



## *The Golden Retriever Club of America, Inc.*

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### Bleeding Disorders in Golden Retrievers

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Golden Retrievers develop a wide variety of conditions which may have a hereditary basis. Hip dysplasia, elbow dysplasia, heart conditions and disorders of the eye are common in our breed and the [GRCA Code of Ethics](#) provides guidelines on testing for these conditions in breeding dogs. The Code of ethics also states that breeding dogs should have good temperaments and be healthy. There are a variety of inherited conditions which can affect the health of our breeding dogs. The frequency of these varies with the popularity of afflicted bloodlines but knowledgeable breeders and owners can protect themselves by knowing about these. Bleeding disorders are among those important conditions which can be inherited in Goldens. The intrinsic ability to limit bleeding and bruising from minor injury is clearly essential to the health of any active Sporting Dog.

Goldens can develop a tendency to bleed with resulting excessive bruising, bleeding from the gums and other mucous membranes, or bleeding during surgery. Bleeding tendencies most often result from cancer, autoimmune diseases, liver failure, toxin exposure, or infectious diseases that affect the ability of the blood to clot. In other cases there is an inherited (genetic) defect in the ability to clot blood. There is quite a bit known about bleeding disorders because these are classic human diseases which historically plagued the royal families of Europe (Stevens, 1999). The bleeding disorders of humans include hemophilia A, hemophilia B, and von Willebrand disease. All 3 of these defects occur in dogs, including Golden retrievers.

VWD is the most common bleeding disorder of dogs (Rebar ET AL, 2005). There are three different types of inherited VWD that affect dogs. These are type 1 VWD, type 2 VWD and type 3 VWD. Type 2 and type 3 VWD tend to cause moderate to severe bleeding tendencies (Kramer ET AL, 2004; Rebar ET AL, 2005). Type 2 and type 3 VWD are generally inherited as simple autosomal recessive diseases (Kramer ET AL, 2004), which means that both male and female dogs are affected, and that each parent of an affected puppy had at least one defective von Willebrand factor gene. Type 1 VWD causes mild bleeding tendencies, affects dogs of both sexes, and affects Golden Retrievers. All types of VWD have one thing in common: a decrease or absence in the amount of von Willebrand factor, a factor that affects the function of platelets and also some other clotting factors. Because dogs with VWD have much lower levels of von Willebrand factor than normal dogs, measuring blood concentrations of von Willebrand can diagnose clinical VWD (dogs that are bleeders because of VWD). Unfortunately, the amount of von Willebrand factor in the blood in any given dog tends to vary due to a number of other factors. This variation in the amount of von Willebrand factor may complicate the accurate

detection of some VWD carriers (the parents of bleeders) by the amount of von Willebrand factor in a single blood sample (Moser ET AL, 1996).

Fortunately, the critical areas of the canine von Willebrand factor gene have been sequenced (Venta ET AL, 2000). As a result, there are now extremely accurate genetic tests which identify the mutation causing type 3 vWD in Scotties (Venta et al., J Vet Intern Med. 2000; 14:10-29) and Shelties (unpublished or website) and genetic carriers of type 1 VWD in Bernese Mountain Dogs, Doberman Pinschers, German Pinschers, Kerry Blue Terriers, Manchester Terriers, Papillons, Pembroke Welsh Corgis and Poodles (unpublished/website). More information on this testing is available online from VetGen at <http://www.vetgen.com> . In addition, recent studies have described the mutations causing type 2 VWD in German Shorthaired Pointers (Kramer ET AL, 2004) and type 3 VWD in Dutch Kooiker dogs (van Oost ET AL, 2004).

Unfortunately, there is not yet a genetic test for VWD in Golden Retrievers. That means that in Golden Retrievers VWD is still diagnosed by testing for von Willebrand factor in blood.

As mentioned above, Golden Retrievers also can get hemophilia A. This is a well-described human genetic disease which is reviewed in Online Mendelian Inheritance in Man at: <http://www.ncbi.nlm.nih.gov/entrez/dispomim.cgi?id=306700>. Recently, hemophilia A was diagnosed in several Golden Retrievers (Brooks ET AL, 2005). This is an X-linked recessive disease. Specifically, the gene that causes the disease is the gene for clotting factor VIII, located on the X chromosome. Because the sex chromosomes of males consists of an X and a Y chromosome, males that inherit the “bad” factor VIII gene on their one X chromosome only have “bad” factor VIII circulating in their blood and they have trouble stopping bleeding. In the recently published study (Brooks ET AL, 2005), the 12 affected male Goldens tended to have problems with bleeding after surgery and when injured. Because the sex chromosomes of females are two X chromosomes, female Golden retrievers that inherit a “bad” factor VIII gene on one X chromosome also have another factor VIII gene on the other X chromosome that is very likely to produce “good” factor VIII. Therefore, female Goldens with one “bad” factor VIII gene do not usually have excess bleeding from surgery or minor trauma. However, roughly half of the sons of such females will inherit their mother’s “bad” factor VIII gene and will have Hemophilia A. There is an experimental “linkage” test for the factor VIII gene causing Hemophilia A in Golden Retriever and this test shows some promise for being able to identify female Golden Retrievers who carry the “bad” factor VIII gene. The experimental test has already helped to limit the dissemination of this gene into the Golden Retriever gene pool. Hemophilia A carriers should not be bred.

In summary, Golden Retrievers that display signs of excess bleeding following trauma or surgery need immediate veterinary care. Owners and breeders should also be aware that two inherited bleeding disorders, VWD and Hemophilia A, have been propagated in the Golden Retriever breed. When bleeding disorders are present in related dogs, breeders should work with the attending veterinarian or a veterinary internal medicine specialist to identify the specific cause, and to prevent breedings that produce Golden Retrievers affected with a hereditary bleeding disorder.

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