Endocarditis due to Lactobacillus jensenii in a Salvin's Amazon parrot (Amazona autumnalis salvini)

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Abstract

A 30-years-old Salvin's amazon parrot (Amazona autumnalis salvini) with a history of a lifelong poor diet and inappropriate housing was presented in lateral recumbency to a veterinary teaching hospital for further evaluation. Radiological and ultrasonographical examination revealed a mild proventricular dilatation, mild hepatomegaly, signs of enteritis and air sacculitis. Main laboratory findings included a mild macrocytic hyperchromic anemia, hypoglobulinemia, decreased bile acids and increased alkaline phosphatase. In this bird a liver pathology was suspected because of the clinical, laboratory and ultrasonographical findings. The bird was treated with supportive care and metabolic aids. After initial improvement of the clinical signs the bird's condition deteriorated and it died. Pathological findings revealed an endo- and myocarditis due to Lactobacillus jensenii and a bacteremia. Endocarditis due to Lactobacillus sp. is a rare phenomenon in humans not yet described in animals. It is associated with severe underlying illnesses leading to translocation of otherwise non-pathogenic bacteria in the bloodstream. A similar pattern might be assumed in animals with compromised immunity.
Endocarditis due to *Lactobacillus jensenii* in a Salvin’s amazon parrot (*Amazona autumnalis salvini*)

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**Running title:** Endocarditis in a parrot

**Abstract**

A 30-years-old Salvin’s amazon parrot (*Amazona autumnalis salvini*) with a history of a lifelong poor
diet and inappropriate housing was presented in lateral recumbency to a veterinary teaching hospital for further evaluation. Radiological and ultrasonographical examination revealed a mild proventricular dilatation, mild hepatomegaly, signs of enteritis and air sacculitis. Main laboratory findings included a mild macrocytic hyperchromic anemia, hypoglobulinemia, decreased bile acids and increased alkaline phosphatase. In this bird a liver pathology was suspected because of the clinical, laboratory and ultrasonographical findings. The bird was treated with supportive care and metabolic aids. After initial improvement of the clinical signs the bird’s condition deteriorated and it died. Pathological findings revealed an endo- and myocarditis due to *Lactobacillus jensenii* and a bacteremia. Endocarditis due to *Lactobacillus* sp. is a rare phenomenon in humans not yet described in animals. It is associated with severe underlying illnesses leading to translocation of otherwise non-pathogenic bacteria in the bloodstream. A similar pattern might be assumed in animals with compromised immunity.
Introduction

Lactobacilli are Gram positive rods belonging to the Lactic Acid Bacteria group (Bernardeau et al., 2007). They are found in the mucosal membranes of mammals (oral cavity, intestines and urogenital tract) and birds (crop and intestines) (Bernardeau et al., 2007; Gong et al., 2007). Lactobacilli are ubiquitous in the diet, especially in fermented products (Bernardeau et al., 2007). They are assumed to have a low pathogenicity (Moudden et al., 2007). However, cases of infection due to Lactobacilli have been reported in humans (Atkins et al., 1990; Antony et al., 1996; Cannon et al., 2005; Land et al., 2005; Salvana & Frank, 2006; Chanet et al., 2007; Moudden et al., 2007). Lactobacillus (L.) casei and L. rhamnosus are the most commonly found species, but there are also reports of L. jensenii causing endocarditis and septicemia (Atkins et al., 1990; Cannon et al., 2005; Salminen et al., 2006; Moudden et al., 2007). To our knowledge, this is the first case report of a natural endocarditis and bacteremia due to a Lactobacillus sp. in an animal.

Case Report

A 30-years-old Salvin’s amazon parrot (Amazona autumnalis salvini) was presented in lateral recumbency. The bird was kept in the kitchen on a poor diet with the owner as a heavy smoker. It showed weakness, apathy, a head tilt to the left and bilateral clenched claws with deterioration of the signs within a few hours. Physical examination revealed the bird to be in a hypovolemic shock with severe dehydration, opisthotonus, and tremors. Both feet showed mild plantar reddening and clenched claws. The bird was in a good nutritional status. Lung and heart auscultation revealed no abnormal findings. After initial examination, a survey radiograph in ventrodorsal projection was obtained to exclude heavy metal intoxication. Additionally, lead levels in the blood were tested and were found not to be suspicious of lead intoxication. The bird was rehydrated with intravenous fluids (Glucose 5 % 5 ml/kg and Saline 0.9% 5 ml/kg) and treated with antibiotics (enrofloxacin 15 mg/kg i.m. BID, Baytril 2.5%, Provet AG, Switzerland and metronidazol 30 mg/kg p.o. BID, Metronidazol-Tropfen, Streuli Pharma AG, Switzerland) in case of a suspected septicemia in this highly depressed bird. A day after initial presentation, the bird was in upright position with a mild head tilt to the left side. Both feet were still held clenched, but the bird moved around and was eating by itself. In the blood evaluation
several values were altered including a mild heterophilia (79 %, reference range 33-73 %) and lymphopenia (18.5 %, reference range 22-66 %) without changes of the leukocyte count (Fudge, 2000). A slight macrocytic hyperchromic anemia was noted (hematocrit 40 %, reference range 42-55 %; RBC 1.96 x 10⁶/µl, reference range 2.45-3.18 x 10⁶/µl; MCH 66 pg, reference range 47.2-56.8 pg; MCV 204 fl, reference range 160-175 fl). Plasma chemistry revealed a mildly increased alkaline phosphatase ALP (155 U/l, reference range 15-150 U/l) and decreasing of the bile acids (4.8 μmol/l, reference range 24-120 μmol/l). Globulines were decreased (16 g/l, reference range 19-23 g/l) with a decreased albumin:globulin ratio (0.63, reference range 0.71-1.44). Based on the laboratory changes, clinical signs and anamnesis the primary differentials at this point were hepatic disease and hepatencephalopathy. Other possibilities were neuromuscular disease (Sarcocystis sp. infection), idiopathic vestibular syndrome, and neoplasia. A cloacal swab was taken for Chlamydophila psittaci antigen test (Antigen ELISA IDEIA™ Chlamydia, K 6002, DAKO, Cambridgeshire, UK) which was negative. Ventrodorsal radiographs and right lateral radiographs were obtained and a mild proventricular dilatation, signs of enteritis, and mild air sacculitis were found. Gram staining of the feces revealed 70 % gram-positive cocci, 20 % gram-positive rods and 10 % gram-negative rods. The fecal examination confirmed the radiological diagnose of enteritis because of the relative high degree of gram negative bacteria in the feces which are not considered to be normal commensales in healthy psittacines (Harrison & McDonald, 2006). To further evaluate the liver, an ultrasonographic examination of the coelom was performed using a 5 to 8 MHz microconvex transducer (ATL HDI 5000, Philips AG Medical Systems, Zurich, Switzerland) with a ventromedian approach. The ultrasonographical findings lead to the diagnosis of mild enteritis, minimal coelomic effusion and mild hepatomegaly. Treatment was adjusted for suspected hepatopathy with milk thistle extract (5 mg/kg p.o. BID, Milk Thistle, Holland & Barret, USA), lactulose (0.3 ml/kg p.o. BID, Duphalac, Solvay Pharma AG, Switzerland), and vitamin K1 (0.2 mg/kg i.m. SID, Konakion MM, Roche Pharma, Switzerland). Vitamin E and selenium (1 mg/kg Selenium and 25 mg/kg vitamin E i.m. once, Selen-E Vetag, Intervet, Switzerland) was given because of the neuromuscular signs. Fluid therapy was changed to non-lactated solutions given subcutaneously. Two days later the clinical state of the bird
deteriorated and the bird was again recumbent. When informed by telephone, the owners wished no further efforts until they could visit the patient. The bird died before they arrived and was submitted for postmortem.

On gross postmortem examination, a mild cardiomegaly and a friable grey-brown mass measuring 0.2 x 0.1 cm was found in the right ventricle attached to the endocardium. Findings also included a mildly enlarged firm liver with rounded edges and a mildly distended duodenum. The spleen was of normal size. Kidneys, lungs, air sacs and gastrointestinal tract (except of the mild distension of the duodenum) showed no macroscopically visible changes. Samples of cardiac blood and liver tissue were collected aseptically and submitted for bacterial culture using aerobic and anaerobic incubation at 37 °C for 24 hours on 5 % sheep blood agar plates. Further sections of all major organs were fixed in 10 % buffered formalin, stained with H & E (hematoxilin and eosin), and evaluated microscopically. Histological examination of heart, liver, kidneys, lungs, ventriculus and proventriculus were made. Throughout the heart lumen and in the endocardium (Fig. 1), bacterial colonizations (A) were noted. The thickened endocardium (Fig. 2) showed a subendocardial inflammatory infiltrate consisting of granulocytic cells (B), primarily of eosinophils and heterophils. The myocard showed a disintegration of myofibrils with interstitial edema and petechial bleedings. An inflammatory response consisting of granulocytic cells was seen as well.

The serosa of the ventriculus and the proventriculus showed an inflammatory infiltration with heterophilic cells and a few bacterial rods. The liver exhibited a disseminated necrosis and an inflammatory reaction comprised primarily of heterophils. The kidneys displayed a degenerative necrotizing tubule- and glomerulonephritis with infiltrations of heterophils and eosinophils. An anthrasilicosis of the lung was noted. The lung tissue showed an interstitial pneumonia with hyperemia, perivascular edema formation and an inflammatory response primarily consisting of eosinophils. Cultures of heart blood and liver tissue collected postmortem yielded pure cultures on blood agar after incubation at 37°C for 24 hours. For further specification of the bacteria grown on blood agar the 16S rDNA was amplified using universal primers and sequenced (Lane, 1991). The acquired sequences were compared with data bank entries and the best hit was obtained with
Lactobacillus jensenii. A suspension of the isolate was prepared and transferred accordingly the manufacturer’s instruction into the culture medium of an ATB™ VET strip (bioMérieux, Lyon, France). After 18-24 hours of incubation, the strip was read automatically by the ATB instrument and revealed resistance to oxacillin, kanamycin, lincomycin, colistin, cotrimoxazole, sulfamethizole, flumequine, oxoline acid, enrofloxacin, and metronidazole. The bacteria showed sensitivity to penicillin, amoxicillin, cephalothin, cefaperazon, streptomycin, spectinomycin, gentamicin, apramycin, chloramphenicol, tetracycline, doxycycline, erythromycin, pristinomycin, tylosin, nitrofurantoin, fusidin acid, rifampicin, and cefquinome.

Discussion

Pathological findings in the represented case revealed an endo- and myocarditis due to L. jensenii. Bacterial infection of the heart has been described in various avian species (De Wit & Schoemaker, 2005). It can be a result of bacteremia from chronic infections as salpingitis, hepatitis and pododermatitis and can lead to endocarditis, myocarditis, or epicarditis (Schmidt et al., 2003a; De Wit & Schoemaker, 2005). Prognosis for small animals with bacterial endocarditis is poor to grave (Kittleson & Kienle, 1998). All cases of birds with endocarditis described in literature are based on postmortem examinations (Isaza et al., 1992; Greenwood et al., 1996; Harari & Miller, 2007), so that one can assume in birds with endocarditis prognosis is grave as well. Endocarditis in birds may cause valvular insufficiency with or without associated murmur. No signs of heart disease such as a heart murmur were noted during physical examination of the patient. An echocardiography, which could have revealed the endocarditis, was not done. Other signs of heart diseases in birds are lethargy, dyspnea, weakness and collapse or syncope (Strunk & Heather Wilson, 2003). Diagnosis of endocarditis in animals is based on anamnesis (sudden onset of signs), physical examination (heart murmur), positive blood cultures and leukocytosis and signs of vegetative lesions of the endocardium in echocardiography (Isaza et al., 1992; Kittleson & Kienle, 1998; Strunk & Heather Wilson, 2003). Treatment of endocarditis includes antibiotic therapy, ideally based on culture results, and supportive care. Associated signs like renal or congestive heart failure as well as fluid and electrolyte imbalances
should be treated likewise (Kittleson & Kienle, 1998; Peddle, 2007). Management and control of the underlying disease is crucial (Peddle, 2007). Different bacterial pathogens have been described for endocarditis in birds like *Streptococcus* sp., *Pasteurella* sp., *Enterococcus* sp., *Enterobacter* sp., *Staphylococcus* sp., and *Erysipelothrix rhusiopathiae* (Isaza *et al.*, 1992; Gerlach, 1994; Greenwood *et al.*, 1996; Harari & Miller, 2007). In this case, pure cultures of *L. jensenii* were isolated from heart and liver tissues. To date, no case of endocarditis and bacteremia due to *Lactobacillus* sp. in an animal can be found in literature. Cases of infection due to Lactobacilli have been reported in humans as a rare phenomenon, associated with compromised immunity, structural heart disease, recent surgery, prolonged antibiotic therapy and severe comorbid conditions (Atkins *et al.*, 1990; Antony *et al.*, 1996; Cannon *et al.*, 2005; Land *et al.*, 2005; Hammermann *et al.*, 2006; Salvena & Frank, 2006; Chanet *et al.*, 2007; Moudden *et al.*, 2007). *Lactobacillus (L.) casei* and *L. rhamnosus* are the most commonly found species, but there are also reports of *L. jensenii* causing endocarditis and septicemia (Atkins *et al.*, 1990; Cannon *et al.*, 2005; Salminen *et al.*, 2006; Moudden *et al.*, 2007). It is assumed, that the mucosa of the gastrointestinal and urogenital tract in humans with severe underlying illnesses is friable and allows translocation of otherwise non-pathogenic bacteria (Hammermann *et al.*, 2006). A translocation of mucosa-associated bacteria after mucosal lesion, e.g. due to enteritis, appears possible in birds as well. Histological examination in this case revealed not only an endo- and myocarditis, but also a high presence of eosinophils in the heart, kidneys and lungs. The exact functions of the avian eosinophil is still unclear (Campbell, 1995). It is supposed, that eosinophils have different functions such as participation in inflammatory responses, phagocytosis and bactericidal and parasiticidal activity. Eosinophilia has been seen in gastrointestinal parasitism (Campbell, 1995; Latimer & Rakich, 2007). Studies also suggest that avian eosinophils may participate in the modulation of inflammation in delayed hypersensitivity reactions (Latimer & Rakich, 2007). Eosinophilic myocarditis can be the result of some parasitic infections, such as sarcocystosis, as it is described in birds (Strunk & Heather Wilson, 2003). However, in this case no protozoal parasites were seen on histological examination. A delayed hypersensitivity reaction to staphylococcal dermatitis known as “Amazon foot necrosis” is reported in Amazon parrots (Burgmann, 1995; Schmidt *et al.*, 2003b). Owners of the affected birds are
often heavy smokers as it was the case in the described bird. It is assumed that some element in the tobacco smoke may initiate this disease (Schmidt et al., 2003b). First, the birds feet and legs become erythematous, then the bird starts chewing at the feet which leads to an ulcerative dermatitis with possible secondary bacterial infection (Burgmann, 1995). Because relapses are very common other contributing factors to this condition like immunosuppression, underlying infectious diseases and topical irritations of the skin are assumed (Burgmann, 1995). In the present case, a combination of different factors (poor husbandry and nutrition, age of the bird, exposure to tobacco smoke) might have led to a delayed hypersensitivity reaction plus immunosuppression, which allowed a translocation of usually non-pathogenic intestinal microorganism in the blood stream followed by a fatale endocarditis and bacteremia. The chosen antibiotic regime could not succeed because L. jensenii, responsible for the bacteremia in this bird, was resistant against enrofloxacin and metronidazole. Lactobacilli have a high natural resistance to bacitracine, cefoxitine, ciprofloxacin, fusidic acid, kanamycine, gentamicine, metronidazole, nitrofurantoine, norfloxacine, streptomycin, sulphadiazine, trimethoprim/sulphamethoxazole, and vancomycin (Bernardeau et al., 2007). However, the antimicrobial susceptibility of the large genus Lactobacillus seems to be species dependent (Salminen et al., 2006). Antibiotic treatment with cephalosporins and quinolones are not advisable because of the low effectiveness of this antibiotics against the isolates (Antony et al., 1996). Susceptibility testing may be important for definitive and successful treatment.

In the present report the underlying disease was not diagnosed with the applied procedures. An echocardiography would have given further information but was not performed because of absence of a heart murmur and other clinical signs suggestive of heart disease. In such cases of a highly depressed patient, a septicemia should be suspected and a blood culture may lead to the right diagnosis and causally therapy after sensitivity testing.

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References


Figure legends

**Figure 1.** Cross section of the valvular region of the right ventricle of an amazon parrot (*Amazona autumnalis salvini*) (hematoxilin and eosin [H & E] stain). Note heterophils (B) and bacterial nests (A) infiltrating the thickened endocardium.

**Figure 2.** Cross section of the valvular region of the right ventricle of an amazon parrot (*Amazona autumnalis salvini*) (H & E stain). Note heterophils (B) and nests (A) of bacteria infiltrating the thickened endocardium.
Figure 1.