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Granulomatous myocarditis and coelomic effusion due to *Salmonella enterica arizonae* in a Madagascar Dumerili's boa (*Acrantophis dumerili*, Jan. 1860)

Lionel Schilliger¹, David Vanderstylen¹, Jérôme Piétrain¹, Valérie Chetboul²

Abstract

A granulomatous myocarditis due to *Salmonella enterica arizonae* was diagnosed in an 8-year-old Madagascar Dumerili's boa (*Acrantophis dumerili*) based on positive coelomic effusion culture, ultrasound visualization of abnormal ventricular myocardium, necropsy and cardiac histological examination.

Key words: Myocarditis, snake, *Salmonella enterica arizonae*, Salmonellosis, Echocardiography.

An 8-year-old male Madagascar Dumerili's boa (*Acrantophis dumerili*) was referred with a 6 week-history of progressive lethargy and anorexia. Physical examination revealed a relative good condition (Figure 1), a normal heart rate (60 beats/min) with regular rhythm, but moderate apathy and dehydration. Biochemical abnormalities included elevated levels of serum uric acid (141 mg/L ; normal range = 10-60 mg/L) and creatinine phosphokinase (1986 UI/L ; normal range = 50-400 UI/L). The cell blood count showed a moderate anemia (hemoglobin = 7.4 g/100 mL) without leukocytosis. A marked coelomic effusion was observed on survey thoracic radiographs (Figure 2). A two-dimensional ultrasound examination (Challenge, Esaote, Italy) was performed in ventrodorsal recumbency using both ventral and intercostal approaches. The apical short-axis section (Figure 3) of the ventricle showed that the myocardium was abnormal, containing focal hyperechoic

Figure 1 - Madagascarian Dumerili's Boa.



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Figure 2 - Survey thoracic radiographs. The cardiac silhouette is obscured on the lateral (2a) and the dorsoventral (2b) views because of the coelomic effusion.

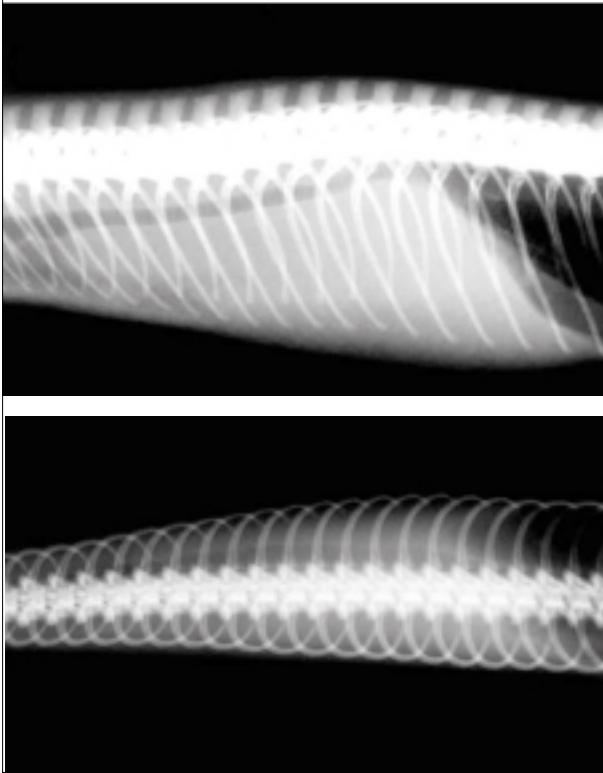


Figure 3 - Two-dimensional echocardiogram. This apical short-axis view shows a transversal section of the abnormal apical myocardium surrounded by the coelomic liquid. The ventral cavum pulmonale (CP) is partially visualized.

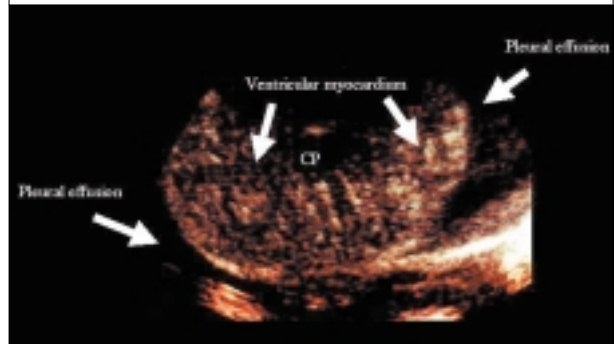
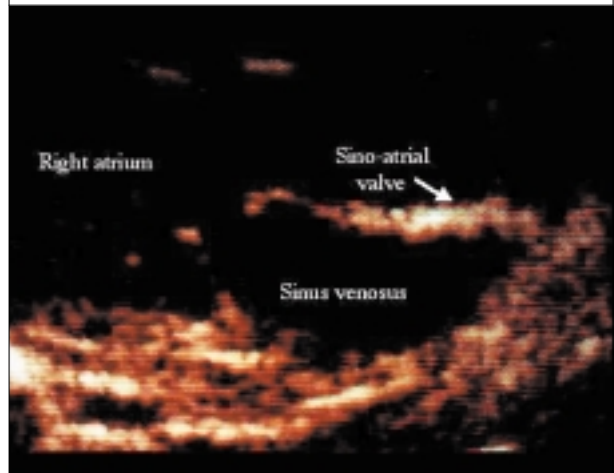


Figure 4 - Two-dimensional echocardiogram. This right transatrial short-axis section shows the opening of the sinus venous into the right atrium and the anomalous sinoatrial valve (arrow).



lesions. On the right transatrial short-axis section, one of the sino-atrial valves appeared irregular and hyperechoic (Figure 4). Echo-guided ponction of the coelomic effusion (Figure 5) was performed, and *Salmonella arizonae* was isolated from liquid cultures. The owner decided euthanasia. Microscopically, a granulomatous myocarditis (Figure 6) associated with a fibrinous and necrotic pericarditis was diagnosed (Figure 7). Evidence of granulomatous hepatitis, pneumonia, thyroiditis were also seen with granulomatous infiltration. Bacterial elements were observed on the histological sections of all of these organs.

Discussion

Several cardiac lesions have been described in ophidians, including most commonly endocarditis, myocarditis and pericarditis, but also infarct, cardiomyopathy, parasitic infestation or even tumors^{1,2,3}. As in human and small animal medicine, ultrasound examination is the technique of choice for establishing an ante mortem diagnosis and for withdrawing coelomic fluid: the heart is easily found, located behind the head at about 15 to 25% of the overall body length^{4,5}.

Salmonellosis is the most recognized reptilian zoonosis^{6,7,8}. *Salmonella* sp. is a worldwide gram-negative facultative flagellated anaerobe straight rod from the family of the Enterobacteriaceae⁹. The sub-species *arizonae* and *diarizonae* (sub-groups III and IIIb), which are the most frequently isolated in reptiles, respectively include 94 and 321

Figure 5 - Withdrawal of the coelomic liquid under echo control.



Figure 6 - Histological examination of the myocardium, hematoxylin eosin staining (original magnification, x 40). A granuloma (arrow) is observed.

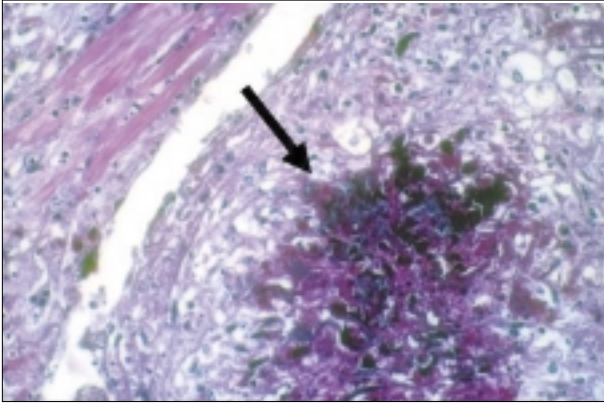
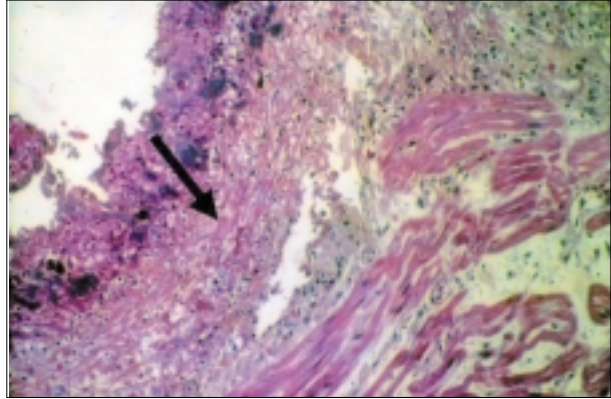


Figure 7 - Histological examination of the myocardium, hematoxylin eosin staining (original magnification, x 40). A granuloma (arrow) is observed.



serotypes^{9,10}. Nearly 90% of captive reptiles are asymptomatic carriers of different serotypes of *Salmonella* organisms in their digestive tract that they irregularly shed in their stools. These saprophytic and opportunistic bacteria are particularly well tolerated in poikilothermic animals, when those are in a good health status and in proper husbandry conditions. However, as in this case, they can lead to septicemia, coelomitis, and also pneumonia, gastro-enteritis, hypovolemia and shock in weakened reptiles^{9,10}.

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