CLINICAL CASE

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

Albert Martinez-Silvestre
DVM, MSc, Dipl. ECZM (herpetology)

C.R.A.R.C
Catalonian Reptile and Amphibian Rehabilitation Centre
08783 Masquefa, Barcelona
SPAIN

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 magnifyng 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 Nematelmint roundworms, Oxuyroidae family, *Tachygonetria conica* species (Drasche, 1884) (Figures **3** and **4**), which are common gastrointestinal parasites in *Testudo hermanni* from Spain, France, and Italy.

Figure 1.

CONSULT Journal, Special 2011, Pages 409-412.


Figure 2.

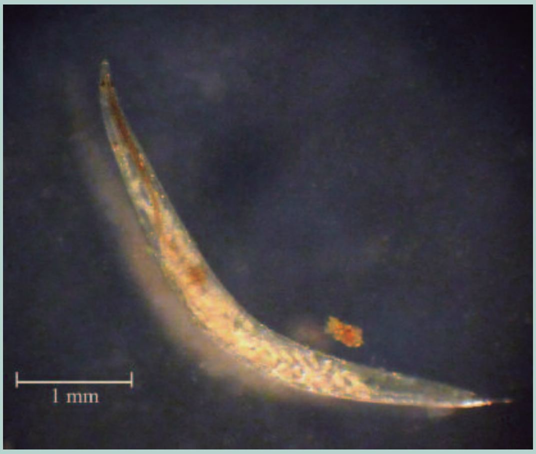

Figure 3.


Figure 4.

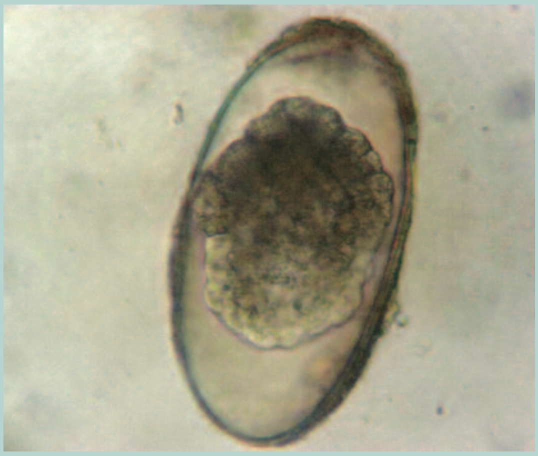
Figure 5.

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).

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

Biochemistry	Results (pre- treatment)	Results (post-treatment)	Range
Total protein (g/L)	41	43	39-54
Glucose (mmol/L)	2.50	3.61	2.94-5.94
Uric acid (umol/L)	333.09	309.30	124.91-576.96
AST (IU/L)	65	43	9-103
Potassium (mmol/L)	4.80	4.00	3.59-6.90
Sodium (mmol/L)	135	128	117-137
Chloride (mmol/L)	28.36	29.47	26.69-31.97

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.)).

Figure 6.

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 & Zaias, 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 & Lavies, 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, Herman'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 clinical problem for tortoises, infection with *Tachygometria* 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, toxicosis 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 percloacally as a liquid, or the powdered 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, *Cosmocercoides*, *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 Herman'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 glucose in intensive treatment regimes as 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 eosinophils 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.

Acknowledgements

Sincere thanks are expressed to Joaquim Soler, Jose Antonio Mateo, and Lluis Parpal, as well as to the Monsant Natural Park, the Balearic Islands Government, and the Wildlife Rescue Centre of Majorca Island.

REFERENCES

Alvarado,T.P., Garner,M., Gamble,K., Levens,G.P., Raymond,J.T., Nordhausen,R., 2001. Fenbendazole overdose in four fea's vipers (*Azemiops feae*). Proceedings of the ARAV 8:35-36.

Asakawa,M., Suzuki,Y., Kimoto,Y., Fox,M.T., 2001. Parasitic nematodes of pet tortoises in Japan: clinical and ecological view points. Proceedings of the ARAV 8:139-144.

Cray,C., Zaias,J., 2004. Laboratory procedures. Veterinary Clinics of North America: Exotic Animal Practice 7:518.

Fitzgerald,K.T., 2008. MASTER CLASS: POISONINGS IN CAPTIVE REPTILES. Proceedings Association of Reptilian and Amphibian veterinarians 15:113-115.

Gagno,S., 2001. Preparation aux reintroductions de Testudo hermanni hermanni: controle parasitologique intestinal-premiers resultats. Proceedings of the International Congress on Testudo Genus 3:157-160.

Gagno,S., 2006. Parasitologie des cheloniens helminthes: biologie , ecologie, pathologie. 1 edition. Volume 5. Editions SOPTOM.

Gagno,S., 2007. Impact de la faune helminthique intestinale de Testudo hermanni (Gmelin, 1789) (*Chelonii, Testudinidae*). Congress Mediterraneen d'Herpetologie 1:52-53.

Greiner,E.C., Schumacher,J. 1998. Parasitology. Pages 689-702 in Ackerman, L. editor. The biology, husbandry and health care of reptiles. TFH, New Jersey.

Greiner,E.C., Schumacher,J. 1998. Parasitology. Pages 689-702 in Ackerman,L. editor. The biology, husbandry and health care of reptiles. TFH, New Jersey.

Hidalgo-Vila, J., Martínez-Silvestre, A., Ribas, A., Casanova, J.C., Pérez-Santigosa, N., Díaz-Paniagua, C. (2011) Pancreatitis associated with helminth Serpinema microcephalus (Nematoda: Camallanidae) in exotic red-eared slider turtles (*Trachemys scripta elegans*). Journal of Wildlife Diseases, 47:201-205.

Jacobson,E.R. 2007. Parasites and parasitic diseases of reptiles. Pages 571-666 in Jacobson,E.R. editor. Infectious Diseases and Pathology of Reptiles: Color Atlas and Text. CRC Press, Boca Raton, Florida.

Kane, K. K., R. M. Corwin, and W. J. Boever. 1976. Impaction due to Oxyurid infection in a Fiji Island iguana (a case report). Vet. Med. Small Anim. Clin. 71: 183–184.

Klingerberg,R.J., 1992. A comparison of Fenbendazole and ivermectin for the treatment of nematode parasites in Ball pythons, Python regius. Bulletin of the Assotiation of Reptilian and Amphibian Veterinarians 2(2):5-6.

Lichtenfels, J. R., and B. Lavies. 1976. Mortality in red-sided garter snakes, Thamnophis sirtalis parietalis, due to larval nematode, Eustrongylides sp. Lab. Anim. Sci. 26: 465–467.

Loukopoulos,P., Komnenou,A., Papadopoulos,E., Psychas,B., 2007. Lethal ozolaimus megatyphlon infection in a green iguana (*Iguana iguana rhinolopa*). Journal of Zoo and Wildlife Medicine 38:131-134.

Marin,A., Bertolero,A., Aguiló,M., Conesa,D., 2001. Haematological parameters in the hermann's tortoise Testudo hermanni hermanni and their application to conservation projects. Proceedings of the International Congress on Testudo Genus 3:346-348.

Martínez Silvestre,A., 1999. Libération de tortues en Espagne. La Tortue 48:34-35.

Mathes,K., Holz,A., Fehr,M., 2005. blood reference values of four species of terrestrial tortoises (*Testudo* spp.) in germany. Proceedings Association of Reptilian and Amphibian veterinarians 12:55-59.

Munakata, Y., I. Inoue, and A. Shirai. 1999. Ozolaimus megatyphlon (Nematoda: Pharyngodonidae) isolated from a green iguana (*Iguana iguana rhinolopa*). J. Jpn. Vet. Med. Assoc. 52: 784–787.

Neiffer,D.L., Lydick,D., Burks,K., Doherty,D., 2005. Hematologic and plasma biochemical changes associated with Fenbendazole administration in Hermann's tortoises (*Testudo hermanni*). Journal of Zoo and Wildlife Medicine 36:661-672.

Rideout, B. A., R. J. Montali, L. G. Phillips, and C. H. Gardiner. 1987. Mortality of captive tortoises due to viviparous nematodes of the genus Proatractis (Family Atractidae). J. Wildl. Dis. 23: 103–108.

Soler Massana,J., Martínez Silvestre,A., Tarin,R., Parellada,X., 2001. Premiers resultats de la reintroduction de la Tortue d'Hermann (*Testudo hermanni hermanni*) dans le massif du Garraf (Catalogne, Espagne). Proceedings of the International Congress on Testudo Genus 3:230-232.

Thienport, D., Rochette,F.,Vanparjis, O.F.J. (1986): Diagnosing helminthiasis by coprological examination. Janssen Research Foundation. Beerse, belgium. 205 pp.