

# Von Willebrand Disease

(a Bleeding Disorder)

## Basics

### OVERVIEW

- Primary bleeding defect caused by low levels of von Willebrand factor or decreased function of existing von Willebrand factor; von Willebrand factor is a type of protein that binds to platelets, causing them to crowd or mass together (aggregate) and to adhere to one another to stop bleeding—if levels of von Willebrand factor are low or if the existing von Willebrand factor does not function normally, platelets do not aggregate and adhere to one another and bleeding is not stopped
- “Platelets” and “thrombocytes” are names for the normal cell fragments that originate in the bone marrow and travel in the blood as it circulates through the body; platelets act to “plug” tears in the blood vessels and to stop bleeding
- Clinical expression of von Willebrand disease varies from mild-to-severe bleeding

### GENETICS

- Most common hereditary bleeding defect seen in dogs
- An autosomal trait in dogs; both males and females express and transmit the defect with equal frequency
- Expression pattern of severe forms (Types 2 and 3 von Willebrand disease) is recessive; milder form (Type 1 von Willebrand disease) appears to be recessive or incomplete dominant

### SIGNALMENT/DESCRIPTION OF PET

#### Species

- Dogs
- Rarely reported in cats

#### Breed Predispositions

- Three type classifications are found in dogs; a single type predominates within each affected breed:
  - ♦ Type 1 von Willebrand disease (mild-to-moderate signs): decreased protein (von Willebrand factor) levels; type 1 is the most common classification; seen in the following breeds: Airedale, Akita, basset hound, Bernese mountain dog, dachshund, Doberman pinscher, German shepherd dog, golden retriever, greyhound, Irish wolfhound, Manchester terrier, miniature pinscher, Pembroke Welsh corgi, and poodle; sporadic cases are seen in any breed and mixed-breed dogs



- Type 2 von Willebrand disease (severe signs): decreased protein (von Willebrand factor) levels and decreased function of existing von Willebrand factor; seen in the following breeds: German wirehaired pointer and German shorthaired pointer
- Type 3 von Willebrand disease (severe signs): complete lack of protein (von Willebrand factor); seen in the following breeds: Chesapeake Bay retriever, Dutch kooiker dog, Scottish terrier, and Shetland sheepdog; sporadic cases are seen in any breed

### **Mean Age and Range**

- Severe signs (Types 2 and 3 von Willebrand disease) typically are apparent by 3–6 months of age
- Milder forms typically are characterized by abnormal bleeding after surgery or trauma, or in association with another condition that impairs blood clotting

### **SIGNS/OBSERVED CHANGES IN THE PET**

- Bleeding from moist tissues of the body: nose bleed (known as “epistaxis”); bleeding into the gastrointestinal tract (the gastrointestinal tract includes the stomach, small intestines, and large intestines); blood in the urine (known as “hematuria”); bleeding into the vagina; and bleeding gums (known as “gingival hemorrhage”)
- Prolonged bleeding after surgery or trauma
- Blood loss-related, low red-blood cell count (known as “blood-loss anemia”), if prolonged bleeding

### **CAUSES**

- Hereditary von Willebrand disease is caused by mutations that impair production, release, or stability of von Willebrand factor (type of protein that binds to platelets, causing them to crowd or mass together [aggregate] and to adhere to one another to stop bleeding)

### **RISK FACTORS**

- Acquired (condition that develops sometime later in life/after birth) disease conditions or drug therapy that impair platelet function may worsen clinical signs of von Willebrand disease; “platelets” and “thrombocytes” are names for the normal cell fragments that originate in the bone marrow and travel in the blood as it circulates through the body; platelets act to “plug” tears in the blood vessels and to stop bleeding

## **Treatment**

### **HEALTH CARE**

- Transfusion of fresh whole blood, fresh plasma, fresh frozen plasma, and cryoprecipitate (a plasma component used to treat bleeding disorders) will supply von Willebrand factor (type of protein that binds to platelets, causing them to crowd or mass together [aggregate] and to adhere to one another to stop bleeding)
- Component therapy (fresh frozen plasma or cryoprecipitate) is best for surgical prophylaxis and nonanemic pets
- Pets with severe von Willebrand disease may require repeated transfusion (every 6–12 hours) to control or prevent bleeding

### **ACTIVITY**

- Depends on severity of clinical signs

### **SURGERY**

- Preoperative transfusion should be given just before the surgical procedure
- Cage rest and close monitoring (serial determination of packed cell volume [PCV, a means of measuring the percentage volume of red-blood cells as compared to the fluid volume of blood] and examination of surgical site) for 24 hours after surgery are ideal to confirm adequate control of bleeding
- Management of severe von Willebrand disease typically requires at least one post-operative transfusion

## **Medications**

Medications presented in this section are intended to provide general information about possible treatment. The treatment for a particular condition may evolve as medical advances are made; therefore, the medications should not be considered as all inclusive

- Desmopressin acetate (DDAVP) can be given preoperatively to dogs with mild-to-moderate Type 1 von Willebrand disease to enhance control of bleeding during and after surgery

- Response is variable; transfusion should be available if DDAVP alone does not prevent bleeding

## **Follow-Up Care**

### **PATIENT MONITORING**

- Observe closely for bleeding associated with trauma or surgical procedures

### **PREVENTIONS AND AVOIDANCE**

- Screen dogs preoperatively to determine baseline von Willebrand factor levels in breeds or lines with high prevalence of von Willebrand disease; the risk of abnormal bleeding is greatest for dogs with von Willebrand factor levels of less than 25%; von Willebrand factor is a type of protein that binds to platelets, causing them to crowd or mass together (aggregate) and to adhere to one another to stop bleeding
- Clinically affected dogs should not be bred; carriers of von Willebrand disease can be identified based on low von Willebrand factor levels of less than 50%; however, values for carrier and clear dogs may overlap at the low end of normal range (von Willebrand factor levels of 50–70%)
- At present, commercial tests (VetGen von Willebrand DNA test) to detect specific von Willebrand disease mutations in DNA are available for several breed-variants of von Willebrand disease; dogs that are heterozygous for a specific mutation are considered von Willebrand disease “carriers” and homozygotes are considered von Willebrand disease “affected”
- Selective breeding practices can reduce or eliminate von Willebrand disease from an affected pedigree—breeding two clear parents is ideal, because all offspring are expected to be von Willebrand disease clear; breeding one clear and one carrier parent may be acceptable, with the clear puppies produced from this mating used for subsequent breeding
- Carrier to carrier matings are inadvisable, because they most likely will produce clinically affected offspring

### **POSSIBLE COMPLICATIONS**

- Depends on severity of clinical signs
- Bleeding during and after surgery or trauma

### **EXPECTED COURSE AND PROGNOSIS**

- Most dogs with mild-to-moderate von Willebrand disease have good quality of life and require minimal or no special treatment
- Dogs with more severe forms require transfusion for surgery, and should be transfused if supportive care fails to control spontaneous bleeding; most of these dogs can be maintained comfortably in pet homes

## **Key Points**

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