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Autoimmune Hemolytic Anemia in a Dog

Joseph J. Bryan
Iowa State University

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by Joseph J. Bryan*

Autoimmune Hemolytic Anemia is a naturally occurring disease of dogs characterized usually by thrombocytopenia, hemolytic anemia, reticulocytosis, and a positive direct anti-globulin test (Coomb's test). The anemia manifests itself by acute hemolytic crises which are separated by varying periods of normalcy. The disease is usually observed in dogs between two and eight years of age.[5]

The mechanism of AIHA involves the body developing antibodies against its own erythrocytes. The erythrocytes become spherocytic, the spleen recognizes them as abnormal, and removes the abnormal erythrocytes.

Physical examination of dogs with AIHA usually reveals pallor, splenomegaly, petechial hemorrhages on mucous membranes, and dark colored urine. Occasionally peripheral lymphadenopathy, tachycardia, polypnea, and purpura may be seen. Icterus, if present, is usually slight.

Affected dogs often have severe macrocytic anemia. Hemoglobin levels may be as low as 2.5 Gm./100 ml. Hyperplasia of the bone marrow is present and signs of bone marrow response (anisocytosis, polychromatophilia, and nucleated red blood cells) are seen. Poikilocytosis, target cells, and spherocytes are seen in the peripheral blood as well[3].

Case Report

A 3½-year-old male Cocker Spaniel was admitted to Stange Memorial Veterinary Clinic, Iowa State University, on September 27, 1970.

Physical examination revealed petechial hemorrhages on the glans penis and on the bulbar conjunctiva. A few drops of reddish urine were present on the tip of the glans penis. No other abnormalities were detected during the physical examination.

The dog strained while attempting to micturate on September 29, 1970. A radiograph revealed cystic calculi and urolithiasis located at the base of the os penis. On September 30, 1970, the dog was unable to void any urine. Severe straining was also noted. Attempts to dislodge the stones failed.

A cystotomy was performed on October 1, 1970. Several blood clots (containing calculi) were removed from the bladder. A catheter was passed into the urethra through the cystotomy incision. The catheter could not dislodge an obstruction at the base of the os penis. A midline incision three cm. long was made in the median raphe of the prepuce and into the urethra. Three calculi were removed from the urethra adjacent to the os penis. Hemorrhage of the bladder could not be completely controlled. The bladder was sutured with a continuous Connel pattern of 2–0 chromic catgut. The skin of the prepuce was sutured to the urethral mucosa using 4–0 silk in an interrupted pattern. The incision sites continued to ooze blood for six days and hematuria was present for eight days postoperatively. During this time, hemograms revealed the anemia increasing in severity. Platelet-rich plasma was administered to the dog on three different occasions.

Diagnosis

The clinical signs of significance in

TABLE 1 Clinical Pathology Data

Factor	9–28–70	10–2–70	10–3–70
Hb. (Gm./100 ml.)	12.1	11.1	6.9
PCV (%)	37	35	22.5
RBC (10⁶/mm³)	4.41	4.48	2.90
WBC/mm³	15,500	30,400	29,000
Lymphocytes (%)	20	2	0
Segmented WBC (%)	74	76	84
Band Neutrophils (%)	3	20	13
Eosinophils (%)	3	0	0
Monocytes (%)	0	2	3
Platelets/mm³	5,000	6,000	5,000
BUN (mg.%)	40	...	...
SGPT (SF units)	32	...	...
Coomb's test	...	+	...

AIHA in the dog are: (1) those caused by increased red blood cell destruction (icterus, dark urine, and heavily pigmented stools); (2) those related to anemia (weakness, loss of condition, pallor, collapse, shortness of breath); (3) those resulting from thrombocytopenia (dermal hemorrhage, epistaxis, and melena); and (4) those associated with an acute systemic disease (fever, polydipsia, vomition, anorexia, and diarrhea)[3].

Although adequate numbers of megakaryocytes are present in the bone marrow, the majority of dogs with AIHA have thrombocytopenia. In this respect the disease mimics the Evans Syndrome (Lupus Erythematosus) in man. In spite of very low platelet levels, all dogs with thrombocytopenia do not show overt signs of hemorrhage.

A positive Coomb's test is essential to diagnose AIHA (certain disease conditions on occasion give a false positive Coomb's test but clinical signs separate them from AIHA). An antibody capable of sensitizing washed erythrocytes of normal dogs can be eluted from the surface of erythrocytes in AIHA. This procedure clearly shows the presence of an antibody on the affected red cells[3].

A differential diagnosis should include conditions in which thrombocytopenia is present, such as: aplastic anemia, idiopathic thrombocytopenic purpura, AIHA, and lupus erythematosus (LE). Warfarin poisoning can cause similar hemorrhages on mucous membranes but platelet numbers are usually adequate.

Lupus erythematosus is characterized by hemolytic anemia, thrombocytopenic purpura, and glomerulonephritis in the presence of abnormal serum proteins (autoantibodies). A positive LE blood smear preparation separates this disease from AIHA. Polyarthritis and facial lesions may also be seen on occasion but are lacking in AIHA.[2,4]

Aplastic anemia is easily diagnosed on the basis of a bone marrow smear and absence of cellular bone marrow response.

Idiopathic thrombocytopenic purpura will exhibit clinical signs similar to AIHA, but the Coomb's test will be negative and hemolytic anemia will usually be absent.

Therapy

Corticosteroids remain the treatment of choice for AIHA and bring about their desired effect by reducing antibody production. Prednisone has been the standard agent used in treatment. The initial dosage is 45 to 60 mg. of prednisone T.i.d. and dosage is decreased as bleeding manifestations subside and the platelet count rises. Many different corticosteroids have been used to treat AIHA and personal preference is the deciding factor[1]. If maintenance therapy is indicated, the smallest dosage capable of maintaining remission is used.

There are instances in which a response to ACTH has been observed after failure of corticosteroid therapy. The forms of thrombocytopenia associated with normal numbers of megakaryocytes in the marrow

TABLE 2   Clinical Pathology Data

Factor	Date 9–28–70
URINALYSIS	
Color	brown
Specific gravity	1.034
pH	unable to determine
Albumin	unable to determine
Acetone	Neg.
Sugar	Neg.
Blood	large amount
Bilirubin-conjugated	unable to determine because of blood
Urobilinogen	unable to determine because of blood
Clot Retraction	None in 24 hours
Van den Bergh, direct	0.5 mg.%
indirect	0 mg.%
Total	0.5 mg.%

are those most likely to respond to corticosteroids. These include ITP, drug induced thrombocytopenia, and immune forms of thrombocytopenia secondary to other diseases such as LE.

Most dogs with AIHA respond favorably to corticosteroids. Antibiotics are given concurrently to prevent secondary infections. Unfortunately, relapses are frequent. The results of splenectomy in cases of recurring AIHA are inconsistent; therefore, splenectomy is resorted to only after medical treatment fails.

Table 3 shows the dog's progress in condensed form. On November 24, 1970, the dog was discharged from the clinic.

Discussion

During the dog's hospitalization, clinical signs included pallor, weakness, splenomegaly, hematuria, petechial hemorrhages, tachycardia, and evidence of increased erythropoiesis. The Coomb's test became negative after forty-five days of treatment with corticosteroids and antibiotics.

Abrupt urinary obstruction necessitated surgery to remove three uroliths. Hemostasis could not be achieved due to a defect in the dog's clotting mechanism. This defect was probably due to a thrombokinase deficiency as a result of the thrombocytopenic state. The loss of blood by way of the urogenital tract further aggravated the condition and three transfusions of platelet-rich blood were given to correct the thrombocytopenic state. It should be remembered that indiscriminate use of whole blood is contraindicated because severe hemolytic reactions may result.

There is much supposition as to the etiology of AIHA. In one inbred strain of mice studied, there appeared to be a genetic influence on the morbidity of AIHA in the mouse population[1]. Whatever the cause, the course of the disease is variable and the prognosis is grave.

Platelet numbers per mm.[3] are a readily available means of· monitoring the progress of the patient if thrombocytopenia is present.

TABLE 3   Clinical Pathology Data

	Date			
	10–7–70	10–8–70	10–23–70	11–10–70
Platelets/cmm.	17,000	65,000	125,000	298,000
PCV (%)	36	36	40	49
Coomb's test	...	...	...	Neg.

Summary

Autoimmune Hemolytic Anemia (AIHA) is characterized by hemolytic anemia, a positive Coomb's test, and usually by thrombocytopenia. Affected dogs have a macrocytic anemia and a bone marrow response. Petechial hemorrhages are frequently present on mucous membranes and the urine may be blood-tinged.

Treatment consists of high doses of corticosteroids (prednisone is most often used), antibiotics, and blood if anemia becomes severe enough to warrant it. A splenectomy is sometimes performed in refractory cases with variable results. Relapses commonly occur and the prognosis is grave in all cases of this disease.

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Factors Predisposing to Urolithiasis in Feedlot Cattle

by Jerry R. Hardisty,* R. C. Dillman, D.V.M., Ph.D.†

The formation of stony precipitates anywhere in the urinary passages is called urolithiasis. The stone is called a urolith or urinary calculus.[16] Urolithiasis is an important disease of castrated male ruminants because of the common occurrence of urethral obstruction. Although it occurs in all species, it is of greatest economic importance in feeder steers and lambs which are fed with heavy concentrate rations. Among feedlot cattle in the United States, obstructive urolithiasis is second in importance only to diseases of the respiratory tract[2].

There are three main groups of causes of urolithiasis. First, those which favor the development of a nidus. A nidus, usually in the form of a group of desquamated epithelial cells or necrotic tissue, favors the deposition of crystals about itself. Second, those which facilitate precipitation of solutes on the nidus. Third, those which favor concretion by cementing the precipitated salts to the developing calculus[2]. It has been suggested that mucoprotein, particularly its mucopolysaccharide fraction, may act as a cementing

*Mr. Hardisty is a senior in the college of Veterinary Medicine, Iowa State University.
†Dr. Dillman is an Associate Professor of Veterinary Pathology and is currently working in the Veterinary Medical Diagnostic Laboratory, Iowa State University