



BREED MIX

Australian Shepherd : 100.0%

GENETIC STATS

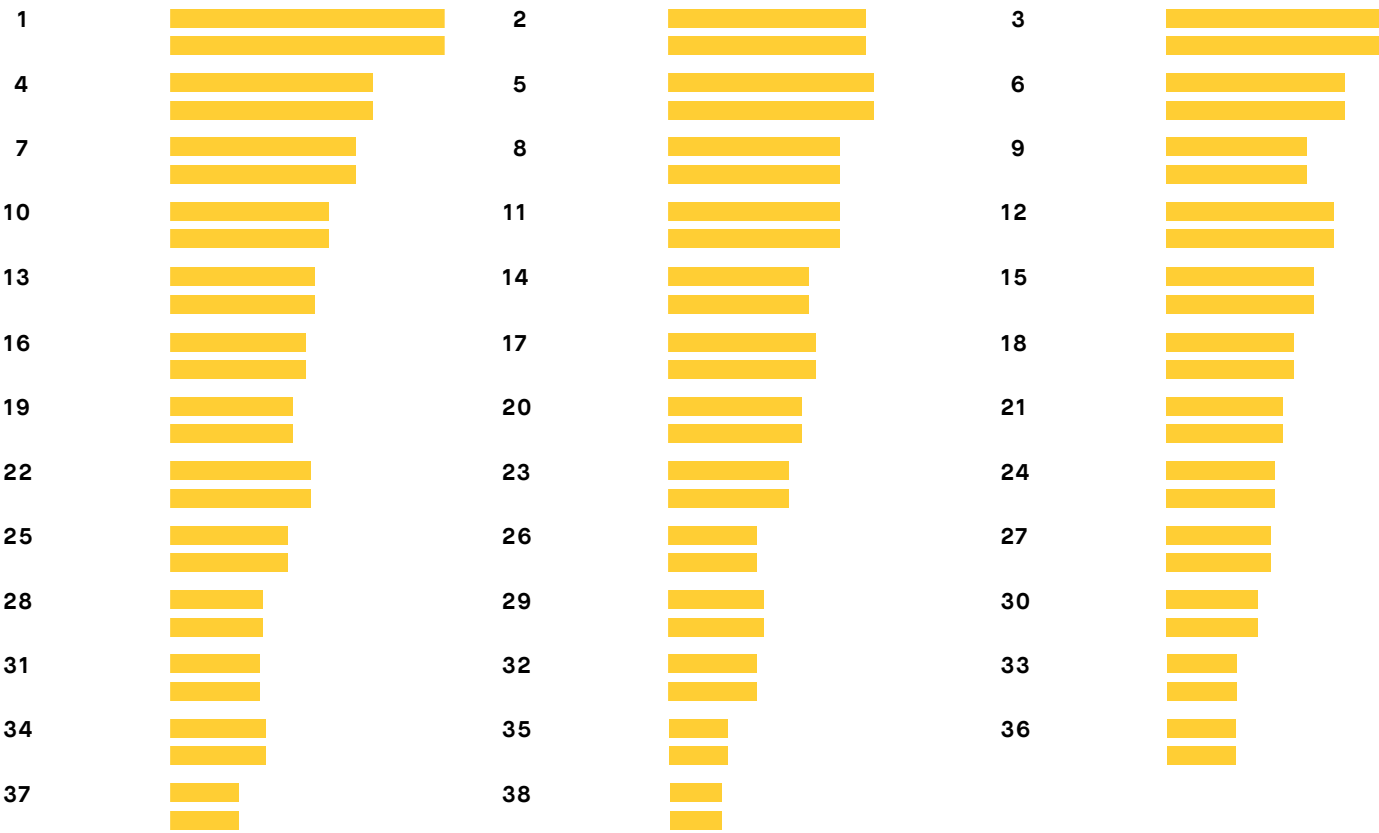
Predicted adult weight: **64 lbs**
Genetic age: **26 human years**
Based on the date of birth you provided

TEST DETAILS

Kit number: EM-7731950
Swab number: 31001809350228

BREED MIX BY CHROMOSOME

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





AUSTRALIAN SHEPHERD



Fun Fact

Australian Shepherds rose to popularity and fame as rodeo stars. After the first World War, people flocked to the west and to watch exhibitions that showcased these very talented canines.

The Australian Shepherd, or Aussie, is the 17th most popular dog in the United States, and given their intelligence and temperament, it's no wonder they're so well-loved. Despite their name, the Australian Shepherd actually originated from the ranches of the United States around the 1800s. They are praised by stockmen and breeders for their trainability and intelligence. They have a medium build and a wide variation of different coat colors. Australian Shepherds have considerable energy and they usually need a job to do to keep themselves entertained, though they're also happy to spend time with the family and settle down at the end of the day. Australian Shepherds are often employed as guide dogs, rescue dogs, and therapy dogs. In addition to exercising an Aussie, it's equally important to keep their mind occupied, as if an Australian Shepherd gets bored they do have the tendency to invent their own games or activities, which sometimes involve destructive behaviors. This is a breed that thrives on close companionship. Aussies are at times called "Velcro Dogs" for their tendency to stay close to their owner.

RELATED BREEDS



Miniature/MAS-type Australian Shepherd
Sibling breed



Collie
Sibling breed



Shetland Sheepdog
Sibling breed



Border Collie
Sibling breed



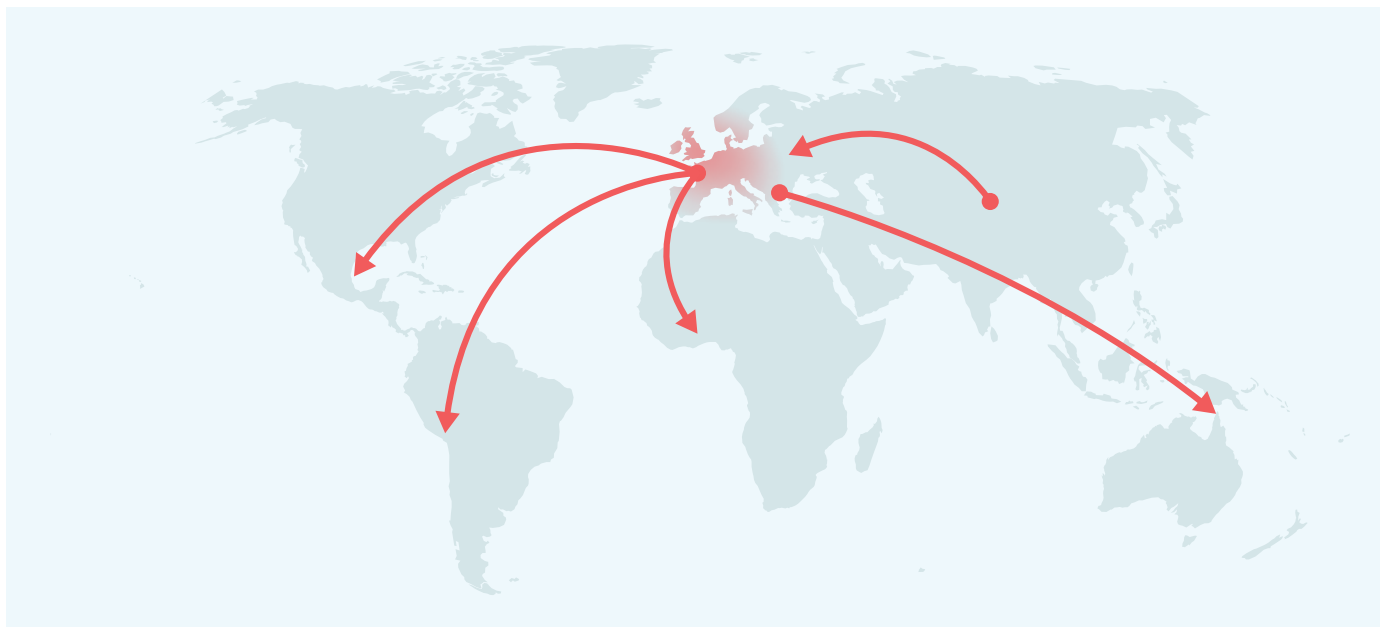
Pembroke Welsh Corgi
Cousin breed



Cardigan Welsh Corgi
Cousin breed



MATERNAL LINE



Through Memphis'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: A1a

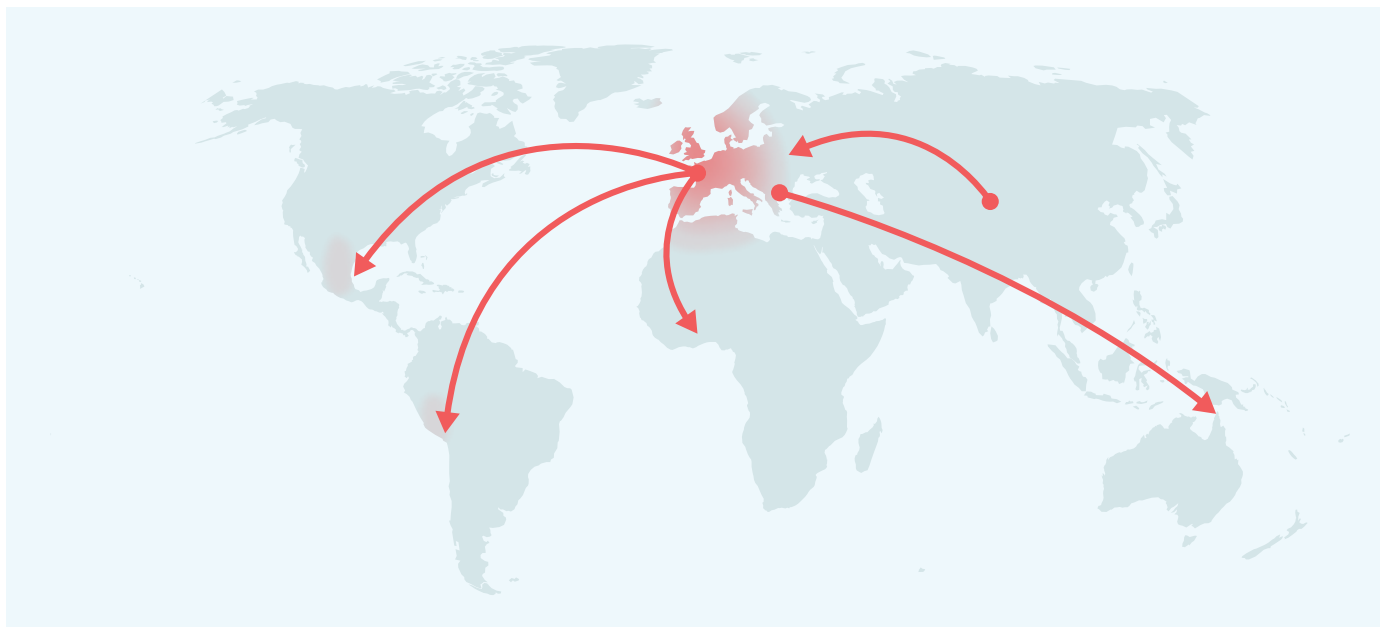
A1a is the most common maternal lineage among Western dogs. This lineage traveled from the site of dog domestication in Central Asia to Europe along with an early dog expansion perhaps 10,000 years ago. It hung around in European village dogs for many millennia. Then, about 300 years ago, some of the prized females in the line were chosen as the founding dogs for several dog breeds. That set in motion a huge expansion of this lineage. It's now the maternal lineage of the overwhelming majority of Mastiffs, Labrador Retrievers and Gordon Setters. About half of Boxers and less than half of Shar-Pei dogs descend from the A1a line. It is also common across the world among village dogs, a legacy of European colonialism.

HAPLOTYPE: A388

Part of the large A1a haplogroup, this haplotype occurs most frequently in Staffordshire Terriers, Labrador Retrievers, and English Bulldogs.



PATERNAL LINE



Through Memphis'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.15

Part of the large A1a haplogroup, this haplotype is found in village dogs from across the globe (outside of Asia). As for breeds, it is primarily seen in German Shepherds, Labrador Retrievers, Nova Scotia Duck Tolling Retriever. It is by far the most common haplotype in German Shepherds.



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 (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 **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)

The K Locus **K^B** allele "overrides" the A Locus, meaning that it prevents the A Locus genotype from affecting coat color. For this reason, the **K^B** allele is referred to as the "dominant black" allele. As a result, dogs with at least one **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 **k^Yk^Y** genotype will show a coat color pattern based on the genotype they have at the A Locus. Dogs who test as **K^Bk^Y** may be brindle rather than black or brown.

Not expressed (k^Yk^Y)

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 **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.

Not expressed (a^ta^t)



TRAITS: COAT COLOR (CONTINUED)

TRAIT

RESULT

D Locus (MLPH)

Dogs with two copies of the **d** 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 **d** allele will not be dilute, but can pass the **d** allele on to their puppies.

Not expressed (Dd)

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".

Likely black colored nose/feet (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 (II)



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 "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.

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.

One merle allele, not expressed in coat (M*m)

Note: This locus includes several alleles. At the time this dog was genotyped Embark we could not distinguish all of the possible alleles.



TRAITS: OTHER COAT TRAITS

TRAIT

RESULT

Furnishings (RSP02) 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 long coat (TT)

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 RSP02 (the furnishings gene) tend to be low shedders regardless of their genotype at this gene.

Likely heavy/seasonal shedding (CC)

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 (RSP02) 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)

Hairlessness (SGK3)

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)



MEMPHIS



DNA Test Report

Test Date: September 21st, 2019

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TRAITS: OTHER COAT TRAITS (CONTINUED)

TRAIT

RESULT

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)

Oculocutaneous Albinism Type 2 (SLC45A2) LINKAGE

Dogs with two copies **DD** 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 **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)



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 TT 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)



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DNA Test Report

Test Date: September 21st, 2019

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TRAITS: BODY SIZE

TRAIT	RESULT
Body Size (IGF1) The I allele is associated with smaller body size.	Larger (NN)
Body Size (IGFR1) The A allele is associated with smaller body size.	Larger (GG)
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.	Larger (GG)
Body Size (GHR - P177L) The T allele is associated with smaller body size.	Larger (CC)



MEMPHIS



DNA Test Report

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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)



MEMPHIS



DNA Test Report

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embk.me/memphis20

TRAITS: GENETIC DIVERSITY

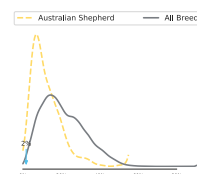
TRAIT

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.

2%

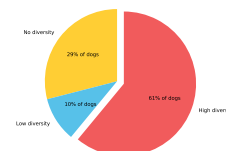


MHC Class II - DLA DRB1

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:

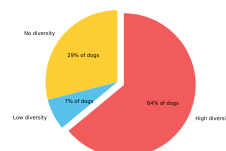


MHC Class II - DLA DQA1 and DQB1

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:





MEMPHIS



DNA Test Report

Test Date: September 21st, 2019

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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)

Memphis's baseline ALT level is Low Normal

Why is this important to your vet?

Memphis has one copy of a variant associated with reduced ALT activity as measured on veterinary blood chemistry panels. Please inform your veterinarian that Memphis has this genotype, as ALT is often used as an indicator of liver health and Memphis is likely to have a lower than average resting ALT activity. As such, an increase in Memphis's 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?

The liver enzyme alanine aminotransferase, or ALT, is one of several values your veterinarian measures on routine blood work to gauge liver health.

How vets diagnose this condition

Genetic testing is the only way to know if your dog has this clinical condition.

How this condition is treated

No treatment is necessary! 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.



MEMPHIS



DNA Test Report

Test Date: September 21st, 2019

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HEALTH REPORT

How to interpret Memphis's genetic health results:

If Memphis 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 Memphis 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.



Memphis is at increased risk for one genetic health condition.



MEMPHIS



DNA Test Report

Test Date: September 21st, 2019

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HEALTH REPORT

MDR1 Drug Sensitivity (MDR1)

How to interpret this result

Memphis has one copy of a variant at the MDR1 gene and is at risk for displaying adverse drug reactions. While he may not be as severely affected as a dog with two copies of the MDR1 drug sensitivity allele, normal dosages of drugs could still have potentially severe effects on Memphis. Please inform your veterinarian that Memphis carries this variant; it is essential that they know this information before prescribing drugs.

What is MDR1 Drug Sensitivity?

Sensitivity to certain classes of drugs, notably the parasiticide ivermectin, as well as certain gastroprotectant and anti-cancer medications, occurs in dogs with mutations in the MDR1 gene.

When signs & symptoms develop in affected dogs

Symptoms arise after a dog has received an MDR1 problem drug or dosage, and can range from vomiting and diarrhea to lethargy, seizures, or coma.

Signs & symptoms

MDR1 often presents in young adulthood, only because this is most commonly when a dog is first exposed to a problem drug like high dose ivermectin or acepromazine.

How vets diagnose this condition

This is usually a retroactive diagnosis after a dog has an adverse reaction to a problem drug--however, genetic testing could help you avoid a first reaction altogether.

How this condition is treated

MDR1 is perfectly avoidable simply by avoiding the problem drugs, or problem dosages.

Actions to take if your dog is affected

Review the MDR1 Problem Drug List as described by Washington State University and notify your veterinarian to flag this in your dog's file! Farm dogs with MDR1 may also benefit if they are either kept away from herds where ivermectin is used as a routine antiparasitic, or if another form of antiparasitic is used in areas that they are working.



MEMPHIS



DNA Test Report

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BREED-RELEVANT CONDITIONS TESTED



Memphis did not have the variants that we tested for, that are relevant to his breed:

- ✓ Progressive Retinal Atrophy, prcd (PRCD Exon 1)
- ✓ Collie Eye Anomaly, Choroidal Hypoplasia, CEA (NHEJ1)
- ✓ Canine Multifocal Retinopathy (BEST1 Exon 2)
- ✓ Hereditary Cataracts, Early-Onset Cataracts, Juvenile Cataracts (HSF4 Exon 9 Shepherd Variant)
- ✓ Hyperuricosuria and Hyperuricemia or Urolithiasis, HUU (SLC2A9)
- ✓ Neuronal Ceroid Lipofuscinosis 6, NCL 6 (CLN6 Exon 7)
- ✓ Neuronal Ceroid Lipofuscinosis (CLN8 Australian Shepherd Variant)
- ✓ Craniomandibular Osteopathy, CMO (SLC37A2)



ADDITIONAL CONDITIONS TESTED



Memphis did not have the variants that we tested for, in the following conditions that the potential effect on dogs with Memphis's breed may not yet be known.

- ✓ P2Y12 Receptor Platelet Disorder (P2RY12)
- ✓ 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 (RASGRP2 Exon 5, Basset Hound Variant)
- ✓ Thrombopathia (RASGRP2 Exon 8)
- ✓ Thrombopathia (RASGRP2 Exon 5, American Eskimo Dog Variant)
- ✓ Von Willebrand Disease Type III, Type III vWD (VWF Exon 4)
- ✓ Von Willebrand Disease Type I (VWF)
- ✓ Von Willebrand Disease Type II, Type II vWD (VWF)
- ✓ Canine Leukocyte Adhesion Deficiency Type III, CLAD3 (FERMT3)
- ✓ Congenital Macrothrombocytopenia (TUBB1 Exon 1, Cavalier King Charles Spaniel Variant)
- ✓ Canine Elliptocytosis (SPTB Exon 30)
- ✓ 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 Labrador Variant)
- ✓ Pyruvate Kinase Deficiency (PKLR Exon 7 Pug Variant)
- ✓ Pyruvate Kinase Deficiency (PKLR Exon 7 Beagle Variant)
- ✓ Pyruvate Kinase Deficiency (PKLR Exon 10)



ADDITIONAL CONDITIONS TESTED

- ✓ Ligneous Membranitis, LM (PLG)
- ✓ Congenital Hypothyroidism (TPO, Tenterfield 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)
- ✓ Golden Retriever Progressive Retinal Atrophy 2, GR-PRA2 (TTC8)
- ✓ Progressive Retinal Atrophy, crd1 (PDE6B)
- ✓ Progressive Retinal Atrophy, crd2 (IQCB1)
- ✓ Progressive Retinal Atrophy - crd4/cord1 (RPGRIP1)
- ✓ Achromatopsia (CNGA3 Exon 7 German Shepherd Variant)
- ✓ Achromatopsia (CNGA3 Exon 7 Labrador Retriever Variant)
- ✓ Autosomal Dominant Progressive Retinal Atrophy (RHO)
- ✓ Canine Multifocal Retinopathy (BEST1 Exon 5)
- ✓ Canine Multifocal Retinopathy (BEST1 Exon 10 Deletion)
- ✓ Canine Multifocal Retinopathy (BEST1 Exon 10 SNP)
- ✓ Glaucoma (ADAMTS10 Exon 9)
- ✓ Glaucoma (ADAMTS10 Exon 17)



ADDITIONAL CONDITIONS TESTED

- ✓ Glaucoma (ADAMTS17 Exon 11)
- ✓ Glaucoma (ADAMTS17 Exon 2)
- ✓ Primary Lens Luxation (ADAMTS17)
- ✓ Congenital Stationary Night Blindness (RPE65)
- ✓ Macular Corneal Dystrophy, MCD (CHST6)
- ✓ 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)
- ✓ Autosomal Recessive Hereditary Nephropathy, Familial Nephropathy, ARHN (COL4A4 Exon 3)
- ✓ Primary Ciliary Dyskinesia, PCD (CCDC39 Exon 3)
- ✓ Congenital Keratoconjunctivitis Sicca and Ichthyosiform Dermatitis, 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)
- ✓ 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 I, MPS I (IDUA)
- ✓ 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)



ADDITIONAL CONDITIONS TESTED

- ✓ 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 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)
- ✓ 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 8, NCL 8 (CLN8 English Setter Variant)
- ✓ Neuronal Ceroid Lipofuscinosis (MFSD8)
- ✓ 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)
- ✓ GM1 Gangliosidosis (GLB1 Exon 15 Shiba Inu Variant)
- ✓ GM1 Gangliosidosis (GLB1 Exon 15 Alaskan Husky Variant)
- ✓ GM1 Gangliosidosis (GLB1 Exon 2)
- ✓ GM2 Gangliosidosis (HEXB, Poodle Variant)
- ✓ GM2 Gangliosidosis (HEXA)
- ✓ Globoid Cell Leukodystrophy, Krabbe disease (GALC Exon 5)
- ✓ Autosomal Recessive Amelogenesis Imperfecta, Familial Enamel Hypoplasia (Italian Greyhound 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)
- ✓ Alaskan Husky Encephalopathy, Subacute Necrotizing Encephalomyelopathy (SLC19A3)



ADDITIONAL CONDITIONS TESTED

- ✓ Alexander Disease (GFAP)
- ✓ 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)
- ✓ Benign Familial Juvenile Epilepsy, Remitting Focal Epilepsy (LG12)
- ✓ Degenerative Myelopathy, DM (SOD1A)
- ✓ 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)
- ✓ L-2-Hydroxyglutaricaciduria, L2HGA (L2HGDH)
- ✓ Neonatal Encephalopathy with Seizures, NEWS (ATF2)
- ✓ Polyneuropathy, NDRG1 Greyhound Variant (NDRG1 Exon 15)
- ✓ Polyneuropathy, NDRG1 Malamute Variant (NDRG1 Exon 4)
- ✓ Narcolepsy (HCRTR2 Intron 6)
- ✓ Progressive Neuronal Abiotrophy, Canine Multiple System Degeneration, CMSD (SERAC1 Exon 15)
- ✓ Progressive Neuronal Abiotrophy, Canine Multiple System Degeneration, CMSD (SERAC1 Exon 4)
- ✓ 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)
- ✓ Juvenile-Onset Polyneuropathy, Leonberger Polyneuropathy 1, LPN1 (LPN1, ARHGEF10)
- ✓ Spongy Degeneration with Cerebellar Ataxia 1, SDCA1, SeSAME/EAST Syndrome (KCNJ10)
- ✓ Spongy Degeneration with Cerebellar Ataxia 2, SDCA2 (ATP1B2)
- ✓ Dilated Cardiomyopathy, DCM1 (PDK4)



ADDITIONAL CONDITIONS TESTED

- ✓ Dilated Cardiomyopathy, DCM2 (TTN)
- ✓ Long QT Syndrome (KCNQ1)
- ✓ Muscular Dystrophy (DMD, Cavalier King Charles Spaniel Variant 1)
- ✓ Muscular Dystrophy (DMD Pembroke Welsh Corgi Variant)
- ✓ Muscular Dystrophy (DMD Golden Retriever Variant)
- ✓ Centronuclear Myopathy (PTPLA)
- ✓ Exercise-Induced Collapse (DNM1)
- ✓ Inherited Myopathy of Great Danes (BIN1)
- ✓ Myostatin Deficiency, Bully Whippet Syndrome (MSTN)
- ✓ Myotonia Congenita (CLCN1 Exon 7)
- ✓ Myotonia Congenita (CLCN1 Exon 23)
- ✓ Myotubular Myopathy 1, X-linked Myotubular Myopathy, XL-MTM (MTM1, Labrador Variant)
- ✓ 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)
- ✓ Congenital Myasthenic Syndrome (CHAT)
- ✓ Congenital Myasthenic Syndrome (COLQ)
- ✓ Episodic Falling Syndrome (BCAN)
- ✓ Dystrophic Epidermolysis Bullosa (COL7A1)
- ✓ Ectodermal Dysplasia, Skin Fragility Syndrome (PKP1)
- ✓ Ichthyosis, Epidermolytic Hyperkeratosis (KRT10)
- ✓ Ichthyosis (PNPLA1)
- ✓ Ichthyosis (SLC27A4)



MEMPHIS



DNA Test Report

Test Date: September 21st, 2019

embk.me/memphis20

ADDITIONAL CONDITIONS TESTED

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