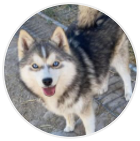


"WOLFIE"

BROOKSIDE POMSKY WOLFIE

embark

DNA Test Report | Test Date: June 22nd, 2021 | embk.me/brooksidepomskywolfie

BREED ANCESTRY

Siberian Husky : 52.2%

Pomeranian : 47.8%

GENETIC STATS

Predicted adult weight: **22 lbs**

Genetic age: n/a (Date of birth unknown)

TEST DETAILS

Kit number: EM-27227266

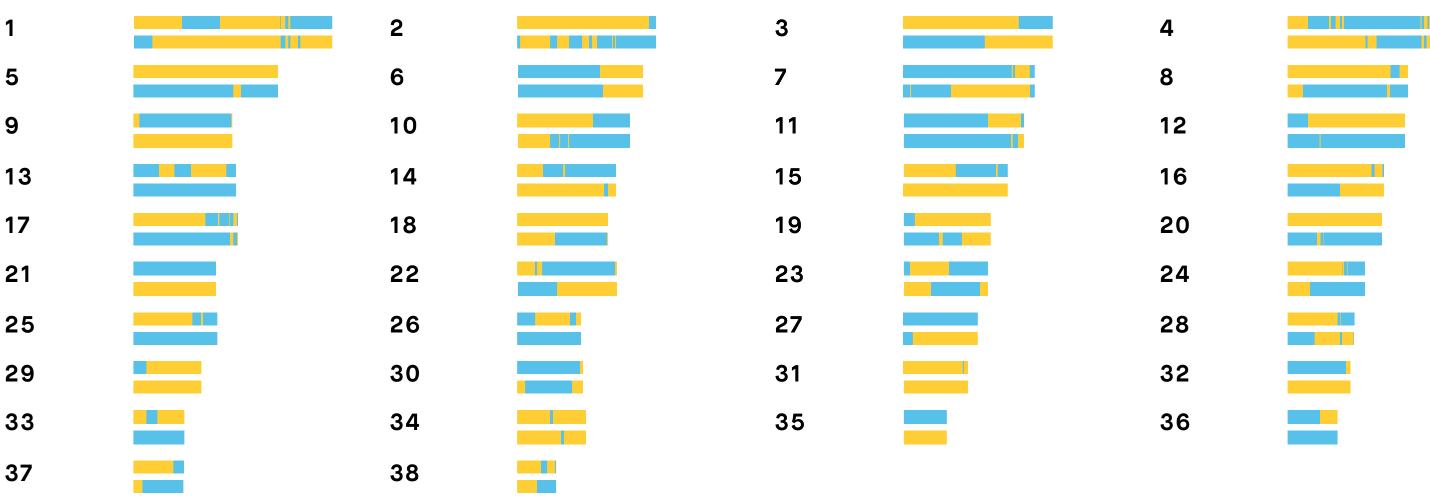
Swab number: 31210152219082

BREED ANCESTRY BY CHROMOSOME

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

Breed colors:

Siberian Husky Pomeranian



Fun Fact

In 1925 a team of Siberian Huskies saved Nome, Alaska by carrying the serum to cure diphtheria a considerable distance by sled. The run was done in the middle of a blizzard and in conditions below -23 degrees Fahrenheit. The run is remembered by the annual Iditarod Trail Sled Race, and Balto, the famous sled dog who led his team through the final leg.

SIBERIAN HUSKY

The Siberian Husky originated from the extreme north east of Siberia. They were initially domesticated by the Chukchi -an ancient population that thrived by herding reindeer and moving with each season to new grazing regions. They came to America in 1909 and found their place in the Alaskan wilderness. They love to be out in cold weather and are known to be the ideal sled dog. They have strong insulated paws that are perfect for traction in the snow. The Siberian Husky also has two layers in their coat that protects them from Arctic winters.

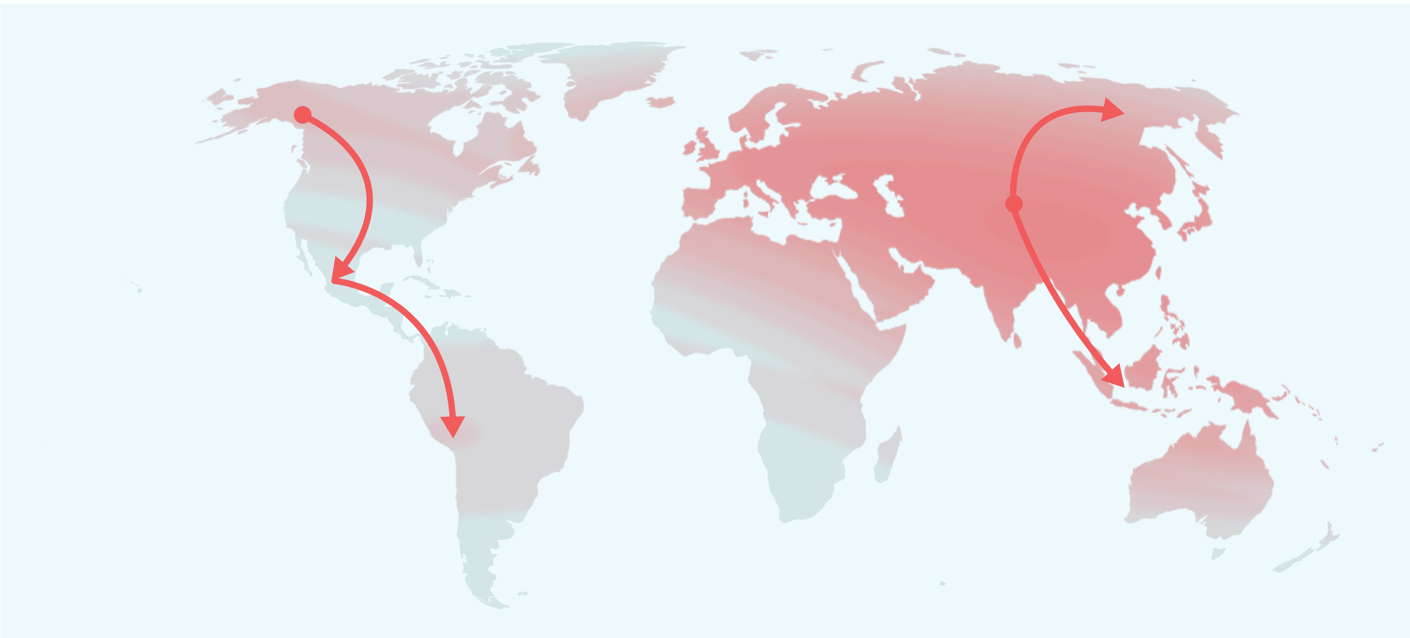
Fun Fact

Pomeranians boast one of the widest variety of color options in one breed. The American Kennel Club lists 23 accepted colors

POMERANIAN

Cute, feisty and furry, Poms are intelligent and loyal to their families. Don't let their cuteness fool you, however. These independent, bold dogs have minds of their own. They are alert and curious about the world around them. Unfortunately, in their minds, they are much larger than they really are, which can sometimes lead them to harass and even attack much larger dogs. Luckily, if they are properly socialized with other dogs and animals, they generally get along quite well with them. Poms take their name from the province of Pomerania, in Germany. They became especially popular when Queen Victoria allowed some of her Pomeranians to be shown in a conformation show, the first Pomeranians ever to be shown. Pomeranians make excellent pets for older people and those who are busy, because they aren't an overly dependent breed. They are also good for apartment dwellers or homes that don't have a backyard. Because of their small size, they aren't recommended for families with small children who might injure them accidentally. While Poms are good with children, they are not a good choice for very young or highly active children because of their small size. Never let your small children and your Pom play without supervision. Because they are so small, Poms can be perceived as prey by owls, eagles, hawks, coyotes, and other wild animals. Never leave them outside unattended, and be watchful if there are predatory birds in your location. If this is the case, stay close to your Pom to discourage birds from trying to carry them off!

MATERNAL LINE



Through Wolfie’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: A2

A2 is a very ancient maternal line. Most likely it was one of the major female lines that contributed to the very first domesticated dogs in Central Asia about 15,000 years ago. Some of the line stayed in Central Asia to the present day, and frequently appear as Tibetan Mastiffs and Akitas. Those that escaped the mountains of Central Asia sought out other cold spots, and are now found among Alaskan Malamutes and Siberian Huskies. This lineage is also occasionally found in several common Western breeds, such as German Shepherds and Labrador Retrievers. Curiously, all New Guinea Singing Dogs descend from this line. These are an ancient and very interesting breed found in the mountains of Papua New Guinea. Unfortunately, they are now endangered. They are closely related to the Australian dingo, so you could say its cousins are dingos! This line is also common in village dogs in Southeast and East Asia. Unlike many other lineages, A2 did not spread across the whole world, probably because it did not have the

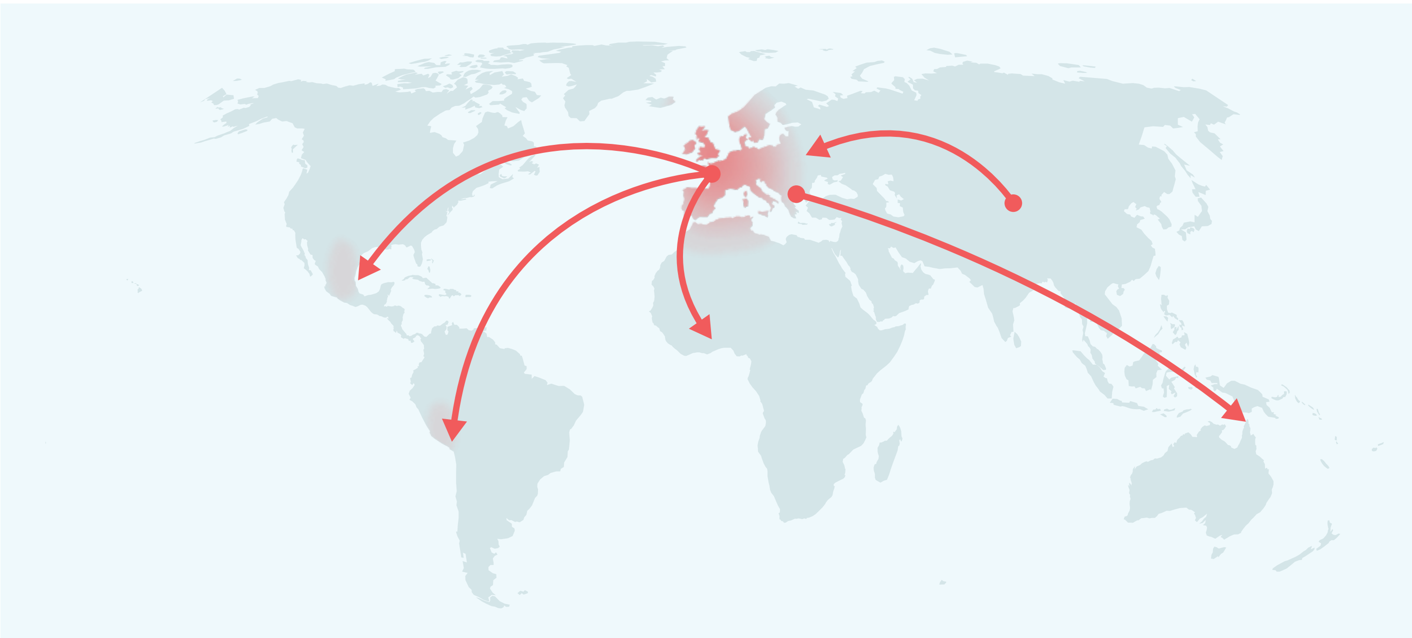
HAPLOTYPE: A29a

Part of the A2 haplogroup, this haplotype occurs most commonly in Siberian Huskies, Alaskan Malamutes, Labrador Retrievers, and village dogs from Alaska.

“WOLFIE”

BROOKSIDE POMSKY WOLFIE

PATERNAL LINE



Through Wolfie’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

HAPLOTYPE: H1a.45

Part of the A1a haplogroup, this haplotype occurs most frequently in mixed breed dogs.

TRAITS: COAT COLOR

TRAIT	RESULT
E Locus (MC1R) 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 mask or grizzle (Ee)**
K Locus (CBD103) 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 $\mathbf{k^yk^y}$ genotype will show a coat color pattern based on the genotype they have at the A Locus. Dogs who test as $\mathbf{K^Bk^y}$ may be brindle rather than black or brown.	**More likely to have a patterned haircoat ($\mathbf{k^yk^y}$)**

TRAITS: COAT COLOR (CONTINUED)

TRAIT	RESULT
Intensity Loci LINKAGE 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 light hair likely white or cream (Dilute Red Pigmentation)**
A Locus (ASIP) 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 $\mathbf{k^yk^y}$ 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.	**Agouti (Wolf Sable) coat color pattern (a^wa^w)**
D Locus (MLPH) 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.	**Dark areas of hair and skin are not lightened (Dd)**

TRAITS: COAT COLOR (CONTINUED)

TRAIT	RESULT
Cocoa (HPS3) 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 **Bb** or **BB** genotypes at the B locus.	**No co alleles, not expressed (NN)**
B Locus (TYRP1) 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”.	**Black or gray hair and skin (Bb)**
Saddle Tan (RALY) 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 **a^t** allele, so dogs that do not express **a^t** are not influenced by this gene.	**Not expressed (NN)**
S Locus (MITF) 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) 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 "non-expressing" merle, meaning that the merle pattern is very subtle or not at all evident in their coat. 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. 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 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) 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)**

TRAITS: OTHER COAT TRAITS

TRAIT	RESULT
Furnishings (RSPO2) LINKAGE 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 unfurnished (no mustache, beard, and/or eyebrows) (II)**
Coat Length (FGF5) 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 short or mid-length coat (GT)**
Shedding (MC5R) 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 heavy/seasonal shedding (CC)**
Hairlessness (FOXI3) LINKAGE 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) Hairlessness in the American Hairless Terrier arises from a mutation in the SGK3 gene. Dogs with the **DD** result are likely to be hairless. Dogs with the **ND** genotype will have a normal coat, but can pass the **D**	**Very unlikely to be hairless (NN)**

TRAITS: OTHER COAT TRAITS (CONTINUED)

TRAIT	RESULT
Oculocutaneous Albinism Type 2 (SLC45A2) LINKAGE Dogs with two copies **DD** of this deletion in the SLC45A2 gene have oculocutaneous albinism (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) 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 straight coat (CC)**

TRAITS: OTHER BODY FEATURES

TRAIT	RESULT
Muzzle Length (BMP3) 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) 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. 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) 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 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) 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)**

TRAITS: BODY SIZE

TRAIT	RESULT
Body Size (IGF1) The **I** allele is associated with smaller body size.	**Intermediate (NI)**
Body Size (IGFR1) The **A** allele is associated with smaller body size.	**Intermediate (GA)**
Body Size (STC2) The **A** allele is associated with smaller body size.	**Intermediate (TA)**
Body Size (GHR - E191K) The **A** allele is associated with smaller body size.	**Smaller (AA)**
Body Size (GHR - P177L) The **T** allele is associated with smaller body size.	**Intermediate (CT)**

TRAITS: PERFORMANCE

TRAIT	RESULT
Altitude Adaptation (EPAS1) 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 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)**

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)

Wolfie's baseline ALT level may be Low Normal

Why is this important to your vet?

Wolfie has two copies of a variant in the GPT gene and is likely to have a lower than average baseline ALT activity. ALT is a commonly used measure of liver health on routine veterinary blood chemistry panels. As such, your veterinarian may want to watch for changes in Wolfie's ALT activity above their current, healthy, ALT activity. As an increase above Wolfie’s baseline ALT activity could be evidence of liver damage, even if it is within normal limits by standard ALT reference ranges.

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.

HEALTH REPORT

How to interpret Wolfie's genetic health results:
If Wolfie inherited any of the variants that we tested, they will be listed at the top of the Health Report section, along with a description of how to interpret this result. We also include all of the variants that we tested Wolfie for that we did not detect the risk variant for.

A genetic test is not a diagnosis
This genetic test does not diagnose a disease. Please talk to your vet about your dog's genetic results, or if you think that your pet may have a health condition or disease.

Good news!

Wolfie is not at increased risk for the genetic health conditions that Embark tests.

Breed-Relevant Genetic Conditions	**7 variants not detected**
Additional Genetic Conditions	**201 variants not detected**

BREED-RELEVANT CONDITIONS TESTED

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

- **Methemoglobinemia (CYB5R3)**
- **Progressive Retinal Atrophy, rcd3 (PDE6A)**
- **X-Linked Progressive Retinal Atrophy 1, XL-PRA1 (RPGR)**
- **Hyperuricosuria and Hyperuricemia or Urolithiasis, HUU (SLC2A9)**
- **GM1 Gangliosidosis (GLB1 Exon 15, Alaskan Husky Variant)**
- **Oculocutaneous Albinism, OCA (SLC45A2, Small Breed Variant)**
- **Hereditary Vitamin D-Resistant Rickets (VDR)**

ADDITIONAL CONDITIONS TESTED

Wolfie did not have the variants that we tested for, in the following conditions that the potential effect on dogs with Wolfie’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, German Shepherd Variant 1)**
- **Factor VIII Deficiency, Hemophilia A (F8 Exon 1, German Shepherd Variant 2)**
- **Thrombopathia (RASGRP1 Exon 5, Basset Hound Variant)**
- **Thrombopathia (RASGRP1 Exon 8, Landseer Variant)**
- **Thrombopathia (RASGRP1 Exon 5, American Eskimo Dog Variant)**
- **Von Willebrand Disease Type III, Type III vWD (VWF Exon 4, Terrier Variant)**
- **Von Willebrand Disease Type III, Type III vWD (VWF Exon 7, Shetland Sheepdog Variant)**
- **Von Willebrand Disease Type I, Type I vWD (VWF)**
- **Von Willebrand Disease Type II, Type II vWD (VWF, Pointer Variant)**
- **Canine Leukocyte Adhesion Deficiency Type I, CLAD I (ITGB2, Setter Variant)**
- **Canine Leukocyte Adhesion Deficiency Type III, CLAD III (FERMT3, German Shepherd Variant)**
- **Congenital Macrothrombocytopenia (TUBB1 Exon 1, Cairn and Norfolk Terrier Variant)**
- **Canine Elliptocytosis (SPTB Exon 30)**
- **Glanzmann's Thrombasthenia Type I (ITGA2B Exon 13, Great Pyrenees Variant)**
- **Glanzmann's Thrombasthenia Type I (ITGA2B Exon 12, Otterhound Variant)**
- **May-Hegglin Anomaly (MYH9)**
- **Prekallikrein Deficiency (KLKB1 Exon 8)**

ADDITIONAL CONDITIONS TESTED

- **Pyruvate Kinase Deficiency (PKLR Exon 7, Pug Variant)**
- **Pyruvate Kinase Deficiency (PKLR Exon 7, Beagle Variant)**
- **Pyruvate Kinase Deficiency (PKLR Exon 10, Terrier Variant)**
- **Trapped Neutrophil Syndrome, TNS (VPS13B)**
- **Ligneous Membranitis, LM (PLG)**
- **Platelet Factor X Receptor Deficiency, Scott Syndrome (TMEM16F)**
- **Congenital Hypothyroidism (TPO, Tenterfield Terrier Variant)**
- **Congenital Hypothyroidism (TPO, Rat, Toy, Hairless Terrier Variant)**
- **Complement 3 Deficiency, C3 Deficiency (C3)**
- **Severe Combined Immunodeficiency, SCID (PRKDC, Terrier Variant)**
- **Severe Combined Immunodeficiency, SCID (RAG1, Wetterhoun Variant)**
- **X-linked Severe Combined Immunodeficiency, X-SCID (IL2RG Exon 1, Basset Hound Variant)**
- **X-linked Severe Combined Immunodeficiency, X-SCID (IL2RG, Corgi Variant)**
- **Progressive Retinal Atrophy, rcd1 (PDE6B Exon 21, Irish Setter Variant)**
- **Progressive Retinal Atrophy, CNGA (CNGA1 Exon 9)**
- **Progressive Retinal Atrophy, prcd (PRCD Exon 1)**
- **Progressive Retinal Atrophy, PRA1 (CNGB1)**
- **Progressive Retinal Atrophy (SAG)**
- **Golden Retriever Progressive Retinal Atrophy 1, GR-PRA1 (SLC4A3)**
- **Golden Retriever Progressive Retinal Atrophy 2, GR-PRA2 (TTC8)**
- **Progressive Retinal Atrophy, crd1 (PDE6B, American Staffordshire Terrier Variant)**
- **Progressive Retinal Atrophy, crd4/cord1 (RPGRIP1)**
- **Progressive Retinal Atrophy, PRA3 (FAM161A)**
- **Collie Eye Anomaly, Choroidal Hypoplasia, CEA (NHEJ1)**
- **Day Blindness, Cone Degeneration, Achromatopsia (CNGB3 Exon 6, German Shorthaired Pointer Variant)**

ADDITIONAL CONDITIONS TESTED

- Achromatopsia (CNGA3 Exon 7, German Shepherd Variant)
- Achromatopsia (CNGA3 Exon 7, Labrador Retriever Variant)
- Autosomal Dominant Progressive Retinal Atrophy (RHO)
- Canine Multifocal Retinopathy, cmr1 (BEST1 Exon 2)
- Canine Multifocal Retinopathy, cmr2 (BEST1 Exon 5, Coton de Tulear Variant)
- Canine Multifocal Retinopathy, cmr3 (BEST1 Exon 10 Deletion, Finnish and Swedish Lapphund, Lapponian Herder Variant)
- Primary Open Angle Glaucoma (ADAMTS10 Exon 9, Norwegian Elkhound Variant)
- Primary Open Angle Glaucoma (ADAMTS10 Exon 17, Beagle Variant)
- Primary Open Angle Glaucoma (ADAMTS17 Exon 11, Basset Fauve de Bretagne Variant)
- Primary Open Angle Glaucoma and Primary Lens Luxation (ADAMTS17 Exon 2, Chinese Shar-Pei Variant)
- Goniodysgenesis and Glaucoma, Pectinate Ligament Dysplasia, PLD (OLFM3)
- Hereditary Cataracts, Early-Onset Cataracts, Juvenile Cataracts (HSF4 Exon 9, Australian Shepherd Variant)
- Primary Lens Luxation (ADAMTS17)
- Congenital Stationary Night Blindness (RPE65, Briard Variant)
- Congenital Stationary Night Blindness (LRIT3, Beagle Variant)
- Macular Corneal Dystrophy, MCD (CHST6)
- 2,8-Dihydroxyadenine Urolithiasis, 2,8-DHA Urolithiasis (APRT)
- Cystinuria Type I-A (SLC3A1, Newfoundland Variant)
- Cystinuria Type II-A (SLC3A1, Australian Cattle Dog Variant)
- Cystinuria Type II-B (SLC7A9, Miniature Pinscher Variant)
- Polycystic Kidney Disease, PKD (PKD1)
- Primary Hyperoxaluria (AGXT)
- Protein Losing Nephropathy, PLN (NPHS1)
- X-Linked Hereditary Nephropathy, XLHN (COL4A5 Exon 35, Samoyed Variant 2)
- Autosomal Recessive Hereditary Nephropathy, Familial Nephropathy, ARHN (COL4A4 Exon 3, Cocker Spaniel Variant)

ADDITIONAL CONDITIONS TESTED

- **Primary Ciliary Dyskinesia, PCD (CCDC39 Exon 3, Old English Sheepdog Variant)**
- **Primary Ciliary Dyskinesia, PCD (NME5, Alaskan Malamute Variant)**
- **Congenital Keratoconjunctivitis Sicca and Ichthyosiform Dermatosis, Dry Eye Curly Coat Syndrome, CKCSID (FAM83H Exon 5)**
- **X-linked Ectodermal Dysplasia, Anhidrotic Ectodermal Dysplasia, XHED (EDA Intron 8)**
- **Renal Cystadenocarcinoma and Nodular Dermatofibrosis, RCND (FLCN Exon 7)**
- **Canine Fucosidosis (FUCA1)**
- **Glycogen Storage Disease Type II, Pompe's Disease, GSD II (GAA, Finnish and Swedish Lapphund, Lapponian Herder Variant)**
- **Glycogen Storage Disease Type IA, Von Gierke Disease, GSD IA (G6PC, Maltese Variant)**
- **Glycogen Storage Disease Type IIIA, GSD IIIA (AGL, Curly Coated Retriever Variant)**
- **Mucopolysaccharidosis Type IIIA, Sanfilippo Syndrome Type A, MPS IIIA (SGSH Exon 6, Dachshund Variant)**
- **Mucopolysaccharidosis Type IIIA, Sanfilippo Syndrome Type A, MPS IIIA (SGSH Exon 6, New Zealand Huntaway Variant)**
- **Mucopolysaccharidosis Type VII, Sly Syndrome, MPS VII (GUSB Exon 5, Terrier Brasileiro Variant)**
- **Mucopolysaccharidosis Type VII, Sly Syndrome, MPS VII (GUSB Exon 3, German Shepherd Variant)**
- **Glycogen storage disease Type VII, Phosphofructokinase Deficiency, PFK Deficiency (PFKM, Whippet and English Springer Spaniel Variant)**
- **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, Dachshund Variant 1)**
- **Neuronal Ceroid Lipofuscinosis 2, NCL 2 (TPP1 Exon 4, Dachshund Variant 2)**
- **Neuronal Ceroid Lipofuscinosis, Cerebellar Ataxia, NCL4A (ARSG Exon 2, American Staffordshire Terrier Variant)**
- **Neuronal Ceroid Lipofuscinosis 5, NCL 5 (CLN5 Exon 4 SNP, Border Collie Variant)**
- **Neuronal Ceroid Lipofuscinosis 6, NCL 6 (CLN6 Exon 7, Australian Shepherd Variant)**
- **Neuronal Ceroid Lipofuscinosis 8, NCL 8 (CLN8 Exon 2, English Setter Variant)**
- **Neuronal Ceroid Lipofuscinosis 7, NCL 7 (MFSD8, Chihuahua and Chinese Crested Variant)**
- **Neuronal Ceroid Lipofuscinosis 8, NCL 8 (CLN8, Australian Shepherd Variant)**
- **Neuronal Ceroid Lipofuscinosis 10, NCL 10 (CTSD Exon 5, American Bulldog Variant)**

ADDITIONAL CONDITIONS TESTED

- **Neuronal Ceroid Lipofuscinosis 5, NCL 5 (CLN5 Exon 4 Deletion, Golden Retriever Variant)**
- **Adult-Onset Neuronal Ceroid Lipofuscinosis, NCL A, NCL 12 (ATP13A2, Tibetan Terrier Variant)**
- **Late-Onset Neuronal Ceroid Lipofuscinosis, NCL 12 (ATP13A2, Australian Cattle Dog Variant)**
- **GM1 Gangliosidosis (GLB1 Exon 15, Shiba Inu Variant)**
- **GM1 Gangliosidosis (GLB1 Exon 2, Portuguese Water Dog Variant)**
- **GM2 Gangliosidosis (HEXB, Poodle Variant)**
- **GM2 Gangliosidosis (HEXA, Japanese Chin Variant)**
- **Globoid Cell Leukodystrophy, Krabbe disease (GALC Exon 5, Terrier Variant)**
- **Autosomal Recessive Amelogenesis Imperfecta, Familial Enamel Hypoplasia (ENAM Deletion, Italian Greyhound Variant)**
- **Autosomal Recessive Amelogenesis Imperfecta, Familial Enamel Hypoplasia (ENAM SNP, 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)**
- **Alexander Disease (GFAP)**
- **Cerebellar Abiotrophy, Neonatal Cerebellar Cortical Degeneration, NCCD (SPTBN2, Beagle Variant)**
- **Cerebellar Ataxia, Progressive Early-Onset Cerebellar Ataxia (SEL1L, Finnish Hound Variant)**
- **Cerebellar Hypoplasia (VLDLR, Eurasier Variant)**
- **Spinocerebellar Ataxia, Late-Onset Ataxia, LoSCA (CAPN1)**
- **Spinocerebellar Ataxia with Myokymia and/or Seizures (KCNJ10)**
- **Hereditary Ataxia, Cerebellar Degeneration (RAB24, Old English Sheepdog and Gordon Setter Variant)**
- **Benign Familial Juvenile Epilepsy, Remitting Focal Epilepsy (LGI2)**
- **Degenerative Myelopathy, DM (SOD1A)**
- **Fetal-Onset Neonatal Neuroaxonal Dystrophy (MFN2, Giant Schnauzer Variant)**

ADDITIONAL CONDITIONS TESTED

- **Hypomyelination and Tremors (FNIP2, Weimaraner Variant)**
- **Shaking Puppy Syndrome, X-linked Generalized Tremor Syndrome (PLP1, English Springer Spaniel Variant)**
- **Neuroaxonal Dystrophy, NAD (TECPR2, Spanish Water Dog Variant)**
- **Neuroaxonal Dystrophy, NAD (VPS11, Rottweiler Variant)**
- **L-2-Hydroxyglutaricaciduria, L2HGA (L2HGDH, Staffordshire Bull Terrier Variant)**
- **Neonatal Encephalopathy with Seizures, NEWS (ATF2)**
- **Alaskan Malamute Polyneuropathy, AMPN (NDRG1 SNP)**
- **Narcolepsy (HCRTR2 Intron 4, Doberman Pinscher Variant)**
- **Narcolepsy (HCRTR2 Intron 6, Labrador Retriever Variant)**
- **Narcolepsy (HCRTR2 Exon 1, Dachshund Variant)**
- **Progressive Neuronal Abiotrophy, Canine Multiple System Degeneration, CMSD (SERAC1 Exon 15, Kerry Blue Terrier Variant)**
- **Progressive Neuronal Abiotrophy, Canine Multiple System Degeneration, CMSD (SERAC1 Exon 4, Chinese Crested Variant)**
- **Juvenile Laryngeal Paralysis and Polyneuropathy, Polyneuropathy with Ocular Abnormalities and Neuronal Vacuolation, POANV (RAB3GAP1, Rottweiler Variant)**
- **Hereditary Sensory Autonomic Neuropathy, Acral Mutilation Syndrome, AMS (GDNF-AS, Spaniel and Pointer Variant)**
- **Sensory Neuropathy (FAM134B, Border Collie Variant)**
- **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, Doberman Pinscher Variant 1)**
- **Dilated Cardiomyopathy, DCM2 (TTN, Doberman Pinscher Variant 2)**
- **Long QT Syndrome (KCNQ1)**
- **Cardiomyopathy and Juvenile Mortality (YARS2)**
- **Muscular Dystrophy (DMD, Cavalier King Charles Spaniel Variant 1)**

ADDITIONAL CONDITIONS TESTED

- Muscular Dystrophy (DMD, Golden Retriever Variant)
- Limb Girdle Muscular Dystrophy (SGCD, Boston Terrier Variant)
- Ullrich-like Congenital Muscular Dystrophy (COL6A3 Exon 10, Labrador Retriever Variant)
- Centronuclear Myopathy, CNM (PTPLA)
- Exercise-Induced Collapse, EIC (DNM1)
- Inherited Myopathy of Great Danes (BIN1)
- Myostatin Deficiency, Bully Whippet Syndrome (MSTN)
- Myotonia Congenita (CLCN1 Exon 7, Miniature Schnauzer Variant)
- Myotonia Congenita (CLCN1 Exon 23, Australian Cattle Dog Variant)
- Myotubular Myopathy 1, X-linked Myotubular Myopathy, XL-MTM (MTM1, Labrador Retriever Variant)
- Inflammatory Myopathy (SLC25A12)
- Hypocatalasia, Acatalasemia (CAT)
- Pyruvate Dehydrogenase Deficiency (PDP1, Spaniel Variant)
- Malignant Hyperthermia (RYR1)
- Imerslund-Grasbeck Syndrome, Selective Cobalamin Malabsorption (CUBN Exon 53, Border Collie Variant)
- Imerslund-Grasbeck Syndrome, Selective Cobalamin Malabsorption (CUBN Exon 8, Beagle Variant)
- Inherited Selected Cobalamin Malabsorption with Proteinuria (CUBN, Komondor Variant)
- Lundehund Syndrome (LEPREL1)
- Congenital Myasthenic Syndrome, CMS (CHAT, Old Danish Pointing Dog Variant)
- Congenital Myasthenic Syndrome, CMS (COLQ, Labrador Retriever Variant)
- Congenital Myasthenic Syndrome, CMS (CHRNE, Jack Russell Terrier Variant)
- Congenital Myasthenic Syndrome, CMS (COLQ, Golden Retriever Variant)
- Myasthenia Gravis-Like Syndrome (CHRNE, Heideterrier Variant)
- Episodic Falling Syndrome (BCAN)
- Paroxysmal Dyskinesia, PxD (PIGN)

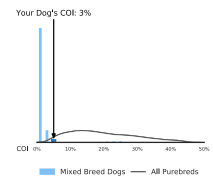
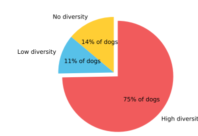
ADDITIONAL CONDITIONS TESTED

- **Demyelinating Polyneuropathy (SBF2/MTRM13)**
- **Dystrophic Epidermolysis Bullosa (COL7A1, Golden Retriever Variant)**
- **Dystrophic Epidermolysis Bullosa (COL7A1, Central Asian Shepherd Dog Variant)**
- **Ectodermal Dysplasia, Skin Fragility Syndrome (PKP1, Chesapeake Bay Retriever Variant)**
- **Ichthyosis, Epidermolytic Hyperkeratosis (KRT10, Terrier Variant)**
- **Ichthyosis, ICH1 (PNPLA1, Golden Retriever Variant)**
- **Ichthyosis (SLC27A4, Great Dane Variant)**
- **Ichthyosis (NIPAL4, American Bulldog Variant)**
- **Hereditary Footpad Hyperkeratosis (FAM83G, Terrier and Kromfohrlander Variant)**
- **Hereditary Footpad Hyperkeratosis (DSG1, Rottweiler Variant)**
- **Hereditary Nasal Parakeratosis, HNPK (SUV39H2)**
- **Musladin-Lueke Syndrome, MLS (ADAMTSL2)**
- **Bald Thigh Syndrome (IGFBP5)**
- **Lethal Acrodermatitis, LAD (MKLN1)**
- **Ehlers Danlos (ADAMTS2, Doberman Pinscher Variant)**
- **Cleft Lip and/or Cleft Palate (ADAMTS20, Nova Scotia Duck Tolling Retriever Variant)**
- **Oculoskeletal Dysplasia 2, Dwarfism-Retinal Dysplasia 2, drd2, OSD2 (COL9A2, Samoyed Variant)**
- **Osteogenesis Imperfecta, Brittle Bone Disease (COL1A2, Beagle Variant)**
- **Osteogenesis Imperfecta, Brittle Bone Disease (SERPINH1, Dachshund Variant)**
- **Osteogenesis Imperfecta, Brittle Bone Disease (COL1A1, Golden Retriever Variant)**
- **Osteochondrodysplasia, Skeletal Dwarfism (SLC13A1, Poodle Variant)**
- **Skeletal Dysplasia 2, SD2 (COL11A2, Labrador Retriever Variant)**
- **Craniomandibular Osteopathy, CMO (SLC37A2)**
- **Raine Syndrome, Canine Dental Hypomineralization Syndrome (FAM20C)**
- **Chondrodystrophy and Intervertebral Disc Disease, CDDY/IVDD, Type I IVDD (FGF4 retrogene - CFA12)**

ADDITIONAL CONDITIONS TESTED

- **Chondrodystrophy (ITGA10, Norwegian Elkhound and Karelian Bear Dog Variant)**

INBREEDING AND DIVERSITY

CATEGORY	RESULT
Coefficient Of Inbreeding 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.	**3%** 
MHC Class II - DLA DRB1 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.	**High Diversity** How common is this amount of diversity in mixed breed dogs: 
MHC Class II - DLA DQA1 and DQB1 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.	**High Diversity** How common is this amount of diversity in mixed breed dogs: