# “BARNEY”

## MOONLIT ACRES SIR GUY GISBORN

DNA Test Report | Test Date: May 9th, 2021 | embk.me/moonlitacressirguygisborn

## BREED MIX

- Poodle (Small) : 44.0%
- Poodle (Standard) : 32.9%
- Cocker Spaniel : 15.3%
- Labrador Retriever : 7.8%

## GENETIC STATS

Predicted adult weight: **31 lbs**

Genetic age: **15 human years**

Based on the date of birth you provided

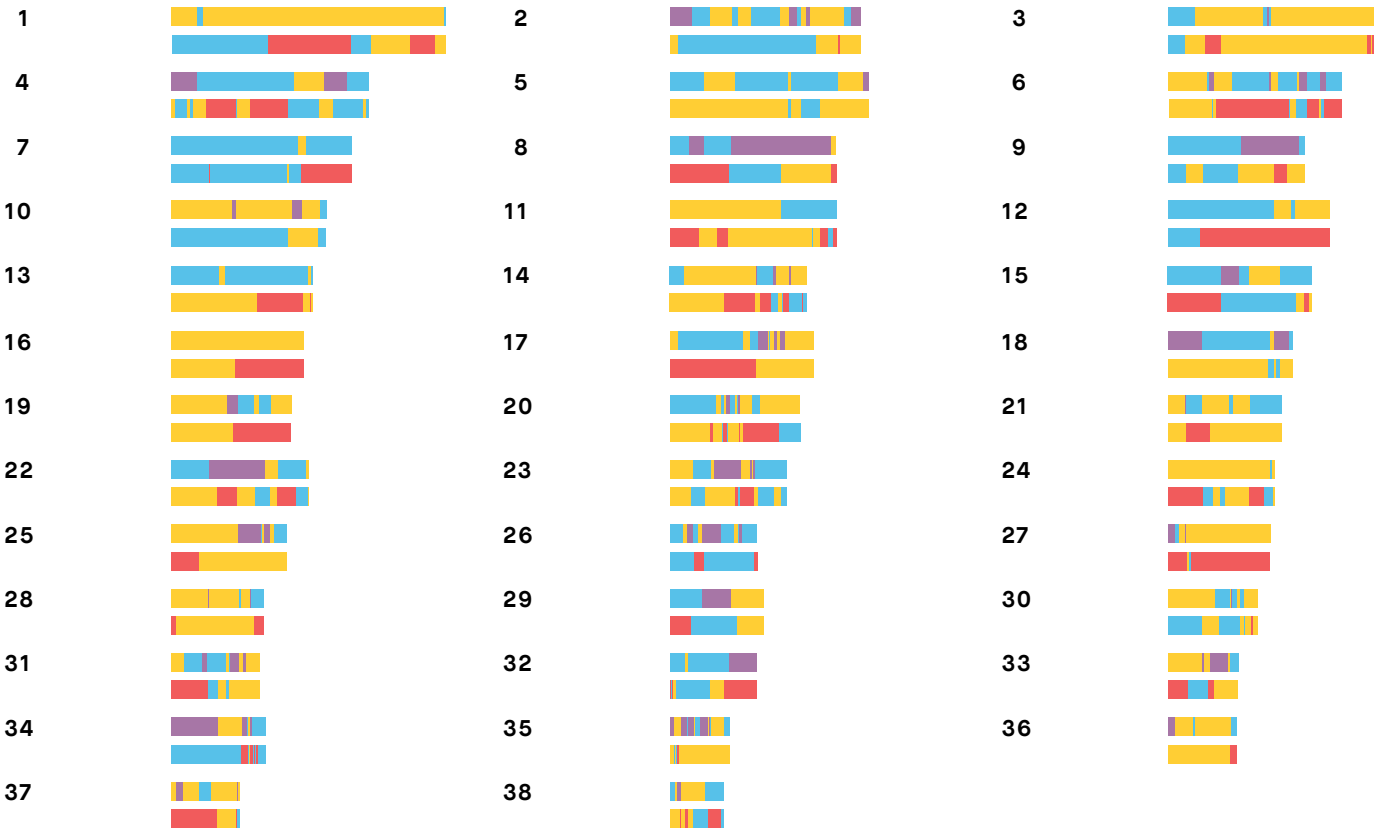
## TEST DETAILS

Kit number: EM-65456768

Swab number: 31201050701898

## BREED MIX BY CHROMOSOME

Our advanced test identifies from where BARNEY inherited every part of the chromosome pairs in his genome.



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## FAMILY TREE

Our algorithms predict this is the most likely family tree to explain BARNEY’s breed mix, but this family tree may not be the only possible one.

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## POODLE (SMALL)

Miniature and toy poodles are varieties of the poodle breed which originated in Germany in the 15th century. Unlike the larger standard poodle (>15 inches tall), these small poodles were not developed for hunting---except for truffles!---and were generally used as lap dogs and companions. Small poodles are frequently used to create designer dogs like Schnoodles and Maltipoos with low-shedding, hypoallergenic coats. All poodles are highly intelligent and energetic, and need daily exercise and stimulation. They are overall healthy dogs, although heritable eye disease, epilepsy and allergies are relatively common, and toy poodles also have a heightened risk of accidents/trauma due to their small size.

**Alternative Names**
Toy Poodle, Miniature Poodle

**Fun Fact**
Although Toy Poodles are the most popular dog breed in Japan, Poodles as a group are the eight most popular breed in the US, with miniature poodles being the most common variety.

### RELATED BREEDS

**Poodle (Standard)**
Sibling breed

**Maltese**
Cousin breed

**Havanese**
Cousin breed

**Bichon Frise**
Cousin breed

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## POODLE (STANDARD)

The Standard Poodle is a popular, water-loving dog used for centuries as a bird dog and popular pet. Poodles were established in Germany by the 15th century. Oddly enough, they are the national dog breed of France, and they were the most popular breed of dog in the United States throughout the 1960s and 70s. They're still quite popular today, owing to their intelligence, trainability, and non-shedding coats. Although well-known for their fancy fur, they’re one of the most intelligent breeds of dog and require a lot of exercise and stimulation.

**Fun Fact**
From 1989 to 1991, John Suter raced a team of Poodles in the Iditarod. Although his teams placed in the back half of the pack, he managed to win $2,000 in prize money before retiring his poodle team. The Iditarod has since changed its rules to specify that only northern dog breeds can compete.

### RELATED BREEDS

**Poodle (Toy)**
Sibling breed

**Poodle (Miniature)**
Sibling breed

**Maltese**
Cousin breed

**Havanese**
Cousin breed

**Bichon Frise**
Cousin breed

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**Fun Fact**

A Cocker Spaniel named Lupo is the pet of the Duke and Duchess of Cambridge, also known as Prince William and Kate Middleton.

## COCKER SPANIEL

A beloved family dog, the popular Cocker Spaniel is a cheerful and merry breed. The Cocker Spaniel derives from the Spaniel family, originating in Spain with references dating back to the 14th century. By the 1800s, Spaniels were split between toy dogs and large hunting dogs. The Cocker Spaniel was named after its excellence in hunting woodcock. Although Spaniels were located in England for hundreds of years, they were not considered an individual breed until 1892 when the English Kennel Club recognized the Cocker Spaniel as an official breed. However, before this, English Cockers were being imported to America and were recognized by the AKC as an official breed in 1887. It was not until 1936 that they gained recognition by the AKC as English Cocker Spaniels, which were bigger than the American-type Cocker Spaniels. In 1938, a motion was passed not to breed the two types of Spaniels, which finally led to the distinction of Cocker Spaniels as their own breed. It may come as a surprise the Cocker Spaniels are sporting dogs, whose ability to adapt to household living may deceive you of their impressive agility and obedience skills. They are strong performers in conformation shows, while also capable of field work, portraying their well-rounded nature. The Cocker Spaniel is a soft and affectionate breed, that appreciates time and attention with the family. It should be noted that although they thrive on human interaction, the Cocker Spaniel’s hunting instincts can kick in when out exercising so remember to keep them on a leash in a non-enclosed area. Due to their soft and gentle nature, a Cocker Spaniel can easily become nervous in unknown scenarios or with harsher training methods which can result in barking and sometimes submissive urination (be prepared!). The Cocker Spaniel is a visually impressive breed, whose thick and heavy coat requires constant grooming to prevent knots and tangles developing. It is common for Cocker Spaniels to seek professional assistance in keeping their pooch well groomed. This beloved family dog ranks as the 30th most popular breed.

### RELATED BREEDS

**English Cocker Spaniel**
Sibling breed

**Sussex Spaniel**
Cousin breed

**English Springer Spaniel**
Cousin breed

**Cavalier King Charles Spaniel**
Cousin breed

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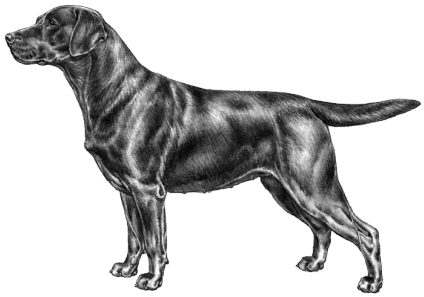

## LABRADOR RETRIEVER

The Labrador Retriever has been the most popular AKC breed in the United States every year for the past 25 years. Their origins have been traced to the St. John’s dog, named for the capital city of the Canadian province "Newfoundland and Labrador." The St. John’s was developed from imported European dogs for fishing and hunting on the island of Newfoundland in the 18th century. During the 19th century St John’s were bred in England and developed into the Labradors we know and love. Labradors were recognized as a breed by the British Kennel Club in 1903 and by the AKC in 1917. With their friendly dispositions and weatherproof build, they are terrific family dogs and outdoor companions. Most Labradors are very active with an appetite to match, and need plenty of exercise. Labradors often love to swim. Their double-coated weather-resistant fur can cause heavy shedding. Great hunting dogs and popular household companions, Labrador Retrievers are also employed as guide dogs and search-and-rescue dogs.

**Fun Fact**

We’re pretty sure Labradors came from the island of Newfoundland, and many experts believe that the Newfoundland breed was developed in neighboring Labrador! By our calculations, there are 10 times as many Labradors in North America than there are people living in Labrador and Newfoundland.

### RELATED BREEDS

**Flat-Coated Retriever**
Sibling breed

**Golden Retriever**
Sibling breed

**Chesapeake Bay Retriever**
Cousin breed

**Newfoundland**
Cousin breed

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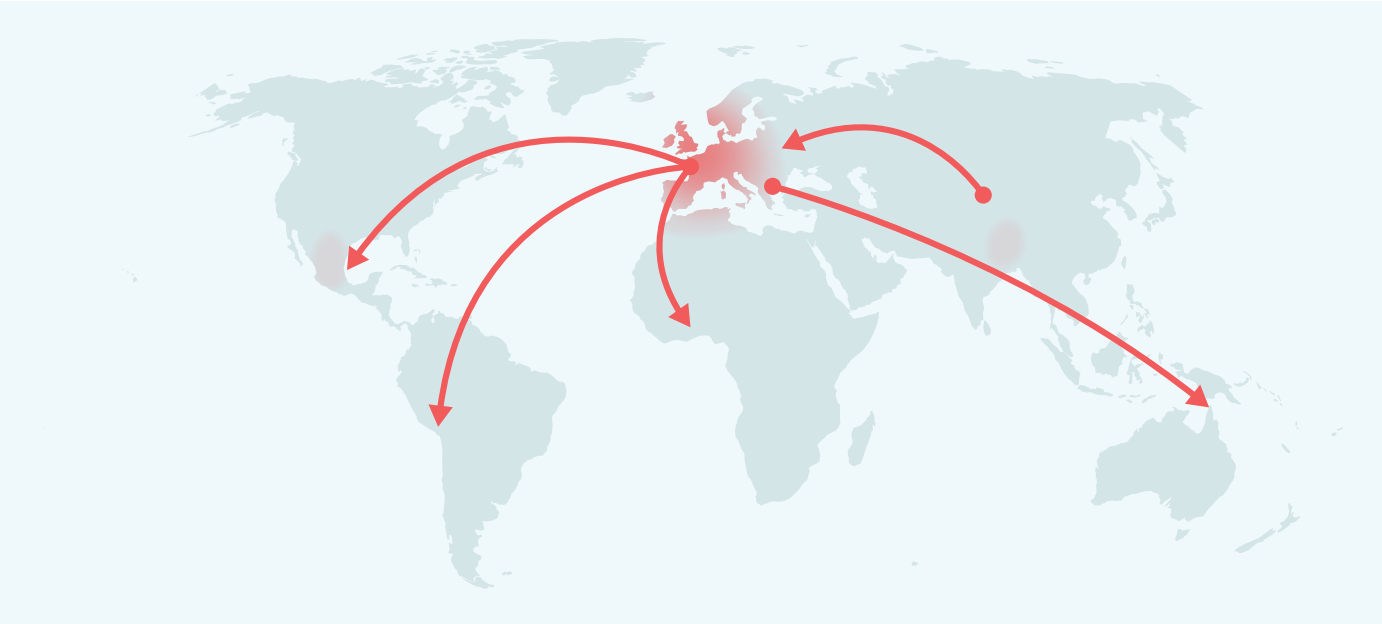
## MATERNAL LINE



Through BARNEY’s mitochondrial DNA we can trace his mother’s ancestry back to where dogs and people first became friends. This map helps you visualize the routes that his ancestors took to your home. Their story is described below the map.

**HAPLOGROUP: B1**

B1 is the second most common maternal lineage in breeds of European or American origin. It is the female line of the majority of Golden Retrievers, Basset Hounds, and Shih Tzus, and about half of Beagles, Pekingese and Toy Poodles. This lineage is also somewhat common among village dogs that carry distinct ancestry from these breeds. We know this is a result of B1 dogs being common amongst the European dogs that their conquering owners brought around the world, because nowhere on earth is it a very common lineage in village dogs. It even enables us to trace the path of (human) colonization: Because most Bichons are B1 and Bichons are popular in Spanish culture, B1 is now fairly common among village dogs in Latin America.

**HAPLOTYPE: B88**

Part of the B1 haplogroup, this haplotype occurs most frequently in Poodles.

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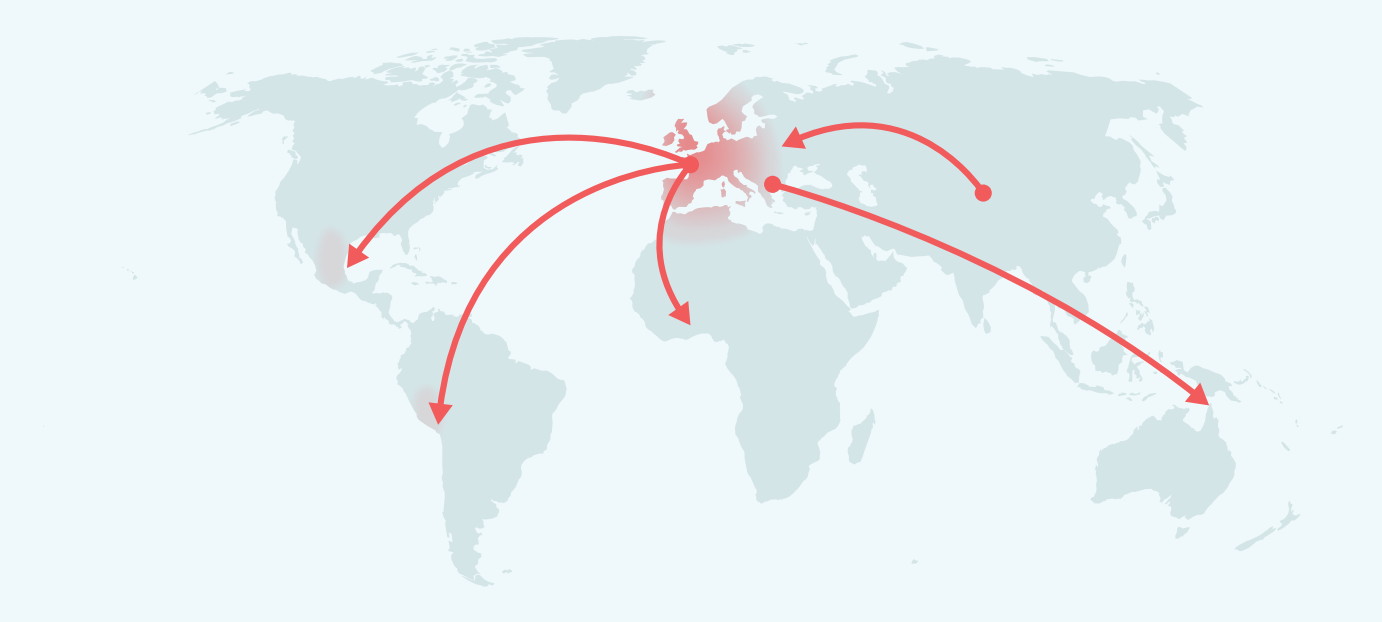
## PATERNAL LINE



Through BARNEY’s Y chromosome we can trace his father’s ancestry back to where dogs and people first became friends. This map helps you visualize the routes that his ancestors took to your home. Their story is described below the map.

**HAPLOGROUP: A1a**

Some of the wolves that became the original dogs in Central Asia around 15,000 years ago came from this long and distinguished line of male dogs. After domestication, they followed their humans from Asia to Europe and then didn't stop there. They took root in Europe, eventually becoming the dogs that founded the Vizsla breed 1,000 years ago. The Vizsla is a Central European hunting dog, and all male Vizslas descend from this line. During the Age of Exploration, like their owners, these pooches went by the philosophy, "Have sail, will travel!" From the windy plains of Patagonia to the snug and homey towns of the American Midwest, the beaches of a Pacific paradise, and the broad expanse of the Australian outback, these dogs followed their masters to the outposts of empires. Whether through good fortune or superior genetics, dogs from the A1a lineage traveled the globe and took root across the world. Now you find village dogs from this line frolicking on Polynesian beaches, hanging out in villages across the Americas, and scavenging throughout Old World settlements.

**HAPLOTYPE: H1a.59**

Part of the A1a haplogroup, this haplotype occurs most frequently in European village dogs.

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## TRAITS: COAT COLOR

| TRAIT | RESULT |
|---|---|
| **E Locus (MC1R)**<br><br>The E Locus determines if and where a dog can produce dark (black or brown) hair. Dogs with two copies of the recessive **e** allele do not produce dark hairs at all, and will be "red" over their entire body. The shade of red, which can range from a deep copper to yellow/gold to cream, is dependent on other genetic factors including the Intensity loci. In addition to determining if a dog can develop dark hairs at all, the E Locus can give a dog a black "mask" or "widow's peak," unless the dog has overriding coat color genetic factors. Dogs with one or two copies of the **Em** allele usually have a melanistic mask (dark facial hair as commonly seen in the German Shepherd and Pug). Dogs with no copies of **Em** but one or two copies of the **Eg** allele usually have a melanistic "widow's peak" (dark forehead hair as commonly seen in the Afghan Hound and Borzoi, where it is called either "grizzle" or "domino"). | **No dark hairs anywhere (ee)** |
| **K Locus (CBD103)**<br><br>The K Locus $\mathbf{K^B}$ allele "overrides" the A Locus, meaning that it prevents the A Locus genotype from affecting coat color. For this reason, the $\mathbf{K^B}$ allele is referred to as the "dominant black" allele. As a result, dogs with at least one $\mathbf{K^B}$ allele will usually have solid black or brown coats (or red/cream coats if they are **ee** at the E Locus) regardless of their genotype at the A Locus, although several other genes could impact the dog's coat and cause other patterns, such as white spotting. Dogs with the $\mathbf{k^y k^y}$ genotype will show a coat color pattern based on the genotype they have at the A Locus. Dogs who test as $\mathbf{K^B k^y}$ may be brindle rather than black or brown. | **Not expressed ($K^Bk^y$)** |

## TRAITS: COAT COLOR (CONTINUED)

| TRAIT | RESULT |
|---|---|
| **Intensity Loci LINKAGE**<br><br>Areas of a dog's coat where dark (black or brown) pigment is not expressed either contain red/yellow pigment, or no pigment at all. Five locations across five chromosomes explain approximately 70% of red pigmentation "intensity" variation across all dogs. Dogs with a result of **Intense Red Pigmentation** will likely have deep red hair like an Irish Setter or "apricot" hair like some Poodles, dogs with a result of **Intermediate Red Pigmentation** will likely have tan or yellow hair like a Soft-Coated Wheaten Terrier, and dogs with **Dilute Red Pigmentation** will likely have cream or white hair like a Samoyed. Because the mutations we test may not directly cause differences in red pigmentation intensity, we consider this to be a linkage test. | **Any pigmented hair likely apricot or red (Intense Red Pigmentation)** |
| **A Locus (ASIP)**<br><br>The A Locus controls switching between black and red pigment in hair cells, but it will only be expressed in dogs that are not **ee** at the E Locus and are $\mathbf{k^y k^y}$ at the K Locus. Sable (also called "Fawn") dogs have a mostly or entirely red coat with some interspersed black hairs. Agouti (also called "Wolf Sable") dogs have red hairs with black tips, mostly on their head and back. Black and tan dogs are mostly black or brown with lighter patches on their cheeks, eyebrows, chest, and legs. Recessive black dogs have solid-colored black or brown coats. | **Not expressed ($a^t a^t$)** |
| **D Locus (MLPH)**<br><br>The D locus result that we report is determined by two different genetic variants that can work together to cause diluted pigmentation. These are the common **d** allele, also known as **"d1"**, and a less common allele known as **"d2"**. Dogs with two **d** alleles, regardless of which variant, will have all black pigment lightened ("diluted") to gray, or brown pigment lightened to lighter brown in their hair, skin, and sometimes eyes. There are many breed-specific names for these dilute colors, such as "blue", "charcoal", "fawn", "silver", and "Isabella". Note that in certain breeds, dilute dogs have a higher incidence of Color Dilution Alopecia. Dogs with one **d** allele will not be dilute, but can pass the **d** allele on to their puppies. To view your dog's **d1** and **d2** test results, click the "SEE DETAILS" link in the upper right hand corner of the "Base Coat Color" section of the Traits page, and then click the "VIEW SUBLOCUS RESULTS" link at the bottom of the page. | **Not expressed (DD)** |

## TRAITS: COAT COLOR (CONTINUED)

| TRAIT | RESULT |
|---|---|
| **Cocoa (HPS3)**<br><br>Dogs with the **coco** genotype will produce dark brown pigment instead of black in both their hair and skin. Dogs with the **Nco** genotype will produce black pigment, but can pass the **co** allele on to their puppies. Dogs that have the **coco** genotype as well as the **bb** genotype at the B locus are generally a lighter brown than dogs that have the **Bbb** or **BB** genotypes at the B locus. | **No co alleles, not expressed (NN)** |
| **B Locus (TYRP1)**<br><br>Dogs with two copies of the **b** allele produce brown pigment instead of black in both their hair and skin. Dogs with one copy of the **b** allele will produce black pigment, but can pass the **b** allele on to their puppies. E Locus **ee** dogs that carry two **b** alleles will have red or cream coats, but have brown noses, eye rims, and footpads (sometimes referred to as "Dudley Nose" in Labrador Retrievers). "Liver" or "chocolate" is the preferred color term for brown in most breeds; in the Doberman Pinscher it is referred to as "red". | **Likely black colored nose/feet (Bb)** |
| **Saddle Tan (RALY)**<br><br>The "Saddle Tan" pattern causes the black hairs to recede into a "saddle" shape on the back, leaving a tan face, legs, and belly, as a dog ages. The Saddle Tan pattern is characteristic of breeds like the Corgi, Beagle, and German Shepherd. Dogs that have the **II** genotype at this locus are more likely to be mostly black with tan points on the eyebrows, muzzle, and legs as commonly seen in the Doberman Pinscher and the Rottweiler. This gene modifies the A Locus $\mathbf{a^t}$ allele, so dogs that do not express $\mathbf{a^t}$ are not influenced by this gene. | **Not expressed (II)** |
| **S Locus (MITF)**<br><br>The S Locus determines white spotting and pigment distribution. MITF controls where pigment is produced, and an insertion in the MITF gene causes a loss of pigment in the coat and skin, resulting in white hair and/or pink skin. Dogs with two copies of this variant will likely have breed-dependent white patterning, with a nearly white, parti, or piebald coat. Dogs with one copy of this variant will have more limited white spotting and may be considered flash, parti or piebald. This MITF variant does not explain all white spotting patterns in dogs and other variants are currently being researched. Some dogs may have small amounts of white on the paws, chest, face, or tail regardless of their S Locus genotype. | **Likely flash, parti, piebald, or extreme white (spsp)** |

## TRAITS: COAT COLOR (CONTINUED)

| TRAIT | RESULT |
|---|---|
| **M Locus (PMEL)**<br><br>Merle coat patterning is common to several dog breeds including the Australian Shepherd, Catahoula Leopard Dog, and Shetland Sheepdog, among many others. Merle arises from an unstable SINE insertion (which we term the "M*" allele) that disrupts activity of the pigmentary gene PMEL, leading to mottled or patchy coat color. Dogs with an **M*m** result are likely to be phenotypically merle or could be "phantom" merle, that is, they have a merle allele that does not affect coat color. Dogs with an **M*M*** result are likely to be phenotypically merle or double merle. Dogs with an **mm** result have no merle alleles and are unlikely to have a merle coat pattern.<br><br>Note that Embark does not currently distinguish between the recently described cryptic, atypical, atypical+, classic, and harlequin merle alleles. Our merle test only detects the presence, but not the length of the SINE insertion. We do not recommend making breeding decisions on this result alone. Please pursue further testing for allelic distinction prior to breeding decisions. | **No merle alleles (mm)** |
| **R Locus (USH2A) LINKAGE**<br><br>The R Locus regulates the presence or absence of the roan coat color pattern. Partial duplication of the USH2A gene is strongly associated with this coat pattern. Dogs with at least one **R** allele will likely have roaning on otherwise uniformly unpigmented white areas. Roan appears in white areas controlled by the S Locus but not in other white or cream areas created by other loci, such as the E Locus with **ee** along with Dilute Red Pigmentation by I Locus (for example, in Samoyeds). Mechanisms for controlling the extent of roaning are currently unknown, and roaning can appear in a uniform or non-uniform pattern. Further, non-uniform roaning may appear as ticked, and not obviously roan. The roan pattern can appear with or without ticking. | **Likely no impact on coat pattern (rr)** |
| **H Locus (Harlequin)**<br><br>This pattern is recognized in Great Danes and causes dogs to have a white coat with patches of darker pigment. A dog with an **Hh** result will be harlequin if they are also **M*m** or **M*M*** at the M Locus and are not **ee** at the E locus. Dogs with a result of **hh** will not be harlequin. This trait is thought to be homozygous lethal; a living dog with an **HH** genotype has never been found. | **No harlequin alleles (hh)** |

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## TRAITS: OTHER COAT TRAITS

| TRAIT | RESULT |
|---|---|
| **Furnishings (RSPO2) LINKAGE**<br>Dogs with one or two copies of the **F** allele have "furnishings": the mustache, beard, and eyebrows characteristic of breeds like the Schnauzer, Scottish Terrier, and Wire Haired Dachshund. A dog with two **I** alleles will not have furnishings, which is sometimes called an "improper coat" in breeds where furnishings are part of the breed standard. The mutation is a genetic insertion which we measure indirectly using a linkage test highly correlated with the insertion. | **Likely furnished (mustache, beard, and/or eyebrows) (FF)** |
| **Coat Length (FGF5)**<br>The FGF5 gene is known to affect hair length in many different species, including cats, dogs, mice, and humans. In dogs, the **T** allele confers a long, silky haircoat as observed in the Yorkshire Terrier and the Long Haired Whippet. The ancestral **G** allele causes a shorter coat as seen in the Boxer or the American Staffordshire Terrier. In certain breeds (such as Corgi), the long haircoat is described as "fluff." | **Likely long coat (TT)** |
| **Shedding (MC5R)**<br>Dogs with at least one copy of the ancestral **C** allele, like many Labradors and German Shepherd Dogs, are heavy or seasonal shedders, while those with two copies of the **T** allele, including many Boxers, Shih Tzus and Chihuahuas, tend to be lighter shedders. Dogs with furnished/wire-haired coats caused by RSPO2 (the furnishings gene) tend to be low shedders regardless of their genotype at this gene. | **Likely light shedding (CT)** |
| **Hairlessness (FOXI3) LINKAGE**<br>A duplication in the FOXI3 gene causes hairlessness over most of the body as well as changes in tooth shape and number. This mutation occurs in Peruvian Inca Orchid, Xoloitzcuintli (Mexican Hairless), and Chinese Crested (other hairless breeds have different mutations). Dogs with the **NDup** genotype are likely to be hairless while dogs with the **NN** genotype are likely to have a normal coat. The **DupDup** genotype has never been observed, suggesting that dogs with that genotype cannot survive to birth. Please note that this is a linkage test, so it may not be as predictive as direct tests of the mutation in some lines. | **Very unlikely to be hairless (NN)** |
| **Hairlessness (SGK3)**<br>Hairlessness in the American Hairless Terrier arises from a mutation in the SGK3 gene. Dogs with the **ND** genotype are likely to be hairless while dogs with the **NN** genotype are likely to have a normal coat. | **Very unlikely to be hairless (NN)** |

## TRAITS: OTHER COAT TRAITS (CONTINUED)

| TRAIT | RESULT |
|---|---|
| **Oculocutaneous Albinism Type 2 (SLC45A2) LINKAGE**<br><br>Dogs with two copies **DD** of this deletion in the SLC45A2 gene have oculocutaneous albinism type 2 (OCA), also known as Doberman Z Factor Albinism, a recessive condition characterized by severely reduced or absent pigment in the eyes, skin, and hair. Affected dogs sometimes suffer from vision problems due to lack of eye pigment (which helps direct and absorb ambient light) and are prone to sunburn. Dogs with a single copy of the deletion **ND** will not be affected but can pass the mutation on to their offspring. This particular mutation can be traced back to a single white Doberman Pinscher born in 1976, and it has only been observed in dogs descended from this individual. Please note that this is a linkage test, so it may not be as predictive as direct tests of the mutation in some lines. | **Likely not albino (NN)** |
| **Coat Texture (KRT71)**<br><br>Dogs with a long coat and at least one copy of the **T** allele have a wavy or curly coat characteristic of Poodles and Bichon Frises. Dogs with two copies of the ancestral **C** allele are likely to have a straight coat, but there are other factors that can cause a curly coat, for example if they at least one **F** allele for the Furnishings (RSPO2) gene then they are likely to have a curly coat. Dogs with short coats may carry one or two copies of the **T** allele but still have straight coats. | **Likely wavy coat (CC)** |

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## TRAITS: OTHER BODY FEATURES

| TRAIT | RESULT |
|---|---|
| **Muzzle Length (BMP3)**<br><br>Dogs in medium-length muzzle (mesocephalic) breeds like Staffordshire Terriers and Labradors, and long muzzle (dolichocephalic) breeds like Whippet and Collie have one, or more commonly two, copies of the ancestral **C** allele. Dogs in many short-length muzzle (brachycephalic) breeds such as the English Bulldog, Pug, and Pekingese have two copies of the derived **A** allele. At least five different genes affect muzzle length in dogs, with BMP3 being the only one with a known causal mutation. For example, the skull shape of some breeds, including the dolichocephalic Scottish Terrier or the brachycephalic Japanese Chin, appear to be caused by other genes. Thus, dogs may have short or long muzzles due to other genetic factors that are not yet known to science. | **Likely medium or long muzzle (CC)** |
| **Tail Length (T)**<br><br>Whereas most dogs have two **C** alleles and a long tail, dogs with one **G** allele are likely to have a bobtail, which is an unusually short or absent tail. This mutation causes natural bobtail in many breeds including the Pembroke Welsh Corgi, the Australian Shepherd, and the Brittany Spaniel. Dogs with **GG** genotypes have not been observed, suggesting that dogs with the **GG** genotype do not survive to birth.<br>Please note that this mutation does not explain every natural bobtail! While certain lineages of Boston Terrier, English Bulldog, Rottweiler, Miniature Schnauzer, Cavalier King Charles Spaniel, and Parson Russell Terrier, and Dobermans are born with a natural bobtail, these breeds do not have this mutation. This suggests that other unknown genetic mutations can also lead to a natural bobtail. | **Likely normal-length tail (CC)** |
| **Hind Dewclaws (LMBR1)**<br><br>Common in certain breeds such as the Saint Bernard, hind dewclaws are extra, nonfunctional digits located midway between a dog's paw and hock. Dogs with at least one copy of the **T** allele have about a 50% chance of having hind dewclaws. Note that other (currently unknown to science) mutations can also cause hind dewclaws, so some **CC** or **TC** dogs will have hind dewclaws. | **Unlikely to have hind dew claws (CC)** |

## TRAITS: OTHER BODY FEATURES (CONTINUED)

| TRAIT | RESULT |
|---|---|
| **Blue Eye Color (ALX4) LINKAGE**<br><br>Embark researchers discovered this large duplication associated with blue eyes in Arctic breeds like Siberian Husky as well as tri-colored (non-merle) Australian Shepherds. Dogs with at least one copy of the duplication (**Dup**) are more likely to have at least one blue eye. Some dogs with the duplication may have only one blue eye (complete heterochromia) or may not have blue eyes at all; nevertheless, they can still pass the duplication and the trait to their offspring. **NN** dogs do not carry this duplication, but may have blue eyes due to other factors, such as merle. Please note that this is a linkage test, so it may not be as predictive as direct tests of the mutation in some lines. | **Less likely to have blue eyes (NN)** |
| **Back Muscling & Bulk, Large Breed (ACSL4)**<br><br>The **T** allele is associated with heavy muscling along the back and trunk in characteristically "bulky" large-breed dogs including the Saint Bernard, Bernese Mountain Dog, Greater Swiss Mountain Dog, and Rottweiler. The "bulky" **T** allele is absent from leaner shaped large breed dogs like the Great Dane, Irish Wolfhound, and Scottish Deerhound, which are fixed for the ancestral **C** allele. Note that this mutation does not seem to affect muscling in small or even mid-sized dog breeds with notable back muscling, including the American Staffordshire Terrier, Boston Terrier, and the English Bulldog. | **Likely normal muscling (CC)** |

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## TRAITS: BODY SIZE

| TRAIT | RESULT |
| --- | --- |
| **Body Size (IGF1)**<br>The **I** allele is associated with smaller body size. | **Smaller (II)** |
| **Body Size (IGFR1)**<br>The **A** allele is associated with smaller body size. | **Larger (GG)** |
| **Body Size (STC2)**<br>The **A** allele is associated with smaller body size. | **Intermediate (TA)** |
| **Body Size (GHR - E191K)**<br>The **A** allele is associated with smaller body size. | **Intermediate (GA)** |
| **Body Size (GHR - P177L)**<br>The **T** allele is associated with smaller body size. | **Larger (CC)** |

# “BARNEY”

## MOONLIT ACRES SIR GUY GISBORN



## TRAITS: PERFORMANCE

| TRAIT | RESULT |
| --- | --- |
| **Altitude Adaptation (EPAS1)**<br><br>This mutation causes dogs to be especially tolerant of low oxygen environments (hypoxia), such as those found at high elevations. Dogs with at least one **A** allele are less susceptible to "altitude sickness." This mutation was originally identified in breeds from high altitude areas such as the Tibetan Mastiff. | **Normal altitude tolerance (GG)** |
| **Appetite (POMC) LINKAGE**<br><br>This mutation in the POMC gene is found primarily in Labrador and Flat Coated Retrievers. Compared to dogs with no copies of the mutation (**NN**), dogs with one (**ND**) or two (**DD**) copies of the mutation are more likely to have high food motivation, which can cause them to eat excessively, have higher body fat percentage, and be more prone to obesity. Read more about the genetics of POMC, and learn how you can contribute to research, in our blog post (https://embarkvet.com/resources/blog/pomc-dogs/). We measure this result using a linkage test. | **Normal food motivation (NN)** |

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## CLINICAL TOOLS

These clinical genetic tools can inform clinical decisions and diagnoses. These tools do not predict increased risk for disease.

**Alanine Aminotransferase Activity (GPT)**

BARNEY's baseline ALT level is Normal

**What is Alanine Aminotransferase Activity?**
Alanine aminotransferase (ALT) is a clinical tool that can be used by veterinarians to better monitor liver health. This result is not associated with liver disease. ALT is one of several values veterinarians measure on routine blood work to evaluate the liver. It is a naturally occurring enzyme located in liver cells that helps break down protein. When the liver is damaged or inflamed, ALT is released into the bloodstream.

**How vets diagnose this condition**
Genetic testing is the only way to provide your veterinarian with this clinical tool.

**How this condition is treated**
Veterinarians may recommend blood work to establish a baseline ALT value for healthy dogs with one or two copies of this variant.

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DNA Test Report | Test Date: May 9th, 2021 | embk.me/moonlitacressirguygisborn

## BREED-RELEVANT CONDITIONS TESTED

**BARNEY did not have the variants that we tested for, that are relevant to his breeds:**

- Von Willebrand Disease Type I (VWF)
- Canine Elliptocytosis (SPTB Exon 30)
- Pyruvate Kinase Deficiency (PKLR Exon 7 Labrador Variant)
- Progressive Retinal Atrophy, prcd (PRCD Exon 1)
- Golden Retriever Progressive Retinal Atrophy 2, GR-PRA2 (TTC8)
- Progressive Retinal Atrophy - crd4/cord1 (RPGRIP1)
- Achromatopsia (CNGA3 Exon 7 Labrador Retriever Variant)
- Macular Corneal Dystrophy, MCD (CHST6)
- Hyperuricosuria and Hyperuricemia or Urolithiasis, HUU (SLC2A9)
- Autosomal Recessive Hereditary Nephropathy, Familial Nephropathy, ARHN (COL4A4 Exon 3)
- Glycogen storage disease Type VII, Phosphofructokinase Deficiency, PFK Deficiency (PFKM Whippet and English Springer Spaniel Variant)
- GM2 Gangliosidosis (HEXB, Poodle Variant)
- Alexander Disease (GFAP)
- Degenerative Myelopathy, DM (SOD1A)
- Neonatal Encephalopathy with Seizures, NEWS (ATF2)
- Narcolepsy (HCRTR2 Intron 6)
- Hereditary Sensory Autonomic Neuropathy, Acral Mutilation Syndrome, AMS (GDNF-AS)
- Ulrich-like Congenital Muscular Dystrophy (COL6A3, Labrador Variant)
- Centronuclear Myopathy (PTPLA)
- Exercise-Induced Collapse (DNM1)
- Myotubular Myopathy 1, X-linked Myotubular Myopathy, XL-MTM (MTM1, Labrador Variant)
- Congenital Myasthenic Syndrome (COLQ)
- Hereditary Nasal Parakeratosis (SUV39H2)

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## ADDITIONAL CONDITIONS TESTED

**BARNEY did not have the variants that we tested for, in the following conditions that the potential effect on dogs with BARNEY’s breeds may not yet be known.**

- MDR1 Drug Sensitivity (ABCB1)
- P2Y12 Receptor Platelet Disorder (P2Y12)
- Factor IX Deficiency, Hemophilia B (F9 Exon 7, Terrier Variant)
- Factor IX Deficiency, Hemophilia B (F9 Exon 7, Rhodesian Ridgeback Variant)
- Factor VII Deficiency (F7 Exon 5)
- Factor VIII Deficiency, Hemophilia A (F8 Exon 10, Boxer Variant)
- Factor VIII Deficiency, Hemophilia A (F8 Exon 11, Shepherd Variant 1)
- Factor VIII Deficiency, Hemophilia A (F8 Exon 1, Shepherd Variant 2)
- Thrombopathia (RASGRP1 Exon 5, Basset Hound Variant)
- Thrombopathia (RASGRP1 Exon 8)
- Thrombopathia (RASGRP1 Exon 5, American Eskimo Dog Variant)
- Von Willebrand Disease Type III, Type III vWD (VWF Exon 4)
- Von Willebrand Disease Type III, Type III vWD (VWF Exon 7)
- Von Willebrand Disease Type II, Type II vWD (VWF)
- Canine Leukocyte Adhesion Deficiency Type I, CLADI (ITGB2)
- Canine Leukocyte Adhesion Deficiency Type III, CLADIII (FERMT3)
- Congenital Macrothrombocytopenia (TUBB1 Exon 1, Cairn and Norfolk Terrier Variant)
- Glanzmann's Thrombasthenia Type I (ITGA2B Exon 13)
- Glanzmann's Thrombasthenia Type I (ITGA2B Exon 12)
- May-Hegglin Anomaly (MYH9)
- Prekallikrein Deficiency (KLKB1 Exon 8)
- Pyruvate Kinase Deficiency (PKLR Exon 5)
- Pyruvate Kinase Deficiency (PKLR Exon 7 Pug Variant)

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## ADDITIONAL CONDITIONS TESTED

- Trapped Neutrophil Syndrome (VPS13B)
- Ligneous Membranitis, LM (PLG)
- Platelet factor X receptor deficiency, Scott Syndrome (TMEM16F)
- Methemoglobinemia CYB5R3
- Congenital Hypothyroidism (TPO, Tenterfield Terrier Variant)
- Congenital Hypothyroidism (TPO, Rat, Toy, Hairless Terrier Variant)
- Complement 3 Deficiency, C3 Deficiency (C3)
- Severe Combined Immunodeficiency (PRKDC)
- Severe Combined Immunodeficiency (RAG1)
- X-linked Severe Combined Immunodeficiency (IL2RG Variant 1)
- X-linked Severe Combined Immunodeficiency (IL2RG Variant 2)
- Progressive Retinal Atrophy, rcd1 (PDE6B Exon 21 Irish Setter Variant)
- Progressive Retinal Atrophy, rcd3 (PDE6A)
- Progressive Retinal Atrophy, CNGA (CNGA1 Exon 9)
- Progressive Retinal Atrophy (CNGB1)
- Progressive Retinal Atrophy (SAG)
- Golden Retriever Progressive Retinal Atrophy 1, GR-PRA1 (SLC4A3)
- Progressive Retinal Atrophy, crd1 (PDE6B)
- X-Linked Progressive Retinal Atrophy 1, XL-PRA1 (RPGR)
- Progressive Retinal Atrophy, PRA3 (FAM161A)
- Collie Eye Anomaly, Choroidal Hypoplasia, CEA (NHEJ1)
- Day blindness, Cone Degeneration, Achromatopsia (CNGB3 Exon 6)
- Achromatopsia (CNGA3 Exon 7 German Shepherd Variant)
- Autosomal Dominant Progressive Retinal Atrophy (RHO)
- Canine Multifocal Retinopathy (BEST1 Exon 2)

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## ADDITIONAL CONDITIONS TESTED

- Canine Multifocal Retinopathy (BEST1 Exon 5)
- Canine Multifocal Retinopathy (BEST1 Exon 10 Deletion)
- Glaucoma (ADAMTS10 Exon 9)
- Glaucoma (ADAMTS10 Exon 17)
- Glaucoma (ADAMTS17 Exon 11)
- Glaucoma (ADAMTS17 Exon 2)
- Goniodysgenesis and Glaucoma (OLFM3)
- Hereditary Cataracts, Early-Onset Cataracts, Juvenile Cataracts (HSF4 Exon 9 Shepherd Variant)
- Primary Lens Luxation (ADAMTS17)
- Congenital Stationary Night Blindness (RPE65)
- Congenital Stationary Night Blindness (LRIT3)
- 2,8-Dihydroxyadenine Urolithiasis, 2,8-DHA Urolithiasis (APRT)
- Cystinuria Type I-A (SLC3A1)
- Cystinuria Type II-A (SLC3A1)
- Cystinuria Type II-B (SLC7A9)
- Polycystic Kidney Disease, PKD (PKD1)
- Primary Hyperoxaluria (AGXT)
- Protein Losing Nephropathy, PLN (NPHS1)
- X-Linked Hereditary Nephropathy, XLHN (COL4A5 Exon 35, Samoyed Variant 2)
- Primary Ciliary Dyskinesia, PCD (CCDC39 Exon 3)
- Primary Ciliary Dyskinesia, PCD (NME5)
- Congenital Keratoconjunctivitis Sicca and Ichthyosiform Dermatosis, Dry Eye Curly Coat Syndrome, CKCSID (FAM83H Exon 5)
- X-linked Ectodermal Dysplasia, Anhidrotic Ectodermal Dysplasia (EDA Intron 8)
- Renal Cystadenocarcinoma and Nodular Dermatofibrosis, RCND (FLCN Exon 7)
- Canine Fucosidosis (FUCA1)

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## ADDITIONAL CONDITIONS TESTED

- Glycogen Storage Disease Type II, Pompe's Disease, GSD II (GAA)
- Glycogen Storage Disease Type IA, Von Gierke Disease, GSD IA (G6PC)
- Glycogen Storage Disease Type IIIA, GSD IIIA (AGL)
- Mucopolysaccharidosis Type IIIA, Sanfilippo Syndrome Type A, MPS IIIA (SGSH Exon 6 Variant 1)
- Mucopolysaccharidosis Type IIIA, Sanfilippo Syndrome Type A, MPS IIIA (SGSH Exon 6 Variant 2)
- Mucopolysaccharidosis Type VII, Sly Syndrome, MPS VII (GUSB Exon 5)
- Mucopolysaccharidosis Type VII, Sly Syndrome, MPS VII (GUSB Exon 3)
- Glycogen storage disease Type VII, Phosphofructokinase Deficiency, PFK Deficiency (PFKM Wachtelhund Variant)
- Lagotto Storage Disease (ATG4D)
- Neuronal Ceroid Lipofuscinosis 1, NCL 1 (PPT1 Exon 8)
- Neuronal Ceroid Lipofuscinosis 2, NCL 2 (TPP1 Exon 4)
- Neuronal Ceroid Lipofuscinosis 1, Cerebellar Ataxia, NCL4A (ARSG Exon 2)
- Neuronal Ceroid Lipofuscinosis 1, NCL 5 (CLN5 Border Collie Variant)
- Neuronal Ceroid Lipofuscinosis 6, NCL 6 (CLN6 Exon 7)
- Neuronal Ceroid Lipofuscinosis 8, NCL 8 (CLN8 English Setter Variant)
- Neuronal Ceroid Lipofuscinosis (MFSD8)
- Neuronal Ceroid Lipofuscinosis (CLN8 Australian Shepherd Variant)
- Neuronal Ceroid Lipofuscinosis 10, NCL 10 (CTSD Exon 5)
- Neuronal Ceroid Lipofuscinosis (CLN5 Golden Retriever Variant)
- Adult-Onset Neuronal Ceroid Lipofuscinosis (ATP13A2, Tibetan Terrier Variant)
- Late-Onset Neuronal Ceroid Lipofuscinosis (ATP13A2, Australian Cattle Dog Variant)
- GM1 Gangliosidosis (GLB1 Exon 15 Shiba Inu Variant)
- GM1 Gangliosidosis (GLB1 Exon 15 Alaskan Husky Variant)
- GM1 Gangliosidosis (GLB1 Exon 2)
- GM2 Gangliosidosis (HEXA)

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## ADDITIONAL CONDITIONS TESTED

- Globoid Cell Leukodystrophy, Krabbe disease (GALC Exon 5)
- Autosomal Recessive Amelogenesis Imperfecta, Familial Enamel Hypoplasia (Italian Greyhound Variant)
- Autosomal Recessive Amelogenesis Imperfecta, Familial Enamel Hypoplasia (Parson Russell Terrier Variant)
- Persistent Mullerian Duct Syndrome, PMDS (AMHR2)
- Deafness and Vestibular Syndrome of Dobermans, DVDob, DINGS (MYO7A)
- Shar-Pei Autoinflammatory Disease, SPAID, Shar-Pei Fever (MTBP)
- Neonatal Interstitial Lung Disease (LAMP3)
- Alaskan Husky Encephalopathy, Subacute Necrotizing Encephalomyelopathy (SLC19A3)
- Cerebellar Abiotrophy, Neonatal Cerebellar Cortical Degeneration, NCCD (SPTBN2)
- Cerebellar Ataxia, Progressive Early-Onset Cerebellar Ataxia (SEL1L)
- Cerebellar Hypoplasia (VLDLR)
- Spinocerebellar Ataxia, Late-Onset Ataxia, LoSCA (CAPN1)
- Spinocerebellar Ataxia with Myokymia and/or Seizures (KCNJ10)
- Hereditary Ataxia (RAB24)
- Benign Familial Juvenile Epilepsy, Remitting Focal Epilepsy (LGI2)
- Fetal-Onset Neonatal Neuroaxonal Dystrophy (MFN2)
- Hypomyelination and Tremors (FNIP2)
- Shaking Puppy Syndrome, X-linked Generalized Tremor Syndrome (PLP)
- Neuroaxonal Dystrophy, NAD (Spanish Water Dog Variant)
- Neuroaxonal Dystrophy, NAD (Rottweiler Variant)
- L-2-Hydroxyglutaricaciduria, L2HGA (L2HGDH)
- Polyneuropathy, NDRG1 Malamute Variant (NDRG1 Exon 4)
- Narcolepsy (HCRTR2 Exon 1)
- Progressive Neuronal Abiotrophy, Canine Multiple System Degeneration, CMSD (SERAC1 Exon 15)
- Progressive Neuronal Abiotrophy, Canine Multiple System Degeneration, CMSD (SERAC1 Exon 4)

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## ADDITIONAL CONDITIONS TESTED

- Juvenile Laryngeal Paralysis and Polyneuropathy, Polyneuropathy with Ocular Abnormalities and Neuronal Vacuolation, POANV (RAB3GAP1, Rottweiler Variant)
- Sensory Neuropathy (FAM134B)
- Juvenile-Onset Polyneuropathy, Leonberger Polyneuropathy 1, LPN1 (LPN1, ARHGEF10)
- Juvenile Myoclonic Epilepsy (DIRAS1)
- Juvenile-Onset Polyneuropathy, Leonberger Polyneuropathy 2, LPN2 (GJA9)
- Spongy Degeneration with Cerebellar Ataxia 1, SDCA1, SeSAME/EAST Syndrome (KCNJ10)
- Spongy Degeneration with Cerebellar Ataxia 2, SDCA2 (ATP1B2)
- Dilated Cardiomyopathy, DCM1 (PDK4)
- Dilated Cardiomyopathy, DCM2 (TTN)
- Long QT Syndrome (KCNQ1)
- Cardiomyopathy and Juvenile Mortality (YARS2)
- Muscular Dystrophy (DMD, Cavalier King Charles Spaniel Variant 1)
- Muscular Dystrophy (DMD Golden Retriever Variant)
- Limb Girdle Muscular Dystrophy (SGCD, Boston Terrier Variant)
- Inherited Myopathy of Great Danes (BIN1)
- Myostatin Deficiency, Bully Whippet Syndrome (MSTN)
- Myotonia Congenita (CLCN1 Exon 7)
- Myotonia Congenita (CLCN1 Exon 23)
- Inflammatory Myopathy (SLC25A12)
- Hypocatalasia, Acatalasemia (CAT)
- Pyruvate Dehydrogenase Deficiency (PDP1)
- Malignant Hyperthermia (RYR1)
- Imerslund-Grasbeck Syndrome, Selective Cobalamin Malabsorption (CUBN Exon 53)
- Imerslund-Grasbeck Syndrome, Selective Cobalamin Malabsorption (CUBN Exon 8)
- Inherited Selected Cobalamin Malabsorption with Proteinuria (CUBN)

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## ADDITIONAL CONDITIONS TESTED

- Lundehund Syndrome (LEPREL1)
- Congenital Myasthenic Syndrome (CHAT)
- Congenital Myasthenic Syndrome (CHRNE)
- Congenital Myasthenic Syndrome (COLQ)
- Myasthenia Gravis Like Syndrome (CHRNE)
- Episodic Falling Syndrome (BCAN)
- Paroxysmal Dyskinesia, PxD (PGIN)
- Demyelinating Polyneuropathy (SBF2/MTRM13)
- Dystrophic Epidermolysis Bullosa (COL7A1)
- Dystrophic Epidermolysis Bullosa (COL7A1)
- Ectodermal Dysplasia, Skin Fragility Syndrome (PKP1)
- Ichthyosis, Epidermolytic Hyperkeratosis (KRT10)
- Ichthyosis (PNPLA1)
- Ichthyosis (SLC27A4)
- Ichthyosis (NIPAL4)
- Hereditary Footpad Hyperkeratosis (FAM83G)
- Hereditary Footpad Hyperkeratosis (DSG1)
- Musladin-Lueke Syndrome (ADAMTSL2)
- Oculocutaneous Albinism, OCA (Pekingese Type)
- Bald Thigh Syndrome (IGFBP5)
- Lethal Acrodermatitis (MKLN1)
- Ehlers Danlos (Doberman) (ADAMTS2)
- Cleft Lip and/or Cleft Palate (ADAMTS20)
- Hereditary Vitamin D-Resistant Rickets (VDR)
- Osteogenesis Imperfecta, Brittle Bone Disease (COL1A2)

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## ADDITIONAL CONDITIONS TESTED

- **Osteogenesis Imperfecta, Brittle Bone Disease (SERPINH1)**
- **Osteogenesis Imperfecta, Brittle Bone Disease (COL1A1)**
- **Craniomandibular Osteopathy, CMO (SLC37A2)**
- **Raine Syndrome, Canine Dental Hypomineralization Syndrome (FAM20C)**
- **Chondrodystrophy, Norwegian Elkhound and Karelian Bear Dog Variant (ITGA10)**

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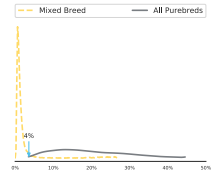
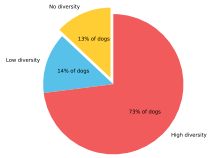
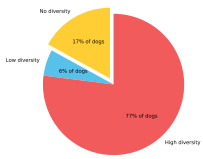
## INBREEDING AND DIVERSITY

| CATEGORY | RESULT |
| --- | --- |
| **Coefficient Of Inbreeding**<br>Our genetic COI measures the proportion of your dog's genome where the genes on the mother’s side are identical by descent to those on the father’s side. | **4%**<br>  |
| **MHC Class II - DLA DRB1**<br>A Dog Leukocyte Antigen (DLA) gene, DRB1 encodes a major histocompatibility complex (MHC) protein involved in the immune response. Some studies have shown associations between certain DRB1 haplotypes and autoimmune diseases such as Addison's disease (hypoadrenocorticism) in certain dog breeds, but these findings have yet to be scientifically validated. | **No Diversity**<br>How common is this amount of diversity in mixed breed dogs:<br>  |
| **MHC Class II - DLA DQA1 and DQB1**<br>DQA1 and DQB1 are two tightly linked DLA genes that code for MHC proteins involved in the immune response. A number of studies have shown correlations of DQA-DQB1 haplotypes and certain autoimmune diseases; however, these have not yet been scientifically validated. | **No Diversity**<br>How common is this amount of diversity in mixed breed dogs:<br>  |