D Locus (Dilute)

The D [Locus](https://www.pawprintgenetics.com/glossary/#Locus) (Dilute) coat color test reliably determines if a dog has one of the following genotypes at the D locus:

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| **D/D** | This dog does not carry any copies of the d1 or d2 mutations and has a D locus genotype of D/D which does not result in the "dilution" or lightening of the pigments that produce the dog’s coat color. This dog will pass one copy of D to 100% of its offspring and cannot produce d/d dogs.  Interpretation: **Non-dilute (does not carry dilute)** |
| **D/d** | This dog carries one copy of either the d1 or d2 [Mutation](https://www.pawprintgenetics.com/glossary/#Mutation) and has a D locus genotype of D/d which does not result in the "dilution" or lightening of the pigments that produce the dog’s coat color. This dog will pass one copy of D to 50% of its offspring and one copy of d to 50% of its offspring. This dog can produce d/d offspring if bred to a dog that is also a [Carrier](https://www.pawprintgenetics.com/glossary/#Carrier) of a d mutation (D/d or d/d).  Interpretation: **Non-dilute (carries one copy of dilute)** |
| **d/d** | This dog carries two copies of the same d mutation and has a D locus genotype of d/d which results in the "dilution" or lightening of the pigments that produce the dog’s coat color. This dog will pass one copy of d to 100% of its offspring. This dog can produce d/d offspring if bred to a dog that is also a carrier of a d mutation (D/d or d/d).  Interpretation: **Dilute (carries two copies of dilute)** |
| **D/d or d/d** | This dog carries one copy of each of the possible d mutations and has a D locus genotype of D/d or d/d that cannot be distinguished without additional testing of parental samples or by examining the nose and coat color of this dog. Dogs inherit two copies of the D locus, one from each parent. Because there are at least two different D locus mutations that can potentially be identified by this test, as well as some limitations inherent to genetic testing methodologies currently available, it cannot be determined if the two d mutations identified in this dog are present on the same copy of the D locus inherited from one parent or if they occur on separate copies of the D locus inherited from each of the parents. If both mutations are present on the same copy of the D locus, this dog will have a D/d genotype and typically will not have a dilute coat, nose and footpads. If the mutations are present on different copies of the D locus, this dog will have a d/d genotype and typically will have a dilute coat, nose and footpads. The D locus genotype for this dog can be inferred without the need for parental testing by evaluating the color of this dog’s coat and nose. If this dog’s coat and nose are dilute, the D locus genotype of this dog must be d/d and this dog will pass one copy of d to 100% of its offspring. If this dog’s coat and nose are not dilute in color, the D locus genotype of this dog must be D/d and this dog will pass one copy of D to 50% of its offspring and one copy of d to 50% of its offspring. In either case, this dog carries at least one copy of d and can produce d/d offspring if bred to a dog that is also a carrier of a d mutation (D/d or d/d).  Interpretation: **Dilute or non-dilute coat, nose and foot pads (carries at least one copy of dilute)** |

Detailed Summary

The D [Locus](https://www.pawprintgenetics.com/glossary/#Locus) (Dilute) corresponds to the *MLPH* gene that is important in determining coat color in dogs. Mutations/variants in this gene modify the expression of the pigments, eumelanin (black and brown) and phaeomelanin (reds, yellows and creams) in the hair resulting in a “dilution” or lightening of the coat color of dogs. Canine coat color determination is complex due to interactions of multiple genes responsible for both color and anatomic placement of the color. A dog with two mutant copies of the *MLPH* gene will have a diluted coat color that may be referred to as blue, charcoal, silver, Isabella (lilac) or fawn (depending on the breed and the base coat color of the dog). **Disease Association Note:** Mutations of the D locus are sometimes responsible for a condition called color dilution [Alopecia](https://www.pawprintgenetics.com/glossary/#Alopecia), black hair follicular dysplasia, or blue Doberman syndrome (depending on the breed) because dilute coat color can be associated with development of alopecia (hair loss). The clinical presentation of alopecia associated with dilute coat color is variable within and between breeds; therefore, only a portion of individuals carrying two copies of the *MLPH* gene [Mutation](https://www.pawprintgenetics.com/glossary/#Mutation) (d/d) will show hair loss with some breeds being much more likely to develop the condition. Though two copies of the *MLPH* gene mutation (d/d) are necessary to develop color dilution alopecia, the variable presentation of this condition suggests that additional environmental or genetic factors contribute to the development of alopecia. Dogs affected with alopecia typically present with loss of hair between the ages of four months and two years. Hair of affected dogs can also appear dry and dull. The hair loss is caused by abnormal [Melanin](https://www.pawprintgenetics.com/glossary/#Melanin) storage in the hair, which leads to breakage of the hair shaft and the lack of normal regrowth of hair. Dogs with this condition can also be affected with recurrent bacterial skin infections originating in the hair follicles (folliculitis). Given that the modifying environmental or genetic factors responsible for alopecia are unknown, the only way to prevent color dilution alopecia is to avoid transmitting the dilute coat color mutation to offspring in susceptible breeds.

Testing Tips

Genetic testing of the *MLPH* gene will reliably determine the number of copies of the color dilution gene [Mutation](https://www.pawprintgenetics.com/glossary/#Mutation) that a dog carries. Coat color dilution associated with mutations of the *MLPH* gene is known to be inherited in an [Autosomal Recessive](https://www.pawprintgenetics.com/glossary/#Autosomal%20Recessive) manner in dogs. [Carrier](https://www.pawprintgenetics.com/glossary/#Carrier) dogs (D/d) do not display a dilute color and are not at risk for [Alopecia](https://www.pawprintgenetics.com/glossary/#Alopecia), but when bred with another dog that also is a carrier (D/d), there is a 25% chance of having pups with diluted coat color that may also be susceptible to alopecia in some breeds. Reliable genetic testing is important for determining breeding practices. Dogs that are not carriers of a d mutation have no increased chance of having pups with diluted coat color or alopecia.

**There may be other causes of this condition in dogs and a normal result does not exclude a different mutation in this gene or any other gene that may result in a similar genetic disease or trait.**

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