

Differentiating Abdominal Disorders in the Ostrich and the Emu

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Summary

This study summarizes the historical and clinical findings of ostriches and emus, six months old or older, presented to the Texas A&M College of Veterinary Medicine with diseases of the abdominal viscera. In the ostrich, impactions (54%), metallic foreign bodies (22%), and primary diseases of the bowel (24%) were identified most often. In contrast, disease of the reproductive tract (65%) was most common in the emu. Lead poisoning (15%), foreign bodies (15%), and intestinal disease (5%) were uncommon findings in the emus. In most cases in both birds, these diseases could be differentiated exclusively on history, physical examination, and laboratory data. In others, particularly those affecting the ostrich, radiographs were required for a primary diagnosis or to confirm clinical findings. Hematological changes and serum uric acid and glucose concentrations, while not specific for any one disease, were of prognostic value. Elevations for gamma glutamyl transferase were only identified in emus with lead intoxication.

Diseases of ostriches (*Struthio camelus*) and emus (*Dromaius novahollandiae*) that selectively affect the abdominal organs often present with nonspecific signs making their differentiation difficult. Accurate and timely diagnosis of these disorders, however, is critical as many will become fatal without prompt medical management or surgical intervention. In this study, the records of ostriches and emus, 6 months of age or older, presented during a three-year period to Texas A&M University with a final diagnosis of disease affecting the gastrointestinal tract, liver, and reproductive tract were reviewed. Historical, clinical, and laboratory findings were compared between the common diseases observed in each of these species.

Ostriches

Ostrich abdominal disorders identified in this study were subdivided into four categories: 1. impactions involving the proventriculus and ventriculus, 2. metallic foreign bodies penetrating the ventriculus, 3. diseases of the bowel, and 4. disorders of the reproductive tract. During this study seven birds were also presented for reproductive tract evaluation. All of these visits were elective and none of these birds were showing signs of systemic illness, therefore they were not included in this study.

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General findings

Thirty seven birds were included in this study. They presented to the clinic in every month of the year except for July and August. Forty percent of these cases fell in the time frame of January through March. Cases ranged in age from seven months to five years and the mean age for each group was similar (approximately 2.3 years). Several historical findings were common to all three of ostrich disease categories. Anorexia, or a significant decrease in food consumption, reduced water consumption, and the absence or a significant decrease in fecal production were nearly universal complaints. Lethargy and reluctance to move were also common observations. Less commonly, owners reported that birds would be reluctant to rise, or in some cases to sit. Physical examination findings common to some of the birds in all three groups included, beak grinding, dehydration, and elevated heart and respiratory rates.

Impactions

Impactions of the gastrointestinal tract were diagnosed in 20 birds. Signs reported by the owner were generally nonspecific and were noted to have lasted from 1 to 60 days (mean 17.5 days). Weight loss, reduced growth rate, and unthriftiness were common complaints. Several birds were so cachectic that they were unable to stand. On physical examination 82% had significant weight loss. Dehydration was also a common finding. The most important, but not pathognomic, finding was distention of the proventriculus and ventriculus. Abdominal pain was noted in 2 birds (10%).

Complete blood counts (CBCs) were done on 16 birds. Inflammatory leukograms, those with a white blood cell count (WBC) over 30,000 cells/ μ l, or evidence of a degenerative left shift, were found in 68% of these birds. A monocytosis (1,500 cells/ μ l) was identified in 40% of the birds. The packed cell volume (PCV) had a mean value of 42% but had a bimodal distribution. Thirty five percent were anemic (PCV < 40%), while 20% had PCVs above 50. Impacted birds were the only birds with elevated PCVs, suggesting that they were more likely to be dehydrated. Fibrinogen levels were not specific. They ranged from 200 to 800 mg/dl with a median value of 200 mg/dl.

Although physical findings were generally sufficient to diagnosis impacted birds, radiography was instrumental in differentiating between medical and surgical cases. Radiography was also necessary to rule out concurrent foreign body disease. Birds were treated medically when it was determined that most of the material impacting the gastro-intestinal system was dirt, small rocks, or sand. If the amount of impacting material was massive, or was comprised of large rocks or plant material, then the birds were treated surgically. Sixty three percent of the impacted cases were successfully treated and released.

Metallic foreign bodies

Eight birds were diagnosed with metal foreign bodies capable of perforating the ventricular wall. Sixty six percent were males. Based on the history alone, most of these birds could not be differentiated from impacted birds. However, in 2 cases, the owner had identified metal inside the bird, one with a metal detector, the other with a "stud finder." On presentation, fifty percent of the birds were in good body condition. The remainder were thin. Proventricular distention was identified in 37.5% of the birds, suggesting a concurrent partial impaction. The most significant clinical finding was cranial abdominal pain, present in 62.5% of the cases.

CBCs and clinical chemistries were essentially the same as those observed in the impacted birds, although these birds were more often anemic (71.4%). While clinical findings were often strongly suggestive of metal foreign body disease, radiographs were considered essential for determining the number of foreign bodies, their location, and the appropriate means for

removing them. Intra-operative radiographs were also necessary to ensure that all the foreign bodies accessible to the surgeon were removed. In three birds, nails or wire had penetrated the ventriculus and were encapsulated in the surrounding tissues. In two of these birds one or more of foreign bodies could not be retrieved. The total number of foreign bodies removed varied from one to over 200. All of the birds were treated, survived, and are doing well.

Diseases of the bowel

Nine birds were identified with bowel disease. Two had a mild enteritis characterized by hemorrhagic diarrhea which responded to antibiotic therapy. Four birds developed a severe fibrinous enterocolitis in conjunction with and probably secondarily to other severe disorders. The first bird was impacted, emaciated, and nearly moribund on presentation. The second was heavily parasitized, had had 2 episodes of severe hypothermia in the proceeding week, and had a severe *Clostridium perfringens* myositis at the time of death. The third bird was starved and severely dehydrated as the result of a constricting band of necrotic skin that encircled the bird's neck. *Salmonella typhimurium* was cultured from this bird. The fourth bird had a partial sand and gravel impaction and was chronically debilitated. A primary fibrinonecrotic enteritis was diagnosed in the seventh case. At necropsy, over 3 meters of colorectum were found to be involved, and multiple perforations had lead to a diffuse peritonitis. Entrapment and strangulation of the colorectum in a mesenteric tear was diagnosed in the eighth case. The final case was a nearly moribund bird that presented with gas distended bowel, a fibrinous peritoneal exudate and a degenerative left shift. This bird was euthanized but not necropsied.

In contrast to birds with foreign bodies and impactions, all these birds presented with signs of less than a weeks duration. When severe intestinal disease was present, no feces were being passed. In three birds with necrotic bowel, peritoneal exudate was detectable by palpation and abdominocentesis. Additional signs were variable, but included tachycardia, tachypnea, injection of the mucous membranes, weakness, the absence of intestinal sounds, and decreased vascular perfusion of the extremities. All the birds had an inflammatory leukogram, 75% had a monocytosis, and 66.6% had a degenerative left shift. Fibrinogen levels were above 400 in 89% of the cases.

Radiographs were taken in three of the birds with necrotic bowel. All three of these birds had loops of bowel markedly distended with gas. With the exception of the two birds with mild enteritis, the remaining birds died.

Other diagnostic and prognostic considerations.

The total solids, as estimated by the refractometer, had a bimodal distribution which varied little between each group. This distribution probably reflected a combination of factors including gamma globulin concentrations, serum protein utilization, and bird's hydration status. Total protein levels also varied significantly and were probably influenced by similar factors. Gamma glutamyl transferase (GGT), total carbon dioxide, alkaline phosphatase, calcium, and phosphorus values varied little and were considered to be of little diagnostic value. Aspartate aminotransferase (AST) levels ranged from 295 - 2194 IU/l, all but three values were higher than the upper end of the reference range. Median values were very similar for each group. Creatinine phosphokinase (CPK) concentrations were also considerably higher than the reference range, 100% of these birds had values in excess of 5,000 IU/l. Thirty five percent had values of 16,000 IU/l or higher. A correlation between the level of the AST and the CPK values was not evident. Three birds with liver lesions diagnosed at necropsy had AST levels in the range of 600 - 900 IU/l. However, one bird with the highest AST level had a histologically normal liver. These findings suggest that other tissue injury, probably muscle necrosis, as well as liver disease contribute significantly to serum AST concentrations.

Sodium, potassium, and chloride levels varied moderately, but with a single exception were within an acceptable range. The exception was an impacted bird that stopped eating, but continued to drink. On presentation it was weak and unable to stand. It had a sodium of 108 meq/l, a chloride of 80 meq/l and a potassium of 1.2 meq/l. Aggressive electrolyte therapy reversed the electrolyte imbalance with a dramatic increase in the birds clinical status.

Glucose and uric acid concentrations were not associated with one disease process or another, but were prognositically important. Both birds with glucose values in excess of 400 mg/dl and all five birds with glucose values less than 175 mg/dl on presentation died. Eight birds presented with uric acid levels above 10 mg/dl. Of these eight, seven died.

Table 1, summarises the findings which characterize the different abdominal disorders described above.

EMUS

During the study period 20 emus were diagnosed with abdominal disorders. Thirteen (65%) had diseases of the reproductive tract associated with egg laying, 3 (15%) had lead poisoning, 3 (15%) had ingested foreign bodies, and 1 (5%) had an obstruction of the jejunum (Table 2).

Reproductive Disorders

Four reproductive presentations were identified: 1. fibrinous peritonitis with an egg present in the oviduct (6 birds), 2. intra-abdominal eggs (2 birds), 3. egg yolk peritonitis with no egg present (4 birds), and 4. fibrinous peritonitis with no egg present (3 birds). Affected birds presented between November and June, although 77% presented during the months of December, January, and February. Six birds were two years old, three were three years old, three were four years old, and one was five years old. Six birds (46%) had never laid an egg. Of the other seven, four had a history of laying soft shelled eggs. Other historical information in some of the birds included, lethargy, failure to lay within the normal 3 day cycle, straining, anorexia, and a cloacal discharge.

Physical findings on these birds were highly significant. All but one bird were considered to be in moderate to good flesh. In all 8 birds in which an egg was present, it could be palpated. In two birds, peritonitis was suspected because the abdomen was distended with fluid. Abdominocentesis was done on eight birds. An exudate was detected in six. For the purposes of this study, WBCs were divided into 3 categories. WBCs less than 25,000 cells/ μ l with no evidence of a left shift or a monocytosis were considered normal. WBCs in excess of 25,000 and had either a monocytosis (monocyte count > 1,500 cells/ μ l) or a left shift were considered to have an inflammatory leukogram. If metamyelocytes or more immature cells were found in the circulation, the WBC was considered to be degenerate. Reactive lymphocytes and monocytes were commonly present in birds with a degenerative left shift. Four birds (31%) had a normal leukogram, five (38%) had an inflammatory leukogram, and four (31%) had a degenerative left shift. All birds with a diffuse severe septic or aseptic peritonitis had either an inflammatory leukogram or a degenerative left shift.

Changes in the clinical chemistries were relatively nonspecific and did not correlate with the severity of disease. In keeping with the reproductive status of these birds, calcium levels were all at the upper level of normal or increased (median value 15.6 mg/dl, range 11.2 - 26 mg/l). Creatinine phosphokinase was elevated (> 200 IU/l) in six of 11 of the birds for which this value was obtained. The maximum CPK value was 3600 IU/l, the median elevated value was 828 IU/l. Aspartate amino transferase was elevated (> 200 IU/l) in four of ten of the birds in which it was measured. The highest value was 883 IU/l, the median elevated value was 506 IU/l. All four of the birds with elevated AST values also had elevated CPKs suggesting that the AST was the

result of muscle injury, possibly from transport, restraint, and treatment, and did not reflect the health of the liver. Fibrinogen and GGT varied considerably and were not correlated with disease severity. With the exception of one bird, glucose levels ranged from 200-267 mg/dl. In one septicemic bird which died within 12 hours after presentation, a plasma glucose concentration of 580 was found. Sodium, chloride, and potassium levels were normal or slightly low.

Shelled eggs were easily detected on radiography. Peritonitis was not consistently diagnosed by radiography unless considerable fluid was present in the abdomen. Ileus, as characterized by gas distention of the bowels, was not seen. Shelled eggs were easily demonstrated by ultrasound, but unshelled eggs could not be differentiated from tertiary follicles. Ultrasonography was useful in detecting free abdominal fluid.

Lead Toxicity

Two emus were identified with uncomplicated lead intoxication. Another had a concurrent aspergillus infection. All birds had a four to seven week history of anorexia and reduced activity. On presentation birds were slightly to moderately thin. Mild to moderate nonregenerative anemias were present in all three birds. WBCs of 33,000 and 36,300 cells/ μ l were found in the uncomplicated cases. The bird with aspergillus had a 55,000 cells/ μ l WBC and a monocytosis. The GGT was elevated in all 3 birds (range 23 - 51 IU/l). While AST and CPK levels were measured in 2 of the birds and found to be high, the significance of these findings was not known. Radiographic findings were highly significant in that all 3 birds had metallic foreign bodies within their ventriculi. All three birds had detectable concentrations of blood lead.

Gastrointestinal Disorders

Only 4 cases were identified with primary disease of the gastrointestinal tract. Two of these birds had single nails in the ventriculus. Both birds had a 2-3 day history of anorexia and decreased activity. The first bird had a moderate leukocytosis (32,000 cells/ μ l) with a left shift and a mild anemia (PCV = 30). Serum chemistries were not done. Abdominal films revealed a nail. The second bird presented with a history of collapse and unwilling to stand. A complete blood count showed a slight left shift and a monocytosis. Serum chemistries suggested severe muscle necrosis (AST = 8628 IU/l and CPK >16000 IU/l) and renal failure (uric acid = 170 mg/dl, calcium = 7.1 meq/l, and phosphorus = 11.3 meq/dl). Glucose was only 148 mg/dl. Radiographs revealed a nail and fluid in the abdominal cavity. The bird died the following day. At necropsy the nail was found to have perforated the ventriculus, there was a diffuse peritonitis, septicemia, and tubulointerstitial nephritis.

Stone and wood ingestion was diagnosed in a single emu with a history of anorexia, weakness, and lethargy of 4 days duration. Physical examination findings were not remarkable. There was a moderate leukocytosis (32,000 cells/ μ l) and the bird was anemic (PCV = 30%). Radiographically, a large stone was present in the ventriculus. At surgery the ventriculus was found to contain a single rock and 12 small sticks.

A single case of small bowel disease was identified. This bird had been anorectic and lethargic for several days. Physical examination revealed a painful movable mass in the mid abdomen. A CBC showed a degenerative left shift and radiographs demonstrated gas-filled loops of bowel. Surgically an 8 cm mass of grass, dirt and sand was found to obstruct the lower jejunum. The overlying jejunum was discolored and had undergone partial necrosis.

Conclusions

Although the common diseases of the ostrich and emus abdomen differ, a similar diagnostic approach can be used for both species. A complete history, thorough physical examination, and

judicious use of hematology, abdominocentesis, and clinical chemistries will often lead to a diagnosis, or identify those cases that require additional radiographic studies or surgical diagnostics. Similarly, hematology, cytology, and clinical chemistry can be used prognostically in both the ostrich and emu.

Recommended Reading

1. Honnas CM, Blue-McLendon A, Zamos DT, et al. Proventriculotomy in ostriches: 18 cases (1990 - 1992). J Am Vet Med Assoc 1993;202(12):461-465.
2. Honnas CM, Jensen JM, Blue-McLendon A, et al. Surgical treatment of egg retention in emus. J Am Vet Med Assoc 1993;203(10):1989-1992.
3. Jensen J (moderate). Proceedings: Advances in ratite management and medicine. College Station, TX: Office of Veterinary Continuing Education, Texas A&M University, 1993.
4. Jensen J (moderate). Proceedings: Annual symposium for veterinarians on advances in ratite health. College Station, TX: Office of Veterinary Continuing Education, Texas A&M University, 1994.
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Table 1 Clinical Findings Differentiating Diseases of the Ostrich Abdomen

	Impactions	Foreign Body Disease	Intestinal Disorders
Duration			
Acute	+	+	++++
Chronic	+++	+++	-
Cranial Abdominal pain	++	++++	-
Abdominal effusion	-	-	+++
Proventricular distention	+++	++	-
Leukogram			
Leukocytosis	+++	+++	++
Degenerative	+	+	+++
Fibrinogen	variable	variable	generally elevated
Radiographic findings	proventricular distention	metallic foreign bodies	gas-filled loops of bowel (common)

Table 2 Clinical Findings Differentiating Diseases of the Emu Abdomen

	Reproductive disorders	Lead poisoning	Foreign bodies
Duration	acute - subacute	chronic	acute
Palpable egg	+++	-	-
Abdominal effusion	+++	-	+
Radiographic findings	shelled egg abdominal effusion	metal	metal, stones
Leukogram			
Leukocytosis	+++	+++	+++
Degenerative	++		
Gamma glutamyl transferase	low	elevated	low
Blood lead	-	++++	-