

INTOXICATION OF YOUNG CROCODILES IN CAPTIVITY DUE TO THE INGESTION OF DARKLING BEETLES *BLAPS NITENS LAPORTEI* ARDOIN (COLEOPTERA; TENEBRIONIDAE)

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ABSTRACT

A sharp increase of mortality was reported among young crocodiles on a rearing farm in the south of Israel during the summer months. Clinical inspection of the animals in the rearing rooms revealed that about 20% of the young crocodiles, suffered from severely swollen expanded abdomens with clinical signs of dyspnea. Post mortem examination of affected animals revealed severe expansion of the stomach and extensive damage to the mucosa with the presence of partly digested traces of black beetles. Visual inspection of the premises revealed very large numbers of black beetles. A tentative diagnosis of a potential poisoning or intoxication related to the ingestion of the beetles by the young crocodiles was suggested. Beetles were identified as *Blaps nitens laportei* belonging to the *Tenebrionidae* family. Within a few days after the pens were cleaned from dead and live beetles and the windows covered with a nylon mesh, the morbidity and mortality began to decline strongly suggesting that the etiology was related to the ingestion of beetles by the young crocodiles. To the best of the knowledge of the authors this is the first case report on the potential poisoning of young crocodiles by the ingestion of the darkling beetle *Blaps nitens laportei*

INTRODUCTION

Since the late 80's, some attempts have been carried in Israel to develop a crocodile farming industry. At present there is only one small crocodile farm in the area of Fazael e Dead Sea where a small breeding colony with several adult crocodiles (*Crocodylus niloticus*) is maintained. The eggs are incubated using artificial incubation and the young hatchlings transported and reared in another farm located in the area of the Negev. Young crocodiles are reared under intensive conditions in small greenhouse buildings in separated rooms with concrete pools and temperature controlled water. Every hatch of crocodiles is located in a different pool in groups containing 100 to 200 crocodiles per room. The rearing farm had a capacity to rear about 2000 young crocodiles up to the age of about 2 years.

During the summer season, large numbers of darkling beetles were observed in the surroundings and inside the crocodile rearing facilities. A sudden increase in mortality among the youngest crocodiles was tentatively related to a possible intoxication due to the ingestion of darkling beetles. In this case report we describe the clinical and pathological findings of the intoxication of young crocodiles after ingestion of darkling beetles *Blaps nitens laportei* (1).

CASE REPORT

Young crocodile hatchlings (*Crocodylus niloticus*) were transported from the hatchery to the rearing farm in the area of the Negev in Israel. The facilities at the farm include two green-houses like buildings with concrete walls and floor and green polycarbonate ceilings that enables light to enter the building. Each building is separated into 5 rooms by concrete walls of about 1.2 meters high, the concrete floor has a slope that allows for filling with water for about 50% of the area of the floor, creating a pool for the crocodiles as well as a dry area to rest.

The young crocodiles were fed with minced fresh ostrich meat from a nearby ostrich slaughter house, the meat was mixed with a special premix containing calcium, vitamins and microelements in order to provide a balanced diet to the young crocodiles.

The temperature of the water in the pools was controlled to avoid hypothermia of the young reptiles, and changed every 3 days to avoid excessive contamination of the water.

A sharp increase of mortality was reported among the youngest crocodiles in some of the rooms in one of the rearing houses.

Clinical inspection of the animals in the rearing rooms revealed that about 20% of the young crocodiles in some of the rooms suffered from severely swollen expanded abdomens; the affected animals held their heads high and the mouths open

indicative of dyspnea (Fig 1).

Post mortem examination of affected animals revealed severe expansion of the stomach (Fig. 2). Opening of the stomach revealed extensive damage to the mucosa with traces of ostrich meat, a gelatinous content and partly digested traces of black beetles (Fig. 3).

Visual inspection of the premises revealed very large numbers of black beetles all over the facility including on the floor of the rearing areas (Fig 4). Young crocodiles were observed to feed on live beetles falling on the water of the pools or crawling on the floor while the older one year old crocodiles did not appear to touch the live or dead beetles.

A tentative diagnosis of a potential poisoning or intoxication related to the ingestion of the beetles by the young crocodiles was suggested as other etiologies were discarded such as addition of water treatments, use of disinfectants or any other toxic product used accidentally. The measures taken to reduce the presence of black beetles inside the rearing areas included physical cleaning of the rearing areas from any dead or live beetle and location of a nylon mesh on the windows of the buildings to avoid further entrance of the beetles to the rearing areas. Within a ten days period, all the affected young crocodiles showing bloated bellies died and general mortality within the affected groups started to reduce, but many of the less affected animals showed apathy and reluctance to eat. Pathologic examination of some of these crocodiles, revealed extensive damage of the mucosa of the stomach and secondary development of some fungal infection probably due to the extensive primary damage to the epithelium of the stomach, and the accumulation of organic debris due to stomach stasis.

Treatment with copper sulphate at $\frac{1}{2}$ kg /1000 liters of water was added to the ponds. Within a week, mortality decreased significantly and no new cases of bloated bellies were observed.

DISCUSSION

Distention of the stomach or "bloating" has been reported in crocodiles by Huchzermeyer as result of over feeding (2). Crocodiles feed after long periods of food withdrawal may eat large quantities of meat and develop stomach stasis, bacterial decomposition of the stomach content that may cause toxemia and mortality.

In this case the young crocodiles were fed every second day just enough meat to feed all the crocodiles in the pen. The development of bloating and mortality was acute and many of the affected crocodiles had only some residues of meat from their last meal. All the crocodiles in this case report examined showed swollen bellies and had residues of black beetles in their stomachs. The internal mucosa of the stomach was eroded and severe desquamation of the epithelium was observed in all the affected crocodiles.

Beetles were identified by Dr. V. Chikatunov from the University of Tel Aviv as *Blaps nitens laportei* belonging to the *Tenebrionidae* family (1) (Fig 5). It has been reported that some members of tenebrionid beetles, have defensive

glands able to produce a mixture of p-benzoquinones and hydrocarbons such as 1,4-benzoquinone, 2-methyl-1,4-benzoquinone and 2-ethyl-1,4-benzoquinone (3, 4, 5). These toxic products are produced and contained in small glands in the abdominal cavity of the insects and are released from small openings at the tip of the abdomen when the beetles are threatened. Some Tenebrionid beetles possess special glands able to produce at least three types of 1,4-benzoquinones (5, 6) and hydrocarbons (4). One of the most effective mechanisms of protection among some insects is the production of caustic or toxic repellent products against predators.

Another possibility, quinones which are very reactive and toxic compounds are able to cause severe membrane damage, enzyme destruction and cell death, and are mutagenic and carcinogenic (Ollinger and Brunmark 1991). The toxicity of the benzoquinones is related to their capacity to produce free oxygen radicals able to severely affect cellular components.

The fact that the number of new cases of bloating among the young crocodiles started to decrease within a few days after the pens were cleaned from dead and live beetles and the windows covered with a nylon mesh, strongly suggest that the bloating and severe damage observed was related to the ingestion of beetles by the young crocodiles. For ethical reasons we did not try to reproduce the clinical signs and pathology of the intoxication by artificially feeding healthy young crocodiles, but the clinical and pathological picture are highly suggestive of an intoxication caused by the toxic benzoquinones contained in the poison glands of the beetles released in the stomach of the young crocodiles.

To the best of our knowledge this is the first case report on the potential poisoning of young crocodiles by the ingestion of the darkling beetle *Blaps nitens laportei*

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LEGENDS FOR FIGURES

Figure 1 - A young crocodile showing extensive distention of the abdominal cavity “bloating”.



Figure 4 - Large quantities of black beetles were found covering the floor of the crocodile rearing pens



Figure 2 - Post mortem examination of a young affected crocodile showing severe distention of the stomach.



Figure 5 - *Blaps nitens laportei* 1973 - darkling beetle, Negev, Israel



Figure 3 - Open stomach showing bleeding and desquamation of the epithelium of the stomach, a large amount of a gelatin like content and semi-digested parts of the black beetles.

