Chronic dermatitis caused by *Lactobacillus jensenii* infection in a blue and gold macaw (*Ara ararauna*)

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Case Description—A 5-year-old sexually intact female blue and gold macaw (*Ara ararauna*) was evaluated by the Zoological Medicine Service at the Louisiana State University Veterinary Teaching Hospital and Clinics because of a swelling on the right side of the face and irritated area on the ventral aspect of the keel.

Clinical Findings—Clinical findings were consistent with dermatitis (right facial lesion) and a coalescing subdermal granuloma (ventral keel lesion). Hematologic analysis revealed monocytosis and mild anemia. Histologic evaluation of the ventral keel lesion revealed evidence of chronic heterophilic dermatitis with multinucleated giant cells and bacterial rods and cocci. An unspeciated gram-positive rod-shaped bacterium was isolated via aerobic bacterial culture. Results of bacterial biochemical tests suggested the organism was a type of *Actinomyces*. A 16S rRNA gene sequence analysis was performed; results indicated the organism was *Lactobacillus jensenii*.

Treatment and Outcome—Extensive surgical debridement of the branching granuloma, which extended throughout the length of the keel, followed by long-term treatment with ciprofloxacin and clindamycin provided full resolution of clinical signs. No recrudescence of clinical signs was evident for up to 18 months after the initial evaluation.

Clinical Relevance—To the authors’ knowledge, this is the first report of *Lactobacillus*-associated dermatitis or subdermal granuloma in the scientific literature and the second report of *L. jensenii* in avian species. Use of 16S rRNA gene sequence analysis was instrumental in the identification of this fastidious organism, indicating the method’s usefulness as a diagnostic tool. (*J Am Vet Med Assoc* 2013;243:1030–1034)

A 5-year-old sexually intact female blue and gold macaw (*Ara ararauna*) was evaluated by the Zoological Medicine Service at the Louisiana State University Veterinary Teaching Hospital and Clinics because of a swelling on the right side of the face and nonhealing skin lesion on the cranioventral aspect of the keel. The owner first noticed the lesion on the bird’s face 2 days earlier, at which time he suspected it was the result of an insect bite (Figure 1). The nonhealing skin lesion had been evident for at least 2 weeks before evaluation in the hospital, and the owner had been treating the bird with an ointment containing neomycin, polymyxin B, and bacitracin with no success. The macaw had also developed unsteadiness and occasionally fell from its perch, which started at the time the facial lesion was noticed.

During the initial evaluation, the macaw was bright, alert, and responsive, with a body weight of 703 g (1.55 lb) and body condition score of 3 of 5 (ideal). Findings of cardiac and respiratory auscultation were unremarkable. The skin over the right facial lesion was inflamed, hyperemic, and firm to the touch. A round, black crust measuring 2 to 3 cm in diameter was detected on the skin covering the cranial third of the keel. It appeared to be erupting and protruding through the dermis. The crust was removed and found to be 5.6 mm thick and V-shaped, with one branch measuring 29.1 mm and the other 27.6 mm (Figure 2).

Palpation of the macaw’s pectoral muscles revealed several subcutaneous masses with suspected dermal invasion. The masses were firm to the touch and attached to the surrounding tissues, extending from the left cranial pectoral region to the keel and continuing caudally over the keel (Figure 3). Microscopic evaluation of impression smears from the ventral keel lesion and cyto logic examination with Romanowsky staining revealed heterophilic inflammation with suspected bacterial rod infiltration. A blood sample was collected and submitted for hematologic analysis. No other abnormalities were detected during the physical examination. At this time, fungal or bacterial dermatitis, including cutaneous mycobacteriosis, was suspected.

After the initial evaluation, the macaw was moved to a cage and hospitalized for further diagnostic testing and...
During the next 6 hours, the bird appeared to develop hyperesthesia (abrupt and uncontrolled movements of the wings and head and exaggerated response to touch) and was not perching or eating. The hyperesthesia seemed to resolve, and by the next day, no more abnormal behavior was noticed. The macaw continued its usual perching and eating activity. The observed episodes of hyperesthesia were attributed to pain or discomfort.

The CBC revealed monocytosis (1.2 × 10³ monocytes/µL; reference interval, 0.015 × 10³ to 1.053 × 10³ monocytes/µL) and mild nonregenerative anemia (Hct, 32%; reference interval, 40.5% to 49.7%). The monocytes were morphologically classified as reactive. Given the unremarkable leukocyte count, mycobacteriosis was considered to be an unlikely underlying cause of the subdermal granuloma.

An exploratory surgical procedure was recommended to determine the extent of the subdermal lesion on the ventral aspect of the keel and allow for collection of specimens for bacterial culture and histologic evaluation. The macaw was physically restrained for anesthetic induction by means of a face mask with 100% oxygen at a flow rate of 2 L/min, and anesthesia was induced with isoflurane at a vaporizer concentration setting of 5%. After anesthesia was induced, endotracheal intubation was performed with a noncuffed tube. Anesthesia was maintained with isoflurane (1.5% to 3% in oxygen at a flow rate of 2.0 L/min). The pectoral contour and down feathers were manually removed, and the skin was aseptically prepared for surgery. A midline incision of approximately 10 cm in length was made over the keel bone, and hemostasis was achieved with a radiosurgical instrument. Blunt dissection was performed to allow debridement of the skin and identification and removal of the various branches of the subdermal granuloma. Specimens of the granulomatous tissue and skin were collected and submitted for diagnostic testing. Once all the suspected diseased tissue had been debrided and removed, the skin incision was closed with a continuous suture pattern of polydioxanone 5-0. The bird received lactated Ringer’s solution (35 mL, SC) and meloxicam (1 mg/kg [0.45 mg/lb], IM, q 24 h). Anesthesia was discontinued, and anesthetic recovery was unremarkable. Two hours after recovery, food and water were offered and ciprofloxacin (10 mg/kg [4.5 mg/lb], PO, q 12 h) administered.

The specimens submitted for histologic examination were composed of serocellular and bloody crusts and skin. The crusts contained large numbers of erythrocytes, heterophils, cellular debris, and moderate num-

Figure 1—Photograph of a 5-year-old sexually intact female blue and gold macaw (Ara ararauna) that was evaluated because of a swelling on the right side of the face and irritated area on the ventral aspect of its keel. Notice the facial swelling. Skin over the right cheek was inflamed, hyperemic, and firm to touch. This condition was first noticed by the owner 2 days prior to evaluation.

Figure 2—Photograph of a large crust being removed from the ventral aspect of the keel of the macaw in Figure 1. Microscopic evaluation of impression smears and cytologic evaluation with Romanowsky staining revealed heterophilic inflammation with suspected bacterial rod infiltration.

Figure 3—Photograph of the ventral aspect of the keel of the macaw in Figure 1, which has been plucked and prepared for exploratory surgery. Thickening of the skin was evident, with subcutaneous granulomas extending from the manubrium to the xiphoid and the left lateral cranial aspect of the pectoral muscle.
bers of macrophages and multinucleated giant cells with filamentous bacteria, short rods, and cocci. Evidence of heterophilic dermatitis was detected in the skin specimens, which contained macrophages, multinucleated giant cells, cellular debris, edema, and a fibrous capsule interpreted as a possible wall of an abscess. Microscopic evaluation of Gram- and silver-stained specimens revealed cocci and rods, which were also partially visible by use of conventional H&E staining (Figure 4). Application of Ziehl-Neelsen and Fite Faracoc acid-fast stain and Gomori methenamine silver stain failed to reveal any other organism. No evidence of a foreign body was identified. The main diagnosis considered at this time was trauma with secondary bacterial infection.

Swab specimens collected from the lesions yielded light aerobic bacterial growth. A gram-positive rod-shaped bacterium was identified, and results of standard biochemical testing suggested the organism was a type of Actinomyces, although unequivocal identification of the bacterium was not possible. A 16S rRNA gene sequence analysis was performed, indicating the organism was Lactobacillus jensenii. No antimicrobial susceptibility testing was performed for the identified bacterium because of its fastidious growth. Because of reported findings of endocarditis associated with L. jensenii in humans, and in an Amazon parrot, cardiology evaluation and echocardiography were performed, revealing no remarkable findings in cardiac function or structure. Although no results of antimicrobial susceptibility tests were available, a review of the scientific literature regarding antimicrobial susceptibilities was performed, revealing no remarkable findings in cardiac function or structure. Because of reported findings of endocarditis associated with L. jensenii in humans, and in an Amazon parrot, cardiology evaluation and echocardiography were performed, revealing no remarkable findings in cardiac function or structure. Although no results of antimicrobial susceptibility tests were available, a review of the scientific literature regarding antimicrobial susceptibility of L. jensenii was undertaken. Reported results of in vitro antimicrobial susceptibility testing of Lactobacillus spp recovered from humans were used in the decision to add clindamycin (50 mg/kg [22.7 mg/lb], PO, q 24 h for 10 days) to the previous treatment regimen. Administration of meloxicam was discontinued. At this time, the facial lesion was still present, although it had subjectively improved since the initial evaluation.

After 10 days of treatment with clindamycin, the macaw was reexamined. The lesions on the face and keel had resolved without evidence of hyperemia or inflammation. A second CBC was performed; results revealed that the previously detected mild anemia had resolved (Hct, 45%), as had the monocytosis (0.2 × 10³ monocytes/µL). No reactive monocytes were identified. At this time, all medications were discontinued. Findings of follow-up evaluations were unremarkable, and the owner did not report any recrudescence of clinical signs during the subsequent 18 months.

Discussion

Lactobacilli are anaerobic or facultative-anaerobic gram-positive, rod-shaped, non-spore-forming bacteria that are ubiquitous and generally considered nonpathogenic inhabitants of the oral cavity, gastrointestinal tract, and female genital tract of humans. More than 50 Lactobacillus spp have been identified, several of which have been recovered from avian species. Only a few reports exist of pathogenic Lactobacillus spp involving avian species. The pathogenicity of Lactobacillus spp in humans is considered low, and the organism is seldom isolated by means of bacteriologic cultures of blood, although the importance of its isolation is controversial. Some authors consider these bacteria to have low clinical importance; however, L. jensenii spp have been reported as the causative pathogen in several types of infections, mainly endocarditis and bacteremia and less commonly pneumonia, dental caries, urinary tract infection, septic arthritis, chooroamnionitis, endometritis, meningitis, and abscess formation (intraabdominal, liver, and spleen).

Recovery of Lactobacilli from typically sterile environments such as blood, peritoneal fluid, or deep foci should be considered an important finding. In a retrospective study of > 200 Lactobacillus infections of humans, Lactobacillus casei and Lactobacillus rhamnosus were the most common, and L. jensenii was recovered from 3 of 241 patients, including 2 patients with endocarditis and 1 patient with bacteremia. In another study, among 48 isolates from humans, L. rhamnosus, Lactobacillus fermentum, and L. casei were the most common, whereas L. jensenii was identified twice.

A review of the literature revealed only 2 reported cases of Lactobacillus bacteremia in avian species. A novel Lactobacillus psittaci was isolated after death from a right pulmonary air sac lesion of a captive adult male hyacinth macaw (Anodorhynchus hyacinthinus). Lactobacillus jensenii was reported to have caused endocarditis and myocarditis in a captive 30-year-old Salvini’s Amazon parrot (Amazona autumnalis salvini). Lactobacilli may be difficult to culture, and speciation is challenging. The use of 16S rRNA or 23S rRNA-
targeted hybridization probes and PCR assays have been successful in the identification of some *Lactobacillus* spp.\(^{21,22}\) However, when a close genetic relationship exists between bacterial species, 16S rRNA has not been useful because of little variation of the 16S rRNA sequence.\(^{23}\) In the macaw of the present report, 16S rRNA gene sequence analysis was chosen because of the difficulties encountered during conventional aerobic culture. This gene sequencing approach to identification of *Lactobacillus* sp is commonly used in human medicine.\(^{23}\) Prior to antimicrobial treatment of the bird, bacteriologic culture of blood could have been performed (although in the opinion of the authors, this diagnostic test is often unrewarding in avian species), which may have yielded confirmation of systemic infection; however, this diagnostic test was not performed.

Because of the reported relationship between lactobacillemia and endocarditis,\(^{1,19,19}\) a cardiac examination was performed to assess cardiac function in the macaw, although cardiac disease was not clinically suspected. The echocardiogram did not reveal any functional or structural abnormalities. Use of a cardiac troponin assay was not considered, although a high serum troponin concentration may have indicated subclinical cardiac disease.\(^{24-26}\)

Ciprofloxacin was chosen as an initial treatment to provide broad-spectrum antimicrobial coverage. Because of the fastidious growth of the bacterium, antimicrobial susceptibility testing was not possible, so it is unclear which antimicrobial would have been most appropriate for the macaw. Once the organism was identified as a *Lactobacillus* sp, the general scientific literature on in vitro antimicrobial susceptibility of that organism was reviewed. Isolates of *Lactobacillus* spp obtained from humans are reportedly susceptible to various antimicrobials. In an in vitro study,\(^{1}\) antimicrobials with the lowest MIC (≤ 0.06 µg/mL) against *L. jensenii* were erythromycin, clindamycin, imipenem, and benzylpenicillin, whereas ciprofloxacin had a high MIC (≥ 2 µg/mL). Results of other in vitro studies\(^{3,7,15,27-29}\) have also indicated good susceptibility of *Lactobacillus* spp to clindamycin. Considering the published information and route of administration of the antimicrobials, we elected to administer a 10-day course of clindamycin in combination with the previously prescribed ciprofloxacin. According to the owner and as identified during follow-up examinations, full resolution of the clinical signs of *L. jensenii* infection was attained 1 month after the initial evaluation. All antimicrobials were discontinued at that time.

Initially, a diagnosis of mycobacteriosis with cutaneous involvement was considered on the basis of physical examination findings. Cutaneous and subcutaneous granulomas associated with mycobacteriosis have been identified in several avian species, including psittacines.\(^{30-33}\) However, this possibility was ruled out because of the unremarkable leukocyte count, lack of acid-fast bacteria detected via histologic evaluation, and identification of *L. jensenii* by means of 16S rRNA gene sequence analysis.

The initial CBC revealed anemia, which was considered to be related to the chronicity of the macaw's infection. As in mammals, anemia in birds is classified as regenerative or nonregenerative.\(^{40}\) Classification can be performed on the basis of erythrocyte shape or laboratory measurement and calculation of erythrocyte indices.\(^{41}\) In the macaw, polychromasia was not evident and therefore its anemia was considered nonregenerative.\(^{42}\) Causes of nonregenerative anemia in birds include anemia of chronic disease (chlamydophilosis, mycobacteriosis, aspergillosis, West Nile virus infection, or neoplasia), toxicant exposure (heavy metals), iron deficiency, hypothyroidism, and leukemia.\(^{43}\) In humans, anemia of chronic disease develops in those with short- or long-term immune activation caused by changes in iron hemostasis, erythropoietin production, and erythrocyte life span.\(^{43}\) For the macaw, anemia was considered resolved by the time the second CBC was performed at the follow-up examination, corresponding with the successful resolution of the chronic dermatitis.

The hyperesthesia detected after the initial physical examination of the macaw was considered to be related to pain or discomfort, as can develop in birds and other species.\(^{44,45}\) Hyperesthesia has been associated with chronic pain in humans.\(^{46}\) Other reported causes of hyperesthesia in birds include toxicosis (in particular, those caused by heavy metals), encephalitis, or drug overdose.\(^{47-52}\) In other species, hyperesthesia can also be related to viral infection (West Nile virus and FeLV).\(^{53-56}\) The hyperesthesia in the macaw was evident for a short period, after which it resolved and was not detected again during the treatment or reexaminations, nor was it reported by the owners.

To the authors’ knowledge, *Lactobacillus*-associated dermatitis has not been reported in the human or veterinary literature. The source of the infection in the macaw remains unclear but a possible crop perforation or a puncture wound with secondary dermatitis could not be ruled out. *Lactobacillus* infections have been reported in immunocompetent human patients, and the most common point of entry is a breach in the mucosal barrier.\(^{57}\) Our experience in diagnosis and treatment of the macaw indicated the importance of 16S rRNA gene sequence analysis for identification of fastidious bacteria and its usefulness as a diagnostic tool.

References


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