and Amphibian Rehabilitation Centre (Barcelona, Spain)) for evaluation of anorexia of 2-month duration. The tortoise belonged to a group of tortoises that were to be released into the Montsant Natural Park (Catalonia, Spain). At the time of clinical examination, the tortoise had numerous little parasites around its cloaca. The tortoise ate a variety of vegetables and fruit in an outdoor facility with access to direct sunlight, subject to the natural temperature fluctuations of the area. The tortoise hibernated in winter, from October to March.

**CLINICAL FINDINGS**

Upon clinical examination, the tortoise was alert and awake but it had low weight, and was dehydrated and cachectic. The eyes were sunken in the orbits and the oral mucosa was pale. The limb movements were diminished. The parasites were whitish, measuring about 5 mm in length, and formed groups of hundreds that occupied the entire tail, which were observed macroscopically in outlying areas of the cloaca (Figures 1 and 2).

**DIAGNOSTIC TESTS**

All parasites were removed from the cloaca and adjacent areas (shell and legs) for microscopic analysis with a stereo magnifying glass. Ten parasites were measured, photographed, and preserved in alcohol in the CRARC private collection. The length of the collected worms varied from 3.8 to 5.2 mm. The parasite was classified on the basis of previously published keys (Gagno, 2006) as Nematelmin roundworms, Oxyuridae family, *Tachygonetria conica* species (Drasche, 1884) (Figures 3 and 4), which are common gastrointestinal parasites in *Testudo hermanni* from Spain, France, and Italy.
TABLE I

Haematology and biochemical data pre and post fenbendazole treatment, in comparison with reference data for Testudo hermanni (Mathes et al., 2005) (Marin et al., 2001).

<table>
<thead>
<tr>
<th>Haematology</th>
<th>Results (pre-treatment)</th>
<th>Results (post-treatment)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haematocrit (%)</td>
<td>32</td>
<td>32</td>
<td>16–35</td>
</tr>
<tr>
<td>Red blood cells (x 10^12/L)</td>
<td>0.8</td>
<td>0.79</td>
<td>0.7–1.2</td>
</tr>
<tr>
<td>White blood cells (x 10^9/L)</td>
<td>4.2</td>
<td>4.8</td>
<td>1.2–7.13</td>
</tr>
<tr>
<td>Heterophils (%)</td>
<td>45</td>
<td>56</td>
<td>32–50</td>
</tr>
<tr>
<td>Eosinophils (%)</td>
<td>12</td>
<td>2</td>
<td>2–8</td>
</tr>
<tr>
<td>Basophils (%)</td>
<td>0</td>
<td>0</td>
<td>0–2</td>
</tr>
<tr>
<td>Monocytes (%)</td>
<td>0</td>
<td>0</td>
<td>0–4</td>
</tr>
<tr>
<td>Lymphocytes (%)</td>
<td>33</td>
<td>42</td>
<td>12–48</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Biochemistry</th>
<th>Results (pre-treatment)</th>
<th>Results (post-treatment)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total protein (g/L)</td>
<td>41</td>
<td>43</td>
<td>39–54</td>
</tr>
<tr>
<td>Glucose (mmol/L)</td>
<td>2.59</td>
<td>3.61</td>
<td>2.94–5.94</td>
</tr>
<tr>
<td>Uric acid (umol/L)</td>
<td>331.09</td>
<td>309.30</td>
<td>124.91–576.96</td>
</tr>
<tr>
<td>AST (IU/L)</td>
<td>65</td>
<td>43</td>
<td>9–103</td>
</tr>
<tr>
<td>Potassium (mmol/L)</td>
<td>4.80</td>
<td>4.00</td>
<td>2.59–6.90</td>
</tr>
<tr>
<td>Sodium (mmol/L)</td>
<td>133</td>
<td>128</td>
<td>117–137</td>
</tr>
<tr>
<td>Chloride (mmol/L)</td>
<td>28.36</td>
<td>29.47</td>
<td>26.69–31.97</td>
</tr>
</tbody>
</table>
One-cm fresh faeces were also sampled for coprological study. Coprological analysis was performed by sedimentation (or the Telemann method) using 4% formalin solution and ethyl acetate as main reagents. Using this technique, it was confirmed that all eggs were of the previously identified species (Figure 5).

A blood sample was obtained by puncture of the dorsal coccigeal vein before and after treatment with antiparasitic fenbendazole (Table I).

**TREATMENT**

Therapy was started by using fenbendazole (Panacur, Intervet) at a single dose of 50 mg/kg per day for 4 days, repeating this dosing regime two weeks later. Fluids were also administered at a rate of 50% Ringer Lactate with 5% Dextrose, as well as by force-feeding by an oesophagostomy feeding tube (Figure 6). Nutritional complexes rich in proteins, vitamins, and trace elements were administered by tube feeding (Gevral Proteina (Wyeth Farma, S.A.)).

**OUTCOME**

The tortoise began to eat by itself after 20 days. The feeding tube was removed two days later. It began to improve in weight and 1 month after admission the turtle weighed 680 g. Coprological analysis was repeated 7 days after tube removal and the faeces were free of parasites. The oral mucosa had a pinkish and healthy colour. After 4 months, the tortoise was marked and released in Montsant Natural Park (Catalonia, Spain).

**DISCUSSION**

Control of pinworm numbers is important in free-living reptiles. These parasites can cause malabsorption or intestinal problems (Jacobson, 2007). In addition, they can cause tisular migration and visceral inflammatory lesions. This has been described for the Trachemys scripta turtle, in which pancreatitis was observed due to helminth tissue migration (Hidalgo et al., 2010).

The Telemann method is a parasite detection technique by centrifugation and isolation of parasites using the phase separation of two immiscible liquids such as formaldehyde and ethyl acetate (Thienport et al., 1986).

This method provides a higher egg recovery rate, as well as a decrease in the false negative results commonly seen in flotation techniques used in pet clinics. The method is not commonly used in exotic pet clinics but, in view of the high number of parasites in reptiles (Jacobson, 2007), it could be a more widely used method with a view to enhancing egg detection in tortoise stool (Cray & Zais, 2004).

Nematodes are common in the digestive system of tortoises and especially in Hermann tortoises (Testudo hermanni) (Gagno, 2006). Nematode overload is commonly encountered in reptiles housed in poor conditions, and has also been associated with disease and mortality in captive iguanas (Loukopoulos et al., 2007), tortoises (Rideout et al., 1987), and snakes (Lichtenfels & Laviyes, 1976).

Oxyurids such as the Tachygonetria genus are common in the colon of tortoises, although they are usually non-pathogenic. However, impaction due to oxyurid infection has been reported in a Fiji Island iguana (Kane et al., 1976) and in a common iguana in Japan (Munakata, 1999) and Greece (Loukopoulos et al., 2007). In all these cases, a large number of parasites were found during necropsy in stomach, intestine, and colon.

Clinical signs of anorexia, regurgitation, obstruction, and abdominal distension have been attributed to the presence of such parasites in these cases. Abdominal distension is an undetectable sign in tortoises due to the presence of the shell. Although anorexia and starvation were observed in the present case, they are a common signs of diseases and not specific to parasites.

Occupants of the intestinal lumen such as pinworms (Oxyuridae) deprive the host of important nutrients. In young reptiles, growth disturbances may be seen, and the fertility rate in females drops (Schneller & Pantchev, 2008). Nematodes can cause severe digestive agglomerations that compromise the intestinal function and can cause chronic weight loss, impaction, and even death in herbivorous reptiles (Loukopoulos et al., 2007).

Currently, Hermann’s tortoise is considered endangered in Spain and, consequently, many are released in the wild (Martínez Silvestre, 1999; Soler Massana et al., 2001). In nature, released tortoises will find other tortoises with the same parasites (Asakawa et al., 2001; Gagno, 2001).

As a result, deworming should not aim to completely eliminate the Oxyura parasites (Gagno, 2007). Only in critical cases is full and deep deparasitation necessary.
Although most oxyurid infections pose no clinic problem for tortoises, infection with *Tachygeumia* sp. resulting in disease has been reported in a Hermann’s tortoise. Treatment of tortoises for nematodiasis is challenging because of the difficulty of accessing the oral cavity, toxicity associated with the anthelmintic ivermectin (Fitzgerald, 2008; Klingerberg, 1992), and prolonged gastrointestinal transit time, which can affect drug absorption.

Fenbendazole is the drug of choice for treating nematode infections in reptiles. It can be administered per os as a liquid, or the powder form can be placed on food. In continued treatment, the liquid form can be given by the gastric catheter used in forced feeding.

Fenbendazole is a benzimidazole drug used to treat many reptile parasites, mainly involving pinworms (Oxyuridae) and ascaris, acanthocephalan, *Heterakis*, Spiruridae, Trichuridae, Cosmocercoids, Strongyloides, Pentastomida and liver flukes (*Dicrocoelium* and *Fasciola*). All of these parasites are frequent in an exotic animals clinic, so fenbendazole use on reptiles is very common, especially in land tortoises (Greiner & Schumacher, 1998).

Benzimidazoles act by inhibiting tubulin polymerization, which affects the formation of microtubules, movement of intracellular particles, cell mitosis and structure, and exocytosis. Loss of microtubules from the tegument and intestinal cells of nematodes leads to their starvation and inhibition of egg production.

Benzimidazole affinity is high for parasites but this drug has also been described as dangerous for vertebrates. In Hermand’s tortoises, fenbendazole has been described as possibly causing heteropenia, leucopenia, and generalized lymphopenia, as well as increases in uric acid, phosphorus, and total proteins or decreased heteropenia, leucopenia, and generalized lymphopenia. In the present case (Neiffer et al., 2005), accordingly, the risk of mortality of an individual from nematode infection should be assessed relative to the potential for metabolic alteration and secondary septicemia following damage to haematopoietic and gastrointestinal systems by fenbendazole.

In the present case, the use of fenbendazole is indicated in combination with blood control and health status evolution of the animal. The good results in blood tests and recovery of weight and appetite after treatment allowed a favourable prognosis of the case. Changes in glucose and eosiinophils can be explained by improved health status to parasitism and not by a fenbendazole secondary effect.

The use of oesophagostomy feeding tubes in tortoises should not be restricted to terminal cases of anorexia, but could also be used in therapies that need various products and drugs by forced feeding daily for a few weeks.

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**REFERENCES**


