



Results for:

ELLIE

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21 MARCH 2017

INSIDE THIS REPORT

We have successfully processed the blood sample for Ellie and summarized our findings in this report. Inside, you will find information about your dog's specific genetic markers as well as insights into what kind of breeds make up your dog's ancestry.

Your veterinarian will be able to give you more insight into how these findings impact your dog's health and wellness. Use this report to work closely with your veterinarian to develop an individual health plan.

THIS REPORT INCLUDES:

Genealogy Findings

Breed Characteristics

Genetic Markers / MDR1

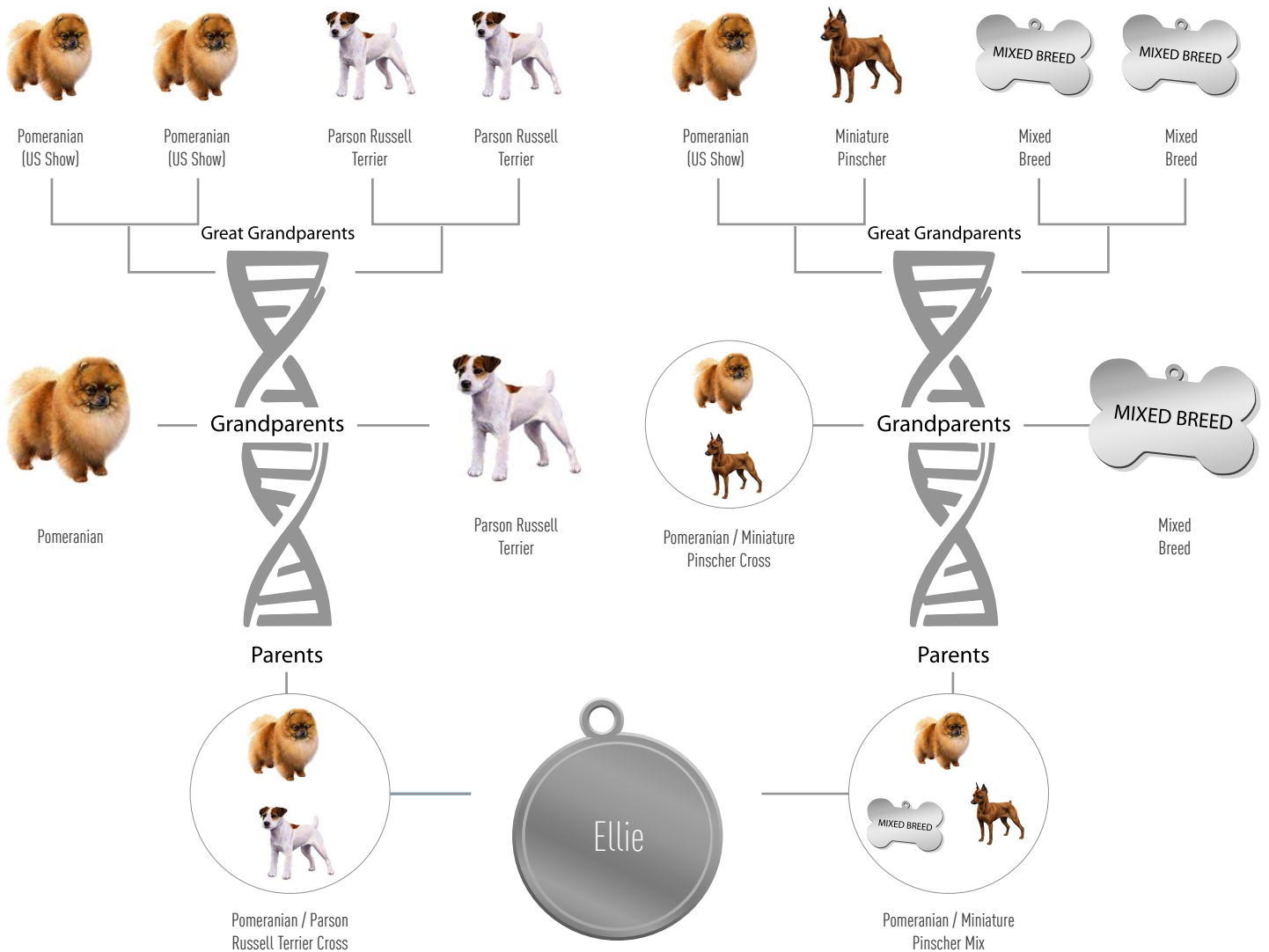
Nutritional Considerations

Genetic Ancestry Certification

GENEALOGY FINDINGS

What breeds make up Ellie?

The ROYAL CANIN® Genetic Health Analysis™ completed over seven million iterations and has typed over 10,000 dogs to determine the most likely combination of breeds that best fit the DNA marker pattern observed in your dog, going back three generations.



ELLIE

GENEALOGY FINDINGS



What does the Mixed-Breed Ancestry mean for Ellie?

A portion of Ellie's ancestry was predicted to be mixed beyond three generations. It is difficult to identify strong breed signals in this mixed portion, so we have listed the genetic breed groups with the strongest statistical likelihood below. The genetic breed groups are listed by the relative strength with the most likely at the top of the list.



Description: The Asian Group is comprised mainly of breeds from the Asian and Arctic regions of the world. Often bred for guarding or working they have been invaluable assets to man throughout the ages.

Example Breeds: Alaskan Malamute, Chinese Shar-Pei, Chow Chow, Siberian Husky



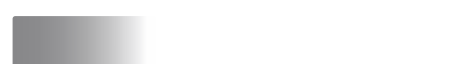
Description: The sporting group of breeds is incredibly diverse in personality and appearance, but can be characterized as a very sturdy group that was developed to work closely with people and in general have a very responsive nature and high intelligence.

Example Breeds: Cocker Spaniel, Golden Retriever, Poodle, Weimaraner



Description: The Terrier Group ancestors were bred to hunt and kill vermin. They are often characterized as feisty and energetic dogs whose sizes range from fairly small to much larger.

Example Breeds: Russell Terrier, Soft-coated Wheaten Terrier, Standard Schnauzer, Chihuahua, Miniature Pinscher



Detection Threshold

ELLIE

BREED CHARACTERISTICS: EXAMPLE

How genetics influence breed appearance and behavior.

This report includes common behavioral and physical traits associated with each of the breeds we've detected in your dog's DNA. But remember, the link between genes and their expression in specific dogs is complex. It's likely that your dog exhibits characteristics of each breed in different ways – some more subtle than others.

An example of breed expression in an individual dog.

We found three primary breeds in our example dog, Frankie. While overall, Frankie is one-of-a-kind, certain aspects of Frankie's behavior and appearance indicate the influence of each of these breeds.



Shetland Sheepdog



Italian Greyhound



Parson Russell Terrier



Feathering

The longer hair on the legs, tail and around the ears, is due to dominant modifier genes available from the Shetland Sheepdog.

White Spotting

This is due to a lack of pigment and is often found in the extremities (feet, chest, face, etc.), but can also extend over more of the body. It can be due to many genes including those found in the three ancestral breeds here.

Brindle Coat Color

The black and tan striping in Frankie's coat is a dominant trait coming from one copy of the brindle gene variant. This is available from the Italian Greyhound, Parson Russell Terrier and Shetland Sheepdog.

Black Pigment

This coloring in the nose, eye rims, lips and pads on the feet is due to one copy of the black gene variant, available from all three ancestral breeds.

Short Hair

This is due to one copy of the gene variant from the Italian Greyhound or the Parson Russell Terrier that is dominant over the long coat gene from the Shetland Sheepdog.

ELLIE

BREED CHARACTERISTICS: ELLIE

Breed Detected:
Pomeranian



Height:

7 - 12 in

Weight (Show):

3 - 7 lb

Weight (Pet):

3 - 10 lb



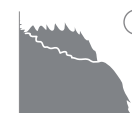
Ears:



Muzzle:



Tail:



The roots of today's Pomeranian breed can be traced back to Prussia, in the region of Pomerania – which stretches across modern Germany and Poland along the southern coast of the Baltic Sea. Around 1850, the breed was brought to England where it was given the name Pomeranian, in honor of its homeland, and recognized by the English Kennel Club in 1870. At that time, Pomeranians were much larger than the breed standard we know today. Today's more diminutive Pomeranian was established when breeders set out to create a breed adequate for city living. Through selective breeding, English breeders were finally able to produce a dog that weighed less than twenty pounds and today's breed standard of around five pounds demonstrates just how much the breed has evolved. In 1888, Queen Victoria was gifted with a Pomeranian, and the breed's association with this influential monarch did much for its popularity all over the world. By 1900, the Pomeranian had been recognized by the American Kennel Club and today, the Pomeranian's manageable size and feisty character have made it one of the most popular breeds.

The DNA detected from this breed is most similar to DNA sampled from American Kennel Club registered dogs.

The Pomeranian has a thick double coat which puffs out around the shoulders and chest. All colors are acceptable in the breed standard, and Pomeranians may be black, brindle (black and brown striped), apricot, red, cream, sable, chocolate, or particolored. White markings and a black mask are also possible.

Do you recognize any of these Pomeranian traits in Ellie?

- Active, intelligent, and alert dogs.
- Eager to learn and responds well to reward-based training using treats or favorite toys.
- Pomeranians seem to enjoy dog sports such as agility, musical canine freestyle, rally and competitive obedience.
- They tend to bark. They can be reserved around strangers and may require careful socialization to prevent or reduce defensive aggressive tendencies.

ELLIE

ROYAL CANIN
GENETIC HEALTH
Analysis

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BREED CHARACTERISTICS: ELLIE

Breed Detected:

Parson Russell Terrier



Height:

11 - 15 in

Weight (Show):

13 - 17 lb

Weight (Pet):

11 - 23 lb



Ears:



Muzzle:



Tail:



"Parson Russell Terrier" is the name of the show variant of the commonly known "Jack Russell" or "Russell Terrier" breed, although all types are relatively difficult to distinguish genetically. The Parson Russell is descended from early white-bodied working terriers. The breed was developed by Reverend John Russell during the 1800's as a fox hunter. Their small bodies allowed them to drive the fox from his lair, giving the hunters easy access. The name Parson Russell was chosen by the American Kennel Club because the name "Jack Russell Terrier" had been trademarked by a group opposed to allowing the working terrier breed into the Kennel Club. The theory was that Parson Russells are show dogs, whereas Jack Russells are working dogs. The breed was first introduced to the United States in the 1930's. Parson Russell Terriers were first recognized by the UK Kennel Club in 1990 and the American Kennel Club in 1997.

The Parson Russell Terrier may have a broken (wirehaired) or smooth coat, and is predominantly white with black, tan, cream, or black and tan markings. Grizzle (some black hairs among the coat) is also possible.

Do you recognize any of these Parson Russell Terrier traits in Ellie?

- Very intelligent, obedient, active, agile, highly energetic, and watchful dogs.
- Eager to learn, especially with reward-based training.

- Parson Russell Terriers enjoy tennis ball retrieving, agility, flyball, and Frisbee, and have the keen sense of smell necessary to participate in earthdog trials.
- May be difficult to disengage from an activity or behavior, bark, or chase wildlife or other dogs.

ELLIE

ROYAL CANIN
GENETIC HEALTH
Analysis

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BREED CHARACTERISTICS: ELLIE

Breed Detected:

Miniature Pinscher



Height:

10 - 12 in

Weight (Show):

4.5 - 9 lb

Weight (Pet):

4 - 12 lb



Ears:



Muzzle:



Tail:



The Miniature Pinscher was developed and refined in Germany to hunt rats in stables. Despite the popular misconception that the breed is a miniature version of the Doberman Pinscher, the Miniature Pinscher is much older than the Doberman Pinscher, though the two breeds do share some common ancestors. The fact that the two breeds share ancestors isn't a coincidence as the Doberman Pinscher was purposely bred to look like the Miniature Pinscher. Miniature Pinschers were very popular in Germany and Scandinavia before their widespread introduction to other countries in the early 1900's. The Miniature Pinscher was imported to the United States in 1919 and was first registered with the American Kennel Club in 1925. The breed is affectionately referred to by its fans as the "Minpin".

The Miniature Pinscher comes in solid colors with shades of red, stag red (with some shading from black hairs) and chocolate or black with red markings.

Do you recognize any of these Miniature Pinscher traits in Ellie?

- Intelligent, curious, and energetic dogs.
- As hunters, Miniature Pinschers may bark.
- Stubbornness may be reduced by using motivational tools such as treats and favorite toys in reward-based training.
- Because of its small size, may be intimidated by other dogs causing defensive barking and confrontations with other dogs.

ELLIE

ROYAL CANIN
GENETIC HEALTH
Analysis

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MDR1 TEST RESULTS

MDR1 Genetic Screening Results

CONDITION	GENE	MODE OF INHERITANCE	TEST RESULTS
Multi-Drug Sensitivity	MDR1	Dominant	Normal/Normal

Please be sure to schedule an appointment with your veterinarian to discuss these results; they can help answer any questions you may have regarding the health of your pet.

Test Results Analysis

MDR1 Normal/Normal - Your dog has two copies of the normal MDR1 gene and does not have the MDR1 mutation. If you breed your dog then they cannot pass the MDR1 mutation on to their offspring.

About MDR1

MDR1, or Multi-Drug Resistance-1 is a genetic mutation found in herding breeds, sighthound breeds and some mixed-breed dogs. All dogs have two copies of this gene, and dogs with mutations in both copies may have side effects or adverse reactions to certain drugs. Even dogs with only one copy of the mutation are more likely to experience side effects or adverse reactions than dogs with two normal MDR1 genes. Therefore, it is critically important to talk about these results with your veterinarian.

Origins of the Test

The discovery of the mutation of the multi-drug resistant gene (MDR1) and its effects on multidrug sensitivity in dogs, was made by Washington State University. It is a patent-protected diagnostic test offered by Washington State University that has been licensed to Mars Veterinary for use in the ROYAL CANIN® Genetic Health Analysis™ tests.

Additional Testing

In addition to the MDR1 genetic mutation screen, Ellie was also tested for more than 140 other genetic health indicators. We have reported all the genetic marker findings including these MDR1 results to your veterinarian. If you have not already consulted with him or her, please be sure to schedule an appointment to find out more information regarding any potential health conditions and any additional health screenings that may be recommended.

Please keep in mind that this test is not designed to diagnose any medical conditions beyond what is noted here and in your veterinarian's report, but to alert you and your veterinarian of a predisposition your dog may have to certain health issues. The main goal of the Genetic Health Analysis™ is to help you and your veterinarian create a customized health and wellness plan for your dog based on the genetic markers of your dog.

Technology Licensed By



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GENETIC MARKERS

Ellie's Health Blueprint

Beyond understanding how your dog's ancestors influence appearance and behavior, the ROYAL CANIN® Genetic Health Analysis™ also identifies genetic markers specific to your dog that can predict the possibility of certain health conditions based on:

- Breed History
- Individual Genetic Makeup

If any of these markers were found, we would have alerted your veterinarian. If you have not already consulted with your veterinarian, be sure to schedule an appointment to find out more information regarding any potential health conditions and any health screenings that may be recommended.

Please keep in mind that this test is not designed to detect diseases, but to alert you and your veterinarian of a predisposition your dog may have to certain diseases and health issues. The main goal of the Genetic Health Analysis™ is to help you and your veterinarian create a custom health and wellness plan for your dog.

ELLIE



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NUTRITIONAL CONSIDERATIONS

ROYAL CANIN® has spent over 40 years researching the science of pet nutrition. And now, with the wealth of information from the Genetic Health Analysis™, we're able to use our expertise to provide you with precise nutritional recommendations based on your dog's genetics.

Adult weight:
6 - 15 lbs

Size Category:
Small

**Age until
Adulthood:**

< 10 months

**Age until
Seniority:**

< 8 years

Ellie's Nutritional Needs

As a Senior: Dental health is important for many senior dogs. Consider talking to your veterinarian about an easy-to-chew food that encourages brushing action and overall dental health maintenance.

Joint health can become an important factor in your dog's overall well-being. Consider talking to your veterinarian about incorporating a balanced diet containing omega-3 fatty acids, glucosamine and chondroitin and to help maintain overall joint health.

In addition to size and life stage, Genetic Health Analysis™ also identifies breeds within your dog's family tree. Understanding nutritional needs within the breed makeup could help you and your veterinarian gain insight into selecting the optimal diet for your pet's overall wellness.

Your dog has **Pomeranian and Parson Russell Terrier** in its breed history. If your dog has traits that are similar to any of these breeds, here are some nutritional factors to consider:

- Maintain dental health with kibbles that are ideal for delicate teeth. Consider kibbles that are small in size and that create a brushing effect during chewing
- Support a healthy skin and coat with a diet that includes EPA, DHA, and omega-6 fatty acids
- Help maintain a healthy weight through a balanced diet that contains the optimal amount of calories to fit the dog's lifestyle and activity needs

Please remember that the nutritional considerations in this report are only a guide. Every dog is unique and has nutritional needs based on multiple factors including medical history, environment, lifestyle, and life stage. It is very important that you consult your veterinarian for a precise diet recommendation.

ELLIE

ANALYSIS SUMMARY

How Genetic Health Analysis works

The process started when you sent a sample to our laboratory, where the DNA was extracted from the cells and examined for over 3000 markers that are used in the test. The results for these markers were sent to a computer that evaluated them using a program designed to consider all of the pedigree trees that are possible in the last three generations. The trees considered include a simple pedigree with a single breed (a likely pure breed dog), two different breeds at the parental level (a first-generation cross), all the way up to a complex tree with eight different great-grandparent breeds allowed.

Our computer used information for over 250 breeds, varieties, and types from our breed database to fill these potential pedigrees. For each of the millions of combinations of ancestry trees built and considered, the computer gave each a score representing how well that selected combination of breeds matched to your dog's data. The pedigree with the overall best score is the one which is shown on the ancestry chart. Only breeds that reached our set confidence threshold for reporting are reported in the ancestry chart.

Each dog is unique and their physical and behavioral traits will be the result of multiple factors, including genetics, training, handling, and environment. ROYAL CANIN®'s proprietary Genetic Health Analysis™ provides insight into the behavioral traits in breeds that have been identified in your dog, the predicted genetic adult weight range and breed-related risks of developing certain genetic diseases. A dog's weight range can vary significantly depending on age, diet and exercise. Genetic Health Analysis™ is not intended to diagnose diseases or predict behavior in any particular dog.

In the unlikely event that it is not possible to determine breed history, predicted adult weight range or breed-related health risks, or if an error in the analysis occurs, liability by ROYAL CANIN® or related companies and individuals is disclaimed and damages in any event are limited to the payment actually received by ROYAL CANIN® for the individual specified analysis at issue.

Genetic Health Analysis™ is designed and intended to be used solely to identify the genetic history of your dog's recent ancestry and no other purpose is intended, authorized or permitted.

Many countries and provinces have breed-specific ordinances and laws that may require special handling or prohibit the ownership of some dogs with a particular breed in their genetic background. Genetic Health Analysis™ is not intended to be used by regulatory or animal control officials to determine whether a particular breed is legislated or banned in a particular community. Nor is Genetic Health Analysis™ intended to be used in any judicial proceedings. Rather, it is intended to be used as a tool or resource in determining a dog's genetic history. Neither ROYAL CANIN® nor any related company is responsible for compliance or notification regarding these matters.

ROYAL CANIN® continues to study the complexities of the canine genome, with the goal of continuing to add breeds and the ability to detect additional breed-related disease conditions to Genetic Health Analysis™ in the future.

If you have any questions about the results, please contact Technical Services at 1.800.592.6687.

ELLIE



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WE HEREBY CERTIFY THAT

ELLIE

IS GENETICALLY COMPOSED OF THE FOLLOWING CANINE BREEDS:



Pomeranian



Parson Russell Terrier



Miniature Pinscher



Mixed Breed

AS DETERMINED BY A ROYAL CANIN® GENETIC ANALYSIS OF OVER 3000 UNIQUE DNA MARKERS AND A PROPRIETARY BREED DETECTION ALGORITHM EXAMINING THE LAST THREE GENERATIONS OF ANCESTRY.

SIGNED: *Cynthia Cole* DR. Cynthia Cole, R D Director DVM, PhD, DACVCP

ON THIS 21ST DAY OF MARCH IN THE YEAR 2017