

ANALYSIS SUMMARY - PAGE 1



Dear Dr. Soileau,

This is your analysis summary for **Susie McQuaid's dog Lisa**.

Dr. Christy Soileau
VCA Preston Park Animal Hospit
18770 Preston Road,,
Dallas, TX 75252

Owner Name: Susie McQuaid
Pet Name: Lisa
Report Code: 4244906
Date Processed: August 25, 2017

Report Summary:

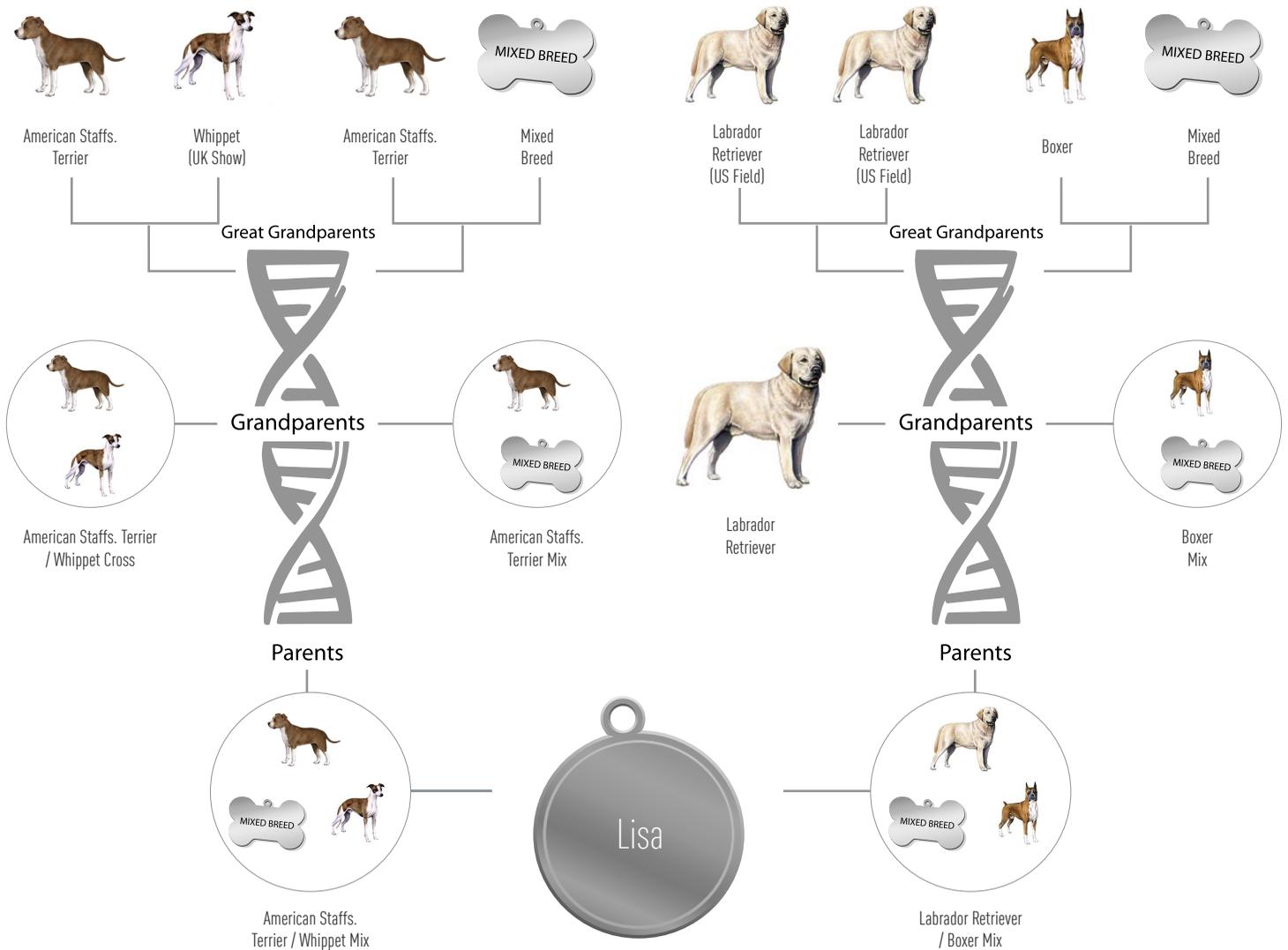
As of today's date, ROYAL CANIN® Genetic Health Analysis™ compares the tested sample against the DNA of over 250 breeds, types, and varieties taken from over 12,000 dogs across the world. This comprehensive test also checks for over 140 specific disease mutations and predicts the adult weight of the tested dog.

We hope the following information will help you to develop a custom health and wellness plan for Lisa:

- Lisa's test results show American Staffs. Terrier / Whippet Mix crossed with Labrador Retriever / Boxer Mix with a portion of the ancestry mixed beyond three generations.
- The test results indicate that Lisa carries no copies of the MDR1 mutation. Please refer to the detailed MDR1 results page later in this report.
- The test results indicate that Lisa carries one copy of the degenerative myelopathy mutation. As this is a recessive disorder, Lisa should not develop the disease, and no further testing is typically required.
- The predicted weight range for Lisa is 41 - 65 lbs.

Lisa is a American Staffordshire Terrier, Labrador Retriever, Boxer, Whippet Mix

The ROYAL CANIN® Genetic Health Analysis™ computer algorithm performed over 17,000,000 calculations using 11 different models (from a single breed to complex combinations of breeds) to predict the most likely combination of pure and mixed breed dogs in the last three ancestral generations that best fit the DNA marker pattern observed in Lisa. The ancestry chart depicting the best statistical result of this analysis is shown in the picture below.



What does the Mixed-Breed Ancestor mean for my patient?

A portion of Lisa'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 herding group is a diverse category. These highly intelligent breeds were developed to guard and control the movement of livestock.

Example Breeds: Australian Cattle Dog, Border Collie, German Shepherd Dog, Great Pyrenees



Description: While this ancient group shares many of the characteristics of the Hound Group, their origins, as the name would suggest, are concentrated in Africa and the Middle East unlike the hound group that has no true geographic center.

Example Breeds: Afghan Hound, Basenji, Saluki, Rhodesian Ridgeback



Description: The most common ancestral trait of this group is being used for hunting. Some use acute powers of scent to follow a trail while others demonstrate the gift of stamina as they run down a quarry. Beyond these two common traits, however, generalizations about hounds are hard to come by as the group is comprised of a very diverse lot of breeds.

Example Breeds: Basset Hound, Beagle, Treeing Walker Coonhound, Bloodhound



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 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

MDR1 Genetic Screening Results

CONDITION	GENE	MODE OF INHERITANCE	TEST RESULTS
Multidrug Sensitivity	MDR1	Dominant	Normal/Normal

Test Results Analysis

MDR1 Normal/Normal - These dogs have 2 copies of the normal MDR1 gene and do not have the MDR1 mutation. They will not pass on the mutation to their offspring. These dogs are not at increased risk for experiencing side effects from drugs that are pumped by P-glycoprotein.

About MDR1

MDR1, or Multidrug Resistance-1 is a genetic mutation found in many of the herding breeds, some sighthound breeds and many mixed-breed dogs. The MDR1 gene is responsible for production of a protein called P-glycoprotein. The P-glycoprotein molecule is a drug transport pump that plays an important role in limiting drug absorption and distribution (particularly to the brain) and enhancing the excretion/elimination of many drugs used in dogs. Some dogs, particularly herding breeds or mixed-breed dogs with herding breed ancestry have a mutation in the MDR1 gene that makes them defective in their ability to limit the absorption and distribution of many drugs. These dogs are also slower to eliminate drugs from the body that are transported by P-glycoprotein. As a result, dogs with the MDR1 mutation may have severe adverse reactions to some common drugs.

What about Mixed-breeds?

Our tests look for the presence of pure breeds in your dog's heritage back to the great-grandparent level. Just because we don't find a pedigree herding breed in the dog's last three generations, doesn't mean he or she doesn't have one further back in their ancestry. Therefore, even mixed-breed dogs should be tested for the MDR1 mutation.

Origins of the Test

The discovery of the mutation of the multidrug resistant gene (MDR1) and its effects on multidrug sensitivity in dogs, was made by the 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.

For more information about MDR1

Contact Mars Veterinary at 1-888-597-3883 or customercare@marsveterinary.com or visit the Washington State University School of Veterinary Medicine web site at: <http://vcpl.vetmed.wsu.edu/>.

Technology Licensed By



MDR1 Genetic Screening Information

Drugs affected by the MDR1 mutation

Acepromazine
Butorphanol
Doxorubicin
Doramectin
Emodepside
Erythromycin
Ivermectin
Loperamide
Milbemycin
Moxidectin
Paclitaxel
Rifampin
Selamectin
Vinblastine
Vincristine

Breeds affected by the MDR1 mutation (frequency %):

Australian Shepherd 50%
Australian Shepherd, Mini 50%
Border Collie 5%
Collie 70%
English Shepherd 15%
German Shepherd 10%
Herding Breed Cross 10%
Long-haired Whippet 65%
McNab 30%
Mixed Breed 5%
Old English Sheepdog 5%
Shetland Sheepdog 15%
Silken Windhound 30%

Genetic mutation tests performed for Lisa:

ROYAL CANIN® Genetic Health Analysis™ currently looks for more than 140 specific disease causing mutations in every sample submitted. The most common disease mutation test results as well as any others with positive results are listed below. All positive results are highlighted and additional information for those are provided below. For more information about these and all the diseases that the Genetic Health Analysis™ tests for, please visit marsveterinary.force.com/royalcaningha/

DISEASE	GENE	MODE OF INHERITANCE	TEST RESULTS
Phosphofructokinase Deficiency	PFKM	recessive	negative
Degenerative Myelopathy	SOD1	recessive with incomplete penetrance	positive - one copy
Exercise-Induced Collapse	DNM1	recessive	negative
Hyperuricosuria	SLC2A9	recessive	negative
Pyruvate Kinase Deficiency	PKLR_West Highland White Terrier	recessive	negative
Cystinuria Type I-A	SLC3A1_Newfoundland	recessive	negative
Pyruvate Dehydrogenase Phosphatase 1 Deficiency	PDP1	recessive	negative
Neonatal Encephalopathy with Seizures	ATF2	recessive	negative
L-2-Hydroxyglutaric Aciduria	L2HGDH_Staffordshire Bull Terrier	recessive	negative
Early-Onset Progressive Polyneuropathy	NDRG1_Greyhound	recessive	negative
von Willebrand's Disease (vWD) Type 1	VWF	recessive but may also affect some heterozygotes	negative
Factor VII Deficiency	F7	recessive	negative
Primary Lens Luxation	ADAMTS17	recessive but may also affect some heterozygotes with incomplete penetrance	negative

Degenerative Myelopathy:

Degenerative myelopathy (DM) is an inherited neurologic disorder found in many dog breeds but most commonly associated with the German Shepherd Dog and Pembroke Welsh Corgi. It is not yet clear if all dogs carrying two copies of the mutation will develop clinical signs, especially considering the variable presentation noted among breeds found to carry it. DM is inherited in an autosomal recessive fashion. Dogs affected by DM show a slowly progressive loss of coordination that starts in the hind limbs and progresses forward, with the dog becoming increasingly more paretic. The clinical signs are related to the degeneration of the white matter of the spinal cord and generally result in euthanasia.

Additional information on degenerative myelopathy can be seen online at: marsveterinary.force.com/royalcaningha/

Next Steps: Tests indicate that Lisa has inherited one copy of the degenerative myelopathy mutation. As this is a recessive disorder, Lisa should not suffer from it and no further action is typically necessary.

This genetic screening was developed in partnership with Genoscoper® (www.genoscoper.com) for use in ROYAL CANIN® Genetic Health Analysis™ tests.

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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:
41 - 65 lbs

Size Category:
Medium

**Age until
Adulthood:**

< 12 months

**Age until
Seniority:**

< 7 years

Lisa's Nutritional Needs

As a Puppy: A puppy's natural defenses are not yet fully developed. A diet with antioxidants such as Vitamin E, Vitamin C, Taurine and Lutein can help support a puppy's natural defenses.

Puppies in the medium size category may have ancestors bred for hunting and other high energy activities. It is important to feed your puppy a diet with the appropriate amount of calories for his/her lifestyle in order to maintain a healthy weight.

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

Your dog has **American Staffordshire Terrier** in its breed history. If your dog has traits that are similar to this breed, here are some nutritional factors to consider:

- Support healthy digestion with a diet that contains highly digestible proteins, a blend of prebiotic fibers and high quality carbohydrates
- 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
- Help support healthy joints by selecting a diet with omega-3 fatty acids, glucosamine and chondroitin

Your dog has **Labrador Retriever** in its breed history. The nutritional considerations regarding this breed include those already listed.

Please remember that the nutritional needs and considerations listed in this report are meant to be a guide based on the comprehensive results of your patient. Every dog is unique and we recognize that his or her nutritional needs are based on multiple factors including medical history, environment, lifestyle, and lifestage. We encourage you to talk about nutrition with your clients to ensure that they understand your expert nutritional recommendation for their pet. We are here to support you. If you have additional questions, please contact our Technical Services Team at 1-800-592-6687.

EXAMINATION REPORT

Patient information

Patient name:

Age:

Breed:

Weight:

Physical exam results

Temperature:

Pulse:

Respiration:

Nutrition:

Genetic Health Analysis results and recommendations

Nutrition:

Feeding guidelines:

Target weight:

Next Visit:

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 patient'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.

All dogs should be considered individual animals. Because each dog is a product of its unique environment and handling, it may exhibit different traits and behaviors than those listed on the breed detail pages provided in the final results. The descriptions of the individual breeds provided by ROYAL CANIN® Genetic Health Analysis™ on these pages are intended to be general in nature. They are not intended to be all-inclusive or definitive and may or may not reflect the natural temperament of your dog.

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.