



# "KNIFE"

## LANN MORIAN KNIFE



DNA Test Report

Test Date: May 19th, 2019

embk.me/knife

### BREED MIX

● Belgian Sheepdog : 100.0%

### GENETIC STATS

Predicted adult weight: **60 lbs**

Genetic age: **69 human years**

Based on the date of birth you provided

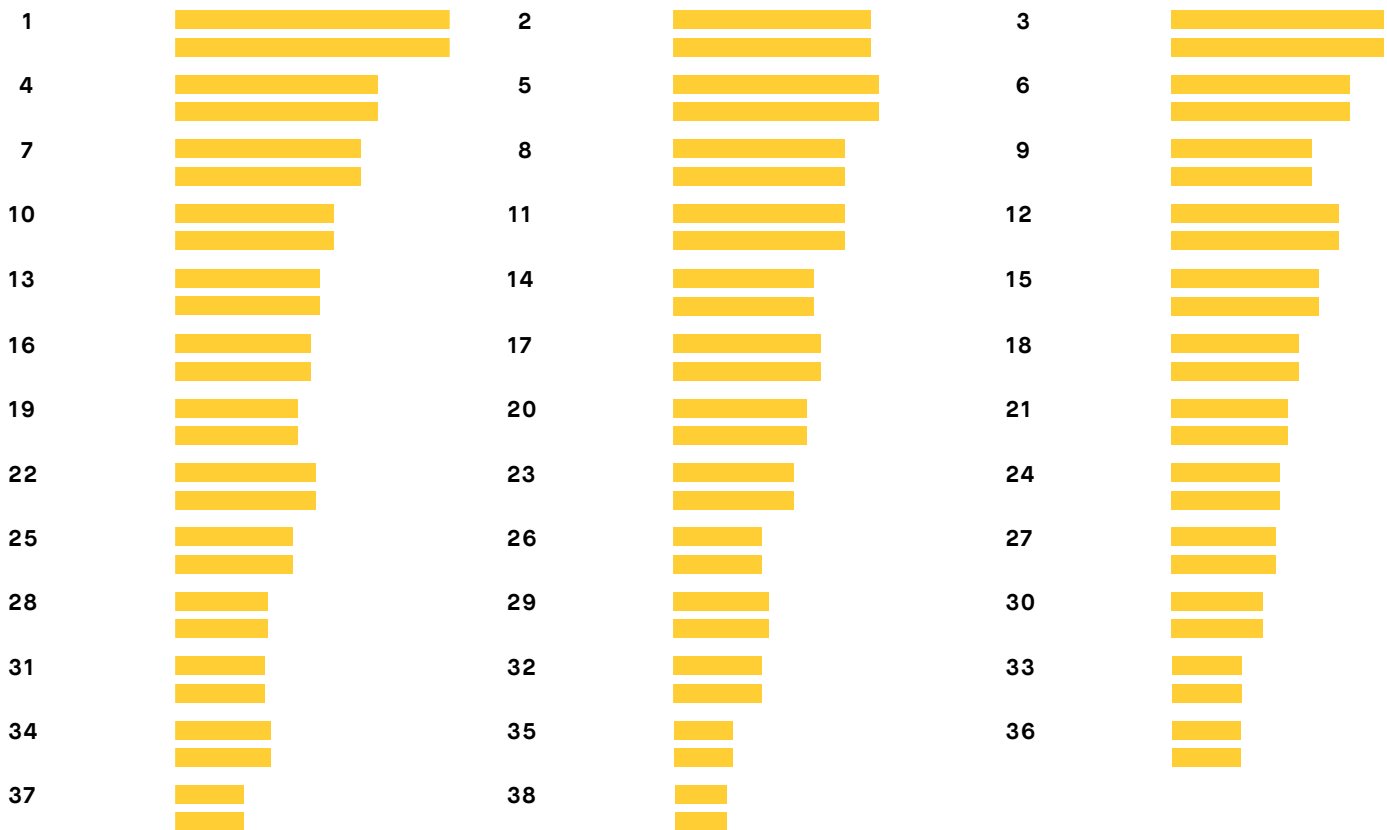
### TEST DETAILS

Kit number: EM-6575297

Swab number: 31001901330049

### BREED MIX BY CHROMOSOME

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





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### BELGIAN SHEEPDOG



Belgian Sheepdogs are very intelligent and alert. They also have strong herding and protection instincts. Early, consistent training is critical! Although they are good-size dogs, they are very people-oriented and want to be included in family activities. Belgian Sheepdogs are play-oriented and sensitive. Keep training sessions fun, consistent, and positive. Because of their intelligence, high energy levels, and other characteristics, Belgian Sheepdogs are not recommended for inexperienced dog owners. Shyness can be a problem in this breed. Choose the middle-of-the-road puppy, not the one beating up his litter mates or the one hiding in the corner. Belgian Sheepdogs require at least an hour of exercise per day. If you don't provide them with exercise and mental stimulation in the form of training or play, they'll find their own entertainment, and chances are it will be expensive to repair. Belgian Sheepdogs can get along well with other dogs and cats if they're raised with them, but they have a chase instinct and will go after animals that run from them. Belgian Sheepdogs shed year-round and require 15 to 20 minutes of brushing weekly.

#### Alternative Names

Groenendael

#### Fun Fact

During WWI, The Belgian Sheepdog distinguished themselves on the battlefields, serving as message carriers, ambulance dogs, and even pulling machine guns.

### RELATED BREEDS



**Belgian Tervuren**  
Sibling breed



**Belgian Malinois**  
Sibling breed



**Belgian Laekenois**  
Sibling breed



**German Shepherd Dog**  
Cousin breed



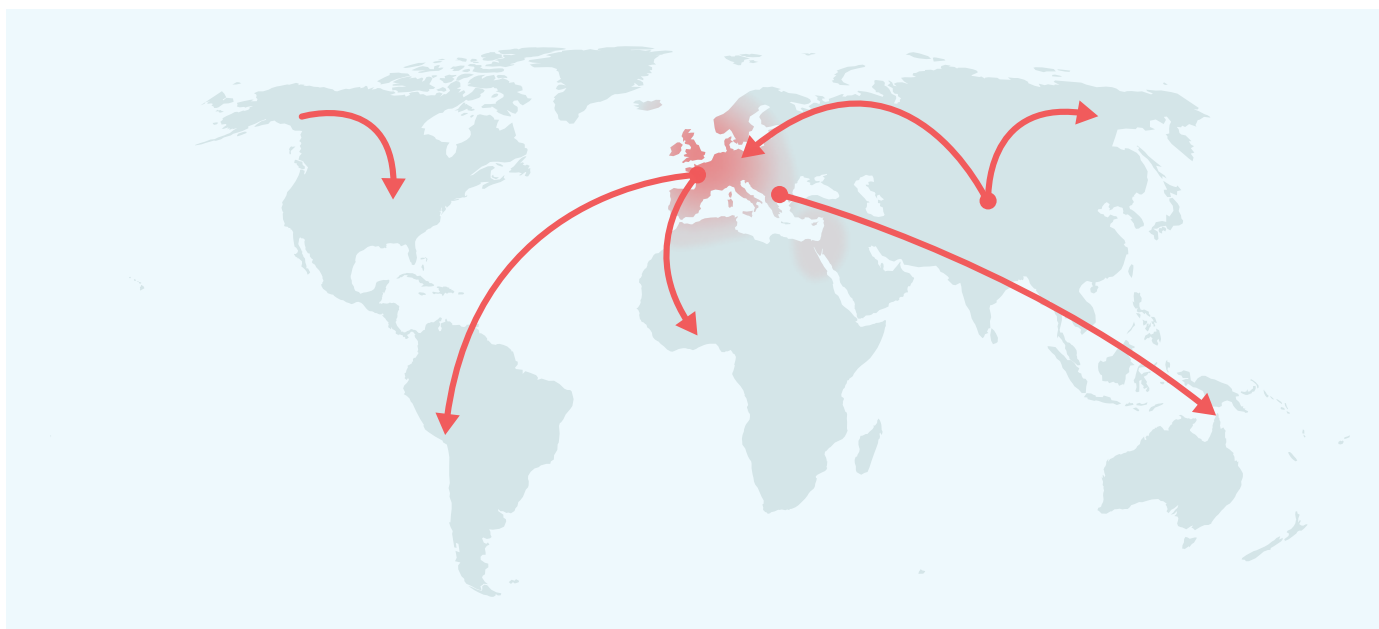
**Dutch Shepherd**  
Cousin breed



# "KNIFE"

## LANN MORIAN KNIFE

### MATERNAL LINE



Through Knife'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: A1e

This female lineage likely stems from some of the original Central Asian wolves that were domesticated into modern dogs starting about 15,000 years ago. It seemed to be a fairly rare dog line for most of dog history until the past 300 years, when the lineage seemed to "explode" out and spread quickly. What really separates this group from the pack is its presence in Alaskan village dogs and Samoyeds. It is possible that this was an indigenous lineage brought to the Americas from Siberia when people were first starting to make that trip themselves! We see this lineage pop up in overwhelming numbers of Irish Wolfhounds, and it also occurs frequently in popular large breeds like Bernese Mountain Dogs, Saint Bernards and Great Danes. Shetland Sheepdogs are also common members of this maternal line, and we see it a lot in Boxers, too. Though it may be all mixed up with European dogs thanks to recent breeding events, its origins in the Americas makes it a very exciting lineage for sure!

#### HAPLOTYPE: A22

Part of the large A1e haplogroup, we see this haplotype in Bernese Mountain Dogs, German Shepherd Dogs, Great Danes, and village dogs in the Democratic Republic of the Congo.



# "KNIFE"

## LANN MORIAN KNIFE

### PATERNAL LINE



Through Knife'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: A1b

For most of dog history, this haplogroup was probably quite rare. However, a couple hundred years ago it seems to have found its way into a prized male guard dog in Europe who had many offspring, including the ancestors of many European guard breeds such as Doberman Pinchers, St. Bernards, and Great Danes. Despite being rare, many of the most imposing dogs on Earth have it; strangely, so do many Pomeranians! Perhaps this explains why some Poms are so tough, acting like they're ten times their actual size! This lineage is most commonly found in working dogs, in particular guard dogs. With origins in Europe, it spread widely across other regions as Europeans took their dogs across the world.

#### HAPLOTYPE: Ha.4/11

Part of the A1b haplogroup, this haplotype occurs most frequently in mixed breed dogs.



# "KNIFE"

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## TRAITS: COAT COLOR

TRAIT	RESULT
<b>E Locus (MC1R)</b> <p>The E Locus determines if and where a dog can produce dark (black or brown) hair. Dogs with two copies of the recessive <b>e</b> 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 (I) Locus, which has yet to be genetically mapped. 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 <b>Em</b> allele usually have a melanistic mask (dark facial hair as commonly seen in the German Shepherd and Pug). Dogs with no copies of <b>Em</b> but one or two copies of the <b>Eg</b> 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").</p>	<b>Can have a melanistic mask (E<sup>m</sup>E<sup>m</sup>)</b>
<b>K Locus (CBD103)</b> <p>The K Locus <b>K<sup>B</sup></b> allele "overrides" the A Locus, meaning that it prevents the A Locus genotype from affecting coat color. For this reason, the <b>K<sup>B</sup></b> allele is referred to as the "dominant black" allele. As a result, dogs with at least one <b>K<sup>B</sup></b> allele will usually have solid black or brown coats (or red/cream coats if they are <b>ee</b> 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 <b>k<sup>Y</sup>k<sup>Y</sup></b> genotype will show a coat color pattern based on the genotype they have at the A Locus. Dogs who test as <b>K<sup>B</sup>k<sup>Y</sup></b> may be brindle rather than black or brown.</p>	<b>More likely to have a mostly solid black or brown coat (K<sup>B</sup>k<sup>Y</sup>)</b>
<b>A Locus (ASIP)</b> <p>The A Locus controls switching between black and red pigment in hair cells, but it will only be expressed in dogs that are not <b>ee</b> at the E Locus and are <b>k<sup>Y</sup>k<sup>Y</sup></b> 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.</p>	<b>Not expressed (a<sup>Y</sup>a<sup>Y</sup>)</b>



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### TRAITS: COAT COLOR (CONTINUED)

TRAIT	RESULT
<b>D Locus (MLPH)</b>  Dogs with two copies of the <b>d</b> allele 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 dilute dogs have a higher incidence of Color Dilution Alopecia, especially in certain breeds. Dogs with one copy of the <b>d</b> allele will not be dilute, but can pass the <b>d</b> allele on to their puppies.	<b>No Call</b>
<b>B Locus (TYRP1)</b>  Dogs with two copies of the <b>b</b> allele produce brown pigment instead of black in both their hair and skin. Dogs with one copy of the <b>b</b> allele will produce black pigment, but can pass the <b>b</b> allele on to their puppies. E Locus <b>ee</b> dogs that carry two <b>b</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".	<b>Black or gray hair and skin (BB)</b>
<b>Saddle Tan (RALY)</b>  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 <b>ll</b> 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 <b>a<sup>t</sup></b> allele, so dogs that do not express <b>a<sup>t</sup></b> are not influenced by this gene.	<b>Not expressed (NN)</b>



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[embk.me/knife](https://embk.me/knife)

### TRAITS: COAT COLOR (CONTINUED)

TRAIT	RESULT
<p><b>M Locus (PMEL)</b></p> <p>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 <b>M*m</b> 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 <b>M*M*</b> result are likely to be phenotypically merle or double merle. Dogs with an <b>mm</b> result have no merle alleles and are unlikely to have a merle coat pattern.</p>	<b>No merle alleles (mm)</b>

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.



# "KNIFE"

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## TRAITS: OTHER COAT TRAITS

TRAIT	RESULT
<b>Furnishings (RSPO2) LINKAGE</b>	
Dogs with one or two copies of the <b>F</b> allele have "furnishings": the mustache, beard, and eyebrows characteristic of breeds like the Schnauzer, Scottish Terrier, and Wire Haired Dachshund. A dog with two <b>I</b> 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.	<b>Likely unfurnished (no mustache, beard, and/or eyebrows) (II)</b>
<b>Coat Length (FGF5)</b>	
The FGF5 gene is known to affect hair length in many different species, including cats, dogs, mice, and humans. In dogs, the <b>T</b> allele confers a long, silky haircoat as observed in the Yorkshire Terrier and the Long Haired Whippet. The ancestral <b>G</b> 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."	<b>Likely long coat (TT)</b>
<b>Shedding (MC5R)</b>	
Dogs with at least one copy of the ancestral <b>C</b> allele, like many Labradors and German Shepherd Dogs, are heavy or seasonal shedders, while those with two copies of the <b>T</b> 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.	<b>Likely heavy/seasonal shedding (CC)</b>
<b>Coat Texture (KRT71)</b>	
Dogs with a long coat and at least one copy of the <b>T</b> allele have a wavy or curly coat characteristic of Poodles and Bichon Frises. Dogs with two copies of the ancestral <b>C</b> 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 <b>F</b> 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 <b>T</b> allele but still have straight coats.	<b>Likely straight coat (CC)</b>
<b>Hairlessness (SGK3)</b>	
Hairlessness in the American Hairless Terrier arises from a mutation in the SGK3 gene. Dogs with the <b>ND</b> genotype are likely to be hairless while dogs with the <b>NN</b> genotype are likely to have a normal coat.	<b>Very unlikely to be hairless (NN)</b>





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### TRAITS: OTHER COAT TRAITS (CONTINUED)

TRAIT	RESULT
<p><b>Hairlessness (FOXI3) LINKAGE</b></p> <p>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 <b>NDup</b> genotype are likely to be hairless while dogs with the <b>NN</b> genotype are likely to have a normal coat. The <b>DupDup</b> 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.</p>	<b>Very unlikely to be hairless (NN)</b>
<p><b>Oculocutaneous Albinism Type 2 (SLC45A2) LINKAGE</b></p> <p>Dogs with two copies <b>DD</b> of this deletion in the SLC45A2 gene have oculocutaneous albinism type 2 (OCA2), 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 <b>ND</b> 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.</p>	<b>Likely not albino (NN)</b>



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## TRAITS: OTHER BODY FEATURES

TRAIT	RESULT
<b>Muzzle Length (BMP3)</b>	
<p>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 <b>C</b> allele. Dogs in many short-length muzzle (brachycephalic) breeds such as the English Bulldog, Pug, and Pekingese have two copies of the derived <b>A</b> 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.</p>	<b>Likely medium or long muzzle (CC)</b>
<b>Tail Length (T)</b>	
<p>Whereas most dogs have two <b>C</b> alleles and a long tail, dogs with one <b>G</b> 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 <b>GG</b> genotypes have not been observed, suggesting that dogs with the <b>GG</b> 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.</p>	<b>Likely normal-length tail (CC)</b>
<b>Hind Dewclaws (LMBR1)</b>	
<p>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 <b>T</b> 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 <b>TT</b> or <b>TC</b> dogs will have hind dewclaws.</p>	<b>Unlikely to have hind dew claws (CC)</b>



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## TRAITS: OTHER BODY FEATURES (CONTINUED)

TRAIT	RESULT
<p><b>Blue Eye Color (ALX4) LINKAGE</b></p> <p>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 (<b>Dup</b>) 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. <b>NN</b> 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.</p>	<b>Less likely to have blue eyes (NN)</b>
<p><b>Back Muscling &amp; Bulk, Large Breed (ACSL4)</b></p> <p>The <b>T</b> 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" <b>T</b> allele is absent from leaner shaped large breed dogs like the Great Dane, Irish Wolfhound, and Scottish Deerhound, which are fixed for the ancestral <b>C</b> 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.</p>	<b>Likely normal muscling (CC)</b>



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### TRAITS: BODY SIZE

TRAIT	RESULT
<b>Body Size (IGF1)</b> The I allele is associated with smaller body size.	<b>Larger (NN)</b>
<b>Body Size (IGFR1)</b> The A allele is associated with smaller body size.	<b>Larger (GG)</b>
<b>Body Size (STC2)</b> The A allele is associated with smaller body size.	<b>Larger (TT)</b>
<b>Body Size (GHR - E191K)</b> The A allele is associated with smaller body size.	<b>Larger (GG)</b>
<b>Body Size (GHR - P177L)</b> The T allele is associated with smaller body size.	<b>Larger (CC)</b>

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# "KNIFE"

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### TRAITS: PERFORMANCE

TRAIT	RESULT
<b>Altitude Adaptation (EPAS1)</b>	
<p>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 <b>A</b> allele are less susceptible to "altitude sickness." This mutation was originally identified in breeds from high altitude areas such as the Tibetan Mastiff.</p>	<b>Normal altitude tolerance (GG)</b>
<b>Appetite (POMC) LINKAGE</b>	
<p>This mutation in the POMC gene is found primarily in Labrador and Flat Coated Retrievers. Compared to dogs with no copies of the mutation (<b>NN</b>), dogs with one (<b>ND</b>) or two (<b>DD</b>) 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 (<a href="http://embarkvet.com/resources/blog/pomc-dogs">embarkvet.com/resources/blog/pomc-dogs</a>). We measure this result using a linkage test.</p>	<b>Normal food motivation (NN)</b>



# "KNIFE" LANN MORIAN KNIFE

## TRAITS: GENETIC DIVERSITY

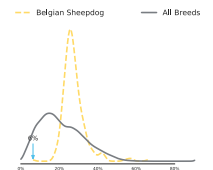
### TRAIT

#### 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.

### RESULT

6%

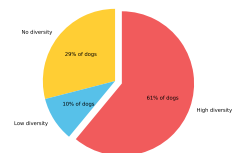


#### MHC Class II - DLA DRB1

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 purebreds:

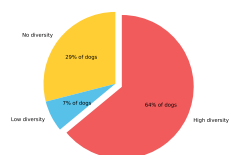


#### MHC Class II - DLA DQA1 and DQB1

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 purebreds:





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## CLINICAL TOOLS

These clinical genetic traits can inform clinical decisions and diagnoses. These traits do not predict a disease state or increased risk for disease. We currently assess one clinical tool: Alanine Aminotransferase Activity.

### **Alanine Aminotransferase Activity result: Low Normal**

Lann Morian Knife has one copy of a variant associated with reduced ALT activity as measured on veterinary blood chemistry panels. Please inform your veterinarian that Lann Morian Knife has this genotype, as ALT is often used as an indicator of liver health and Lann Morian Knife is likely to have a lower than average resting ALT activity. As such, an increase in Lann Morian Knife's ALT activity could be evidence of liver damage, even if it is within normal limits by standard ALT reference ranges.

#### More information on Alanine Aminotransferase Activity:

The liver enzyme alanine aminotransferase, or ALT, is one of several values your veterinarian measures on routine blood work to gauge liver health. Dogs with one or more copies of the "A" allele are likely to have a lower baseline ALT activity ("low normal") than dogs with zero copies of the "A" allele ("normal"). This means that your veterinarian may recommend blood work to establish an individualized baseline ALT value during an annual wellness exam or before starting certain medications. You and your veterinarian would then be able to monitor your dog for any deviation from this established baseline. Please note that this mutation should never cause an increase in your dog's ALT activity and does not cause liver disease. If your dog has high ALT activity, please consult your veterinarian.



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### HEALTH

Good news! Knife did not test positive for any of the genetic conditions that Embark screens for.

0  
AT RISK

0  
CARRIER





# "KNIFE"

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### OTHER CONDITIONS

Good news! Knife tested clear for 3 genetic conditions that are common in his breed.

- Mucopolysaccharidosis Type VII, Sly Syndrome, MPS VII (GUSB Exon 3)
- Spongy Degeneration with Cerebellar Ataxia 1, SDCA1, SeSAME/EAST Syndrome (KCNJ10)
- Spongy Degeneration with Cerebellar Ataxia 2, SDCA2 (ATP1B2)



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## FULL TEST PANEL

Knife is also clear of 170 other genetic health conditions that Embark tests for.

To help ensure healthy breeds, every test includes analysis of our full panel of over 160 genetic health conditions.

The following pages list out all the other genetic health conditions that Knife tested clear for.



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## CLEAR CONDITIONS

- MDR1 Drug Sensitivity (MDR1) (Chromosome 14)
- P2Y12 Receptor Platelet Disorder (P2RY12) (Chromosome 23)
- Factor IX Deficiency, Hemophilia B (F9 Exon 7, Terrier Variant) (Chromosome X)
- Factor IX Deficiency, Hemophilia B (F9 Exon 7, Rhodesian Ridgeback Variant) (Chromosome X)
- Factor VII Deficiency (F7 Exon 5) (Chromosome 22)
- Factor VIII Deficiency, Hemophilia A (F8 Exon 10, Boxer Variant) (Chromosome X)
- Factor VIII Deficiency, Hemophilia A (F8 Exon 11, Shepherd Variant 1) (Chromosome X)
- Factor VIII Deficiency, Hemophilia A (F8 Exon 1, Shepherd Variant 2) (Chromosome X)
- Thrombopathia (RASGRP2 Exon 5, Basset Hound Variant) (Chromosome 18)
- Thrombopathia (RASGRP2 Exon 8) (Chromosome 18)
- Thrombopathia (RASGRP2 Exon 5, American Eskimo Dog Variant) (Chromosome 18)
- Von Willebrand Disease Type III, Type III vWD (VWF Exon 4) (Chromosome 27)
- Von Willebrand Disease Type I (VWF) (Chromosome 27)
- Von Willebrand Disease Type II, Type II vWD (VWF) (Chromosome 27)
- Canine Leukocyte Adhesion Deficiency Type III, LAD3 (FERMT3) (Chromosome 18)
- Congenital Macrothrombocytopenia (TUBB1 Exon 1, Cavalier King Charles Spaniel Variant) (Chromosome 24)
- Canine Elliptocytosis (SPTB Exon 30) (Chromosome 8)
- Glanzmann's Thrombasthenia Type I (ITGA2B Exon 12) (Chromosome 9)
- May-Hegglin Anomaly (MYH9) (Chromosome 10)
- Prekallikrein Deficiency (KLKB1 Exon 8) (Chromosome 16)
- Pyruvate Kinase Deficiency (PKLR Exon 5) (Chromosome 7)
- Pyruvate Kinase Deficiency (PKLR Exon 7 Labrador Variant) (Chromosome 7)
- Pyruvate Kinase Deficiency (PKLR Exon 7 Pug Variant) (Chromosome 7)
- Pyruvate Kinase Deficiency (PKLR Exon 7 Beagle Variant) (Chromosome 7)
- Pyruvate Kinase Deficiency (PKLR Exon 10) (Chromosome 7)
- Trapped Neutrophil Syndrome (VPS13B) (Chromosome 13)
- Ligneous Membranitis, LM (PLG) (Chromosome 1)
- Congenital Hypothyroidism (TPO, Tenterfield Terrier Variant) (Chromosome 17)
- Complement 3 Deficiency, C3 Deficiency (C3) (Chromosome 20)
- Severe Combined Immunodeficiency (PRKDC) (Chromosome 29)
- Severe Combined Immunodeficiency (RAG1) (Chromosome 18)
- X-linked Severe Combined Immunodeficiency (IL2RG Variant 1) (Chromosome X)
- X-linked Severe Combined Immunodeficiency (IL2RG Variant 2) (Chromosome X)
- Progressive Retinal Atrophy, rcd1 Rod-cone dysplasia, rcd1 (PDE6B Exon 21 Irish Setter Variant) (Chromosome 3)
- Progressive Retinal Atrophy, rcd3 Rod-cone dysplasia, rcd3 (PDE6A) (Chromosome 4)
- Progressive Retinal Atrophy, CNGA (CNGA1 Exon 9) (Chromosome 13)
- Progressive Retinal Atrophy, prcd Progressive rod-cone degeneration (PRCD Exon 1) (Chromosome 9)
- Progressive Retinal Atrophy (CNGB1) (Chromosome 2)

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# "KNIFE"

## LANN MORIAN KNIFE



DNA Test Report

Test Date: May 19th, 2019

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## CLEAR CONDITIONS

- Progressive Retinal Atrophy (SAG) (Chromosome 25)
- Golden Retriever Progressive Retinal Atrophy 1, GR-PRA1 (SLC4A3) (Chromosome 37)
- Golden Retriever Progressive Retinal Atrophy 2, GR-PRA2 (TTC8) (Chromosome 8)
- Progressive Retinal Atrophy, crd1 (PDE6B) (Chromosome 3)
- Progressive Retinal Atrophy, crd2 (IQCB1) (Chromosome 33)
- Progressive Retinal Atrophy - crd4/crd1 (RPGRIP1) (Chromosome 15)
- Collie Eye Anomaly, Choroidal Hypoplasia, CEA (NHEJ1) (Chromosome 37)
- Achromatopsia (CNGA3 Exon 7 German Shepherd Variant) (Chromosome 10)
- Achromatopsia (CNGA3 Exon 7 Labrador Retriever Variant) (Chromosome 10)
- Autosomal Dominant Progressive Retinal Atrophy (RHO) (Chromosome 20)
- Canine Multifocal Retinopathy cmr1 (BEST1 Exon 2) (Chromosome 18)
- Canine Multifocal Retinopathy cmr2 (BEST1 Exon 5) (Chromosome 18)
- Canine Multifocal Retinopathy cmr3 (BEST1 Exon 10 Deletion) (Chromosome 18)
- Canine Multifocal Retinopathy cmr3 (BEST1 Exon 10 SNP) (Chromosome 18)
- Glaucoma Primary Open Angle Glaucoma (ADAMTS10 Exon 9) (Chromosome 20)
- Glaucoma Primary Open Angle Glaucoma (ADAMTS10 Exon 17) (Chromosome 20)
- Glaucoma Primary Open Angle Glaucoma (ADAMTS17 Exon 11) (Chromosome 3)
- Glaucoma Primary Open Angle Glaucoma (ADAMTS17 Exon 2) (Chromosome 3)
- Hereditary Cataracts, Early-Onset Cataracts, Juvenile Cataracts (HSF4 Exon 9 Shepherd Variant) (Chromosome 5)
- Primary Lens Luxation (ADAMTS17) (Chromosome 3)
- Congenital Stationary Night Blindness (RPE65) (Chromosome 6)
- 2,8-Dihydroxyadenine Urolithiasis, 2,8-DHA Urolithiasis (APRT) (Chromosome 5)
- Cystinuria Type I-A (SLC3A1) (Chromosome 10)
- Cystinuria Type II-A (SLC3A1) (Chromosome 10)
- Cystinuria Type II-B (SLC7A9) (Chromosome 1)
- Hyperuricosuria and Hyperuricemia or Urolithiasis, HUU (SLC2A9) (Chromosome 3)
- Polycystic Kidney Disease, PKD (PKD1) (Chromosome 6)
- Primary Hyperoxaluria (AGXT) (Chromosome 25)
- Protein Losing Nephropathy, PLN (NPHS1) (Chromosome 1)
- X-Linked Hereditary Nephropathy, XLHN (COL4A5 Exon 35, Samoyed Variant 2) (Chromosome X)
- Autosomal Recessive Hereditary Nephropathy, Familial Nephropathy, ARHN (COL4A4 Exon 3) (Chromosome 25)
- Primary Ciliary Dyskinesia, PCD (CCDC39 Exon 3) (Chromosome 34)
- Congenital Keratoconjunctivitis Sicca and Ichthyosiform Dermatitis, Dry Eye Curly Coat Syndrome, CKCSID (FAM83H Exon 5) (Chromosome 13)
- X-linked Ectodermal Dysplasia, Anhidrotic Ectodermal Dysplasia (EDA Intron 8) (Chromosome X)
- Renal Cystadenocarcinoma and Nodular Dermatofibrosis, RCND (FLCN Exon 7) (Chromosome 5)
- Canine Fucosidosis (FUCA1) (Chromosome 2)
- Glycogen Storage Disease Type II, Pompe's Disease, GSD II (GAA) (Chromosome 9)
- Glycogen Storage Disease Type IA, Von Gierke Disease, GSD IA (G6PC) (Chromosome 9)

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## CLEAR CONDITIONS

- Glycogen Storage Disease Type IIIA, GSD IIIA (AGL) (Chromosome 6)
- Mucopolysaccharidosis Type I, MPS I (IDUA) (Chromosome 3)
- Mucopolysaccharidosis Type IIIA, Sanfilippo Syndrome Type A, MPS IIIA (SGSH Exon 6 Variant 1) (Chromosome 9)
- Mucopolysaccharidosis Type IIIA, Sanfilippo Syndrome Type A, MPS IIIA (SGSH Exon 6 Variant 2) (Chromosome 9)
- Mucopolysaccharidosis Type VII, Sly Syndrome, MPS VII (GUSB Exon 5) (Chromosome 6)
- Glycogen storage disease Type VII, Phosphofructokinase Deficiency, PFK Deficiency (PFKM Whippet and English Springer Spaniel Variant) (Chromosome 27)
- Glycogen storage disease Type VII, Phosphofructokinase Deficiency, PFK Deficiency (PFKM Wachtelhund Variant) (Chromosome 27)
- Lagotto Storage Disease (ATG4D) (Chromosome 20)
- Neuronal Ceroid Lipofuscinosis 1, NCL 1 (PPT1 Exon 8) (Chromosome 15)
- Neuronal Ceroid Lipofuscinosis 2, NCL 2 (TPP1 Exon 4) (Chromosome 21)
- Neuronal Ceroid Lipofuscinosis 1, Cerebellar Ataxia, NCL-A (ARSG Exon 2) (Chromosome 9)
- Neuronal Ceroid Lipofuscinosis 1, NCL 1 (CLN5 Border Collie Variant) (Chromosome 22)
- Neuronal Ceroid Lipofuscinosis 6, NCL 6 (CLN6 Exon 7) (Chromosome 30)
- Neuronal Ceroid Lipofuscinosis 8, NCL 8 (CLN8 English Setter Variant) (Chromosome 37)
- Neuronal Ceroid Lipofuscinosis (MFSD8) (Chromosome 19)
- Neuronal Ceroid Lipofuscinosis (CLN8 Australian Shepherd Variant) (Chromosome 37)
- Neuronal Ceroid Lipofuscinosis 10, NCL 10 (CTSD Exon 5) (Chromosome 18)
- Neuronal Ceroid Lipofuscinosis (CLN5 Golden Retriever Variant) (Chromosome 22)
- Adult-Onset Neuronal Ceroid Lipofuscinosis (ATP13A2, Tibetan Terrier Variant) (Chromosome 2)
- GM1 Gangliosidosis (GLB1 Exon 15 Shiba Inu Variant) (Chromosome 23)
- GM1 Gangliosidosis (GLB1 Exon 15 Alaskan Husky Variant) (Chromosome 23)
- GM1 Gangliosidosis (GLB1 Exon 2) (Chromosome 23)
- GM2 Gangliosidosis (HEXB, Poodle Variant) (Chromosome 2)
- GM2 Gangliosidosis (HEXA) (Chromosome 30)
- Globoid Cell Leukodystrophy, Krabbe disease (GALC Exon 5) (Chromosome 8)
- Autosomal Recessive Amelogenesis Imperfecta, Familial Enamel Hypoplasia (Italian Greyhound Variant) (Chromosome 13)
- Persistent Mullerian Duct Syndrome, PMDS (AMHR2) (Chromosome 27)
- Deafness and Vestibular Syndrome of Dobermans, DVDob, DINGS (MYO7A) (Chromosome 21)
- Shar-Pei Autoinflammatory Disease, SPAID, Shar-Pei Fever (MTBP) (Chromosome 13)
- Alaskan Husky Encephalopathy, Subacute Necrotizing Encephalomyelopathy (SLC19A3) (Chromosome 25)
- Alexander Disease (GFAP) (Chromosome 9)
- Cerebellar Abiotrophy, Neonatal Cerebellar Cortical Degeneration, NCCD (SPTBN2) (Chromosome 18)
- Cerebellar Ataxia, Progressive Early-Onset Cerebellar Ataxia (SEL1L) (Chromosome 8)
- Cerebellar Hypoplasia (VLDLR) (Chromosome 1)
- Spinocerebellar Ataxia, Late-Onset Ataxia, LoSCA (CAPN1) (Chromosome 18)
- Spinocerebellar Ataxia with Myokymia and/or Seizures (KCNJ10) (Chromosome 38)
- Benign Familial Juvenile Epilepsy, Remitting Focal Epilepsy (LGI2) (Chromosome 3)
- Degenerative Myelopathy, DM (SOD1A) (Chromosome 31)

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## CLEAR CONDITIONS

- Fetal-Onset Neonatal Neuroaxonal Dystrophy (MFN2) (Chromosome 2)
- Hypomyelination and Tremors (FNIP2) (Chromosome 15)
- Shaking Puppy Syndrome, X-linked Generalized Tremor Syndrome (PLP) (Chromosome X)
- Neuroaxonal Dystrophy, NAD (Spanish Water Dog Variant) (Chromosome 8)
- L-2-Hydroxyglutaricaciduria, L2HGA (L2HGDH) (Chromosome 0)
- Neonatal Encephalopathy with Seizures, NEWS (ATF2) (Chromosome 36)
- Polyneuropathy, NDRG1 Greyhound Variant (NDRG1 Exon 15) (Chromosome 13)
- Polyneuropathy, NDRG1 Malamute Variant (NDRG1 Exon 4) (Chromosome 13)
- Narcolepsy (HCRTR2 Intron 6) (Chromosome 12)
- Progressive Neuronal Abiotrophy, Canine Multiple System Degeneration, CMSD (SERAC1 Exon 15) (Chromosome 1)
- Progressive Neuronal Abiotrophy, Canine Multiple System Degeneration, CMSD (SERAC1 Exon 4) (Chromosome 1)
- Juvenile Laryngeal Paralysis and Polyneuropathy, Polyneuropathy with Ocular Abnormalities and Neuronal Vacuolation, POANV (RAB3GAP1, Rottweiler Variant) (Chromosome 19)
- Hereditary Sensory Autonomic Neuropathy, Acral Mutilation Syndrome, AMS (GDNF-AS) (Chromosome 4)
- Juvenile-Onset Polyneuropathy, Leonberger Polyneuropathy 1, LPN1 (LPN1, ARHGEF10) (Chromosome 16)
- Dilated Cardiomyopathy, DCM1 (PDK4) (Chromosome 14)
- Dilated Cardiomyopathy, DCM2 (TTN) (Chromosome 36)
- Long QT Syndrome (KCNQ1) (Chromosome 18)
- Muscular Dystrophy Cavalier King Charles Spaniel Variant 1 (Chromosome X)
- Muscular Dystrophy Muscular Dystrophy (DMD Pembroke Welsh Corgi Variant) (Chromosome X)
- Muscular Dystrophy Muscular Dystrophy (DMD Golden Retriever Variant) (Chromosome X)
- Centronuclear Myopathy (PTPLA) (Chromosome 2)
- Exercise-Induced Collapse (DNM1) (Chromosome 9)
- Inherited Myopathy of Great Danes (BIN1) (Chromosome 19)
- Myostatin Deficiency, Bully Whippet Syndrome (MSTN) (Chromosome 37)
- Myotonia Congenita (CLCN1 Exon 7) (Chromosome 16)
- Myotonia Congenita (CLCN1 Exon 23) (Chromosome 16)
- Myotubular Myopathy 1, X-linked Myotubular Myopathy, XL-MTM (MTM1, Labrador Variant) (Chromosome X)
- Hypocatalasia, Acatlasemia (CAT) (Chromosome 18)
- Pyruvate Dehydrogenase Deficiency (PDP1) (Chromosome 29)
- Malignant Hyperthermia (RYR1) (Chromosome 1)
- Imerslund-Grasbeck Syndrome, Selective Cobalamin Malabsorption (CUBN Exon 53) (Chromosome 2)
- Imerslund-Grasbeck Syndrome, Selective Cobalamin Malabsorption (CUBN Exon 8) (Chromosome 2)
- Congenital Myasthenic Syndrome (CHAT) (Chromosome 28)
- Congenital Myasthenic Syndrome (COLQ) (Chromosome 23)
- Episodic Falling Syndrome (BCAN) (Chromosome 7)
- Dystrophic Epidermolysis Bullosa (COL7A1) (Chromosome 20)
- Ectodermal Dysplasia, Skin Fragility Syndrome (PKP1) (Chromosome 7)
- Ichthyosis, Epidermolytic Hyperkeratosis (KRT10) (Chromosome 9)

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## CLEAR CONDITIONS

- Ichthyosis (PNPLA1) (Chromosome 12)
- Ichthyosis (SLC27A4) (Chromosome 9)
- Ichthyosis (NIPAL4) (Chromosome 4)
- Focal Non-Epidermolytic Palmoplantar Keratoderma, Pachyonychia Congenita (KRT16) (Chromosome 9)
- Hereditary Footpad Hyperkeratosis (FAM83G) (Chromosome 5)
- Hereditary Nasal Parakeratosis (SUV39H2) (Chromosome 2)
- Musladin-Lueke Syndrome (ADAMTSL2) (Chromosome 9)
- Cleft Lip and/or Cleft Palate (ADAMTS20) (Chromosome 27)
- Hereditary Vitamin D-Resistant Rickets (VDR) (Chromosome 27)
- Oculoskeletal Dysplasia 1, Dwarfism-Retinal Dysplasia, OSD1 (COL9A3, Labrador Retriever) (Chromosome 24)
- Osteogenesis Imperfecta, Brittle Bone Disease (COL1A2) (Chromosome 14)
- Osteogenesis Imperfecta, Brittle Bone Disease (SERPINH1) (Chromosome 21)
- Osteogenesis Imperfecta, Brittle Bone Disease (COL1A1) (Chromosome 9)
- Osteochondrodysplasia, Skeletal Dwarfism (SLC13A1) (Chromosome 14)
- Skeletal Dysplasia 2, SD2 (COL11A2) (Chromosome 12)
- Craniomandibular Osteopathy, CMO (SLC37A2) (Chromosome 5)
- Chondrodystrophy and Intervertebral Disc Disease, CDDY/IVDD, Type I IVDD (FGF4 retrogene - CFA12) (Chromosome 12)
- Chondrodystrophy, Norwegian Elkhound and Karelian Bear Dog Variant (ITGA10) (Chromosome 17)

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