Aplastic Anemia in a Holstein Bull Calf with Lymphosarcoma

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Introduction

This case was observed by the author while performing his preceptorship at Loudon Veterinary Service in northern Virginia under Dr. George Washington.

History

A nine month old Holstein bull calf was examined on May 20, 1988 for the primary complaint of severe depression and recumbency. The calf was located on a large dairy farm in northern Virginia where he had been born on September 2, 1987. The bull had been kept in a dry lot with mature dairy cattle for several months. Recently the diet of the cattle had been supplemented with wheat silage which had a spoiled odor. The affected bull had no history of illness, but was small for his age (approximately 500 lbs.)

Clinical Findings

Initial examination revealed a recumbent, very depressed animal with very pale mucous membranes. Rectal temperature was 105°F, heartrate 80 beats/min., respiratory rate of 40 breaths/min., and cyanotic sclera. Palpation of the mandibular, prescapular, and prefemoral lymph nodes was performed without any indication of enlargement. Neurologic examination revealed normal swallow, menace and pupillary light responses. Musculoskeletal, integumentary, and respiratory systems were normal on physical examination.

Differential Diagnosis

On the basis of pale mucous membranes, cyanotic sclera, and depression anemia was suspected. The following potential causes were included in the differential:

1) Leptospirosis
2) Babesiasis—not endemic in area
3) Neoplasia
4) Bracken Fern Poisoning
5) Bacillary hemoglobinuria
6) Anaplasmosis—not endemic in area
7) Parasitism with Haemonchus
8) Abomasal ulcers
9) Aflatoxicosis
10) Internal Hemorrhage

Blood was submitted to a diagnostic laboratory for a CBC and biochemical profile. Initially fecal and urine samples could not be collected due to the recumbent status of the bull and because attempts were made to keep stress at a minimum. CBC and biochemical profile tests were repeated three days later. Urinalysis and fecal examination were also performed.

Results

LABORATORY DATA

CBC results

Parameter Measured	Values 5/20	5/23
1] Total WBC's	5,700	----
Neutrophils	11%	22%
Lymphocytes	89%	76%
Eosinophils	0%	1%
Basophils	0%	1%
2] PCV	13.4%	15.0%
3] RBC's	2.53 x 106/μl	2.79 x 106/μl
4] Hemoglobin	4.3 g/dl	5.3 g/dl
5] MCV	5.2 U-3	53 U-3
6] MCHC	30.4%	33.8%
7] Platelets	Adequate	Adequate

Fecal Flotation—Negative

URINALYSIS

1] Urobilinogen	Normal 0.2
2] Protein	30 mg/dl
3] pH	8.0
4] Blood	Large +++
5] Specific Gravity	1.005
6] Ketones	Negative
7] Bilirubin	Negative
8] Glucose	Negative

BIOCHEMICAL PROFILE RESULTS

Parameter Measured	Values 5/20		5/23	
1] Calcium	7.1	mg/dl	8.1	mg/dl
2] Phosphorous	6.6	mg/dl	6.2	mg/dl
3] Glucose (serum)	65	mg/dl	64	mg/dl
4] BUN	53	mg/dl	19	mg/dl
5] Uric Acid	1.5	mg/dl	0.8	mg/dl
6] Cholesterol	77	mg/dl	55	mg/dl
7] Total Protein	6.0	g/dl	6.1	g/dl
8] Albumin	3.2	g/dl	2.8	g/dl
9] Total Bilirubin	1.9	mg/dl	0.7	mg/dl
10] Alkaline Phosphatase	173	IU/l	197	IU/l
11] LDH	3390	IU/l	2600	IU/l
12] SGOT	499	IU/l	570	IU/l
13] Sodium	133	mEq/l	133	mEq/l
14] Potassium	4.1	mEq/l	4.1	mEq/l
15] Chloride	98	mEq/l	102	mEq/l
16] Creatinine (serum)	1.1	mg/dl	0.8	mg/dl
17] SGPT	52	IU/l	65	IU/l
18] GGT	97	IU/l	281	IU/l
19] Iron (total)	147	μg/dl	-------	
20] BUN/Creatinine Ratio	48		23	
21] Total Globulin	2.8	g/dl	3.3	g/dl
22] A/G Ratio	1.14	g/dl	0.84	g/dl

Bacillary hemoglobinuria and leptospirosis were ruled out on the basis of the absence of intravascular hemolysis. Blood smear examination failed to reveal the presence of Anaplasma or Babesia organisms. Hematology results indicated a nonresponding, normocytic, normochromic anemia. Parasitism and abomasal ulcers were ruled out due to the absence of a regenerative response over the course of the illness. Causes of a regenerative response over the course of the illness. Causes of nonregenerative anemia in cattle include myelophthisic disease, bone marrow toxins, erythropoietin deficiency, BLV infection, and anemias of chronic inflammatory or neoplastic diseases. Bone marrow aspirate and cytology was not performed in this case, but would be helpful in differentiating between the above causes of aplastic anemias. The definitive diagnosis of lymphosarcoma in this animal was made post mortem through histopathology of bone marrow, spleen, liver and lymph node samples.

Treatment

Because of the severe acute anemia, transfusion with two liters of whole blood was performed. Antibiotic therapy was initiated using 250 mg Naxcel IM. SID for the possibility that we were dealing with an infectious agent. A single dose of 250 mg Banamine was administered IM for its analgesic and antipyretic activity in hopes of relieving the calf's severe depression. An effort was made to keep stress to a minimum as dyspnea and polypnea was noticed following the treatment regimen. On day two, significant clinical improvement was noticed as the bull was ambulatory and nibbling at feed. Pallor of the mucous membranes and cyanosis of the sclera were still present so the decision to transfuse an additional two liters of whole blood was made. Fecal flotation was negative for parasites, however, 6 cc Ivermectin was administered SQ for the possibility that acute parasitism with *Haemonchus* sp. was responsible for the anemia. The transfusions resulted in alleviation of the symptoms for several days, but on day five, deterioration of the bull's condition and the development of icterus was noticed. Based upon the severely elevated liver enzymes as well as a nonresponding anemia, a grave prognosis was given and on day seven the decision was made for euthanasia.

Pathology

Necropsy was performed immediately following euthanasia. Gross findings were negligible as the only lesions were hepatomegaly and several calcified nodules in the liver parenchyma. Bone marrow, spleen, liver and lymph node samples were submitted for histopathology.

A diagnosis of malignant lymphoma involving the liver, spleen, lymph nodes and bone marrow tissues was made. These tumor cells formed foci, areas, and sheets of cells of variable size, whereby they simply replaced the normal tissue structures of the liver, spleen and lymph nodes where they had infiltrated. The bone marrow slides were characterized by the presence of rather large, mononuclear cells with a variable amount of cytoplasm, the nucleus was variable in size and shape and there were very few cells of either the erythrocytic or granulocytic origin present.

Discussion

There are two forms of lymphosarcoma recognized in cattle. The first from is designated as Enzootic Bovine Leukosis which is an infectious disease caused by the Bovine Leukemia Virus (BLV). This form occurs in adult cattle most commonly between four and eight years of age. The second form is designated as Sporadic Leukosis and is manifested in three syndromes which are not associated with BLV infection.

1. *Sporadic Lymphatic Leukosis* of calves—most commonly occurs in calves less than 6 months old and involves all lymph nodes and major body organs.
2. *Sporadic Lymphatic Leukosis* of the adolescent or thymic type—most commonly involves young cattle from 6 months up to 2 years of age with tumor involvement of the thymus and sometimes regional lymph nodes.

3. *Sporadic Lymphatic Skin Leukosis*—generally occurs in young adult cattle with tumors restricted to skin and commonly regress for periods of time.

This case was atypical in that with the bull calf's age of nine months one might expect to see the thymic syndrome, instead the generalized form of calves occurred. The diagnosis of lymphosarcoma was complicated by the absence of lymph node enlargement. The definitive diagnosis of lymphosarcoma requires histopathologic confirmation. The life span of this calf may have been prolonged with the use of corticosteroids and numerous blood transfusions; however, lymphosarcoma in cattle is invariably fatal after a short course. Lymphosarcoma should be considered in the differential for cattle presenting with aplastic anemias.

References

1. Stober, M. The clinical picture of the enzootic and sporadic forms of bovine leukosis. Bov. Pract. 16:119–129. 1981. 2. Van Der Maaten, M.J. and Miller, J.M. Bovine leukemia virus infections: A continuing cause for concern. Proc. 17th Annual Mtg. Amer. Assoc. Bov. Pract. pp. 70–72. 1985. 3. Miller, J. Bovine lymphosarcoma. Bov. Proc. 20:34–36. 1987. 4. Howard. Current Veterinary Therapy—Food Animal Practice. pp. 506–508. 1986. 5. Blood, Radostits and Henderson. Veterinary Medicine. pg. 682. 1983.

Electrolytes and Reproductive Hormone Concentrations in Maternal Plasma and Fetal Fluids of Dairy Cows with Hydrops

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Veterinary Record (1989) **124**, 159–162

Electrolytes, metabolites, cortisol and reproductive hormones were measured in maternal plasma taken at least twice daily from three cases of bovine hydrops before, during and after parturition induced by dexamethasone or prostaglandin. Caesarean operations were required for two of the cases. Maternal plasma electrolytes remained within the normal range, but average potassium and creatinine concentrations were higher (9–2 and 0–68 mmol/litre, respectively) than normal (4–7 and 0–42 mmol/litre) in samples of amniotic fluid obtained at calving. Sodium (100 mmol/litre) and chloride (67 mmol/litre) in allantoic fluid were also higher than normal (53 and 20 mmol/litre, respectively). Conversely, creatinine concentrations were lower than normal in allantoic fluid (2–2 vs 13–8 mmol/litre). Oestradiol concentrations were lower than normal in maternal plasma (ranges: <20 to 140 pg/ml vs 30 to 440 pg/ml); maximum prostaglandin F metabolite (PGFM) concentrations were slightly elevated (ranges 1–1 to 2–0 ng/ml vs 0–4 to 0–9 ng/ml). Progesterone and cortisol concentrations remained with the normal range; the latter hormone increased markedly in parallel with raised PGFM concentrations. In two cases, the concentrations of reproductive hormones tended to be lower in the amniotic fluid than in the allantoic fluid. For example, progesterone concentrations were 42–8 and 14–9 ng/ml in the amniotic fluids vs 64–2 and 29–8 ng/ml in the allantoic fluids of the two cows; PGFM concentrations were 27–7 and 4–3 ng/ml vs 34–6 and 5–0 ng/ml, and oestradiol concentrations were 1–5 and 3–5 ng/ml vs 1–1 and 6–4 ng/ml in the two fluids, respectively.

Panacur® (fenbendazole)
Suspension 10% 100 mg/mL
Dewormer

CAUTION: FEDERAL LAW RESTRICTS THIS DRUG TO USE BY OR ON THE ORDER OF A LICENSED VETERINARIAN.

Directions:
Determine the proper dose according to estimated body weight. Administer orally. The recommended dose of 5 mg/kg is achieved when 2.3 mL of the drug are given for each 100 lbs. of body weight. The recommended dosage of 10 mg/kg for treatment of Ostertagiasis Type II (inhibited 4th stage larvae) or tapeworm is achieved when 4.6 mL of the drug are given for each 100 lbs. of body weight.

EXAMPLES:

Dose (5 mg/kg)	Dose (10 mg/kg)	Cattle Weight
2.5 mL	5.0 mL	109 lbs.
5.0 mL	10.0 mL	217 lbs.
10.0 mL	20.0 mL	435 lbs.
15.0 mL	30.0 mL	652 lbs.
23.0 mL	46.0 mL	1,000 lbs.

Under conditions of continued exposure to parasites, retreatment may be needed after 4-6 weeks.
There are no known contraindications to the use of the drug in cattle.

WARNINGS: Cattle must not be slaughtered within 8 days following last treatment. Because a withdrawal time in milk has not been established, do not use in dairy cattle of breeding age.

CAUTION: Keep this and all medication out of the reach of children.

DOSAGE:
Cattle – 5 mg/kg (2.3 mg/lb) for the removal and control of:
Lungworm: *(Dictyocaulus viviparus)*
Stomach worm (adults): *Ostertagia ostertagi* (Brown stomach worm)
Stomach worm (adults & 4th stage larvae): *Haemonchus contortus/placei* (barberpole worm)
Trichostrongylus axei (small stomach worm)
Intestinal worm (adults & 4th stage larvae):
Bunostomum phlebotomum (hookworm)
Nematodirus helvetianus (thread-necked intestinal worm)
Cooperia punctata and *C. oncophora* (small intestinal worm)
Trichostrongylus colubriformis (bankrupt worm)
Oesophagostomum radiatum (nodular worm)
Cattle – 10 mg/kg (4.6 mg/lb) for the removal and control of:
Stomach worm (4th stage inhibited larvae): *Ostertagia ostertagi* (type II ostertagiasis)
Tapeworm: *Moniezia benedeni*

NDC 12799-097-80
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