



Results for:

LOGAN

4 2 5 8 5 3 6

16 APRIL 2020

## INSIDE THIS REPORT



We have successfully processed the blood sample for Logan 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

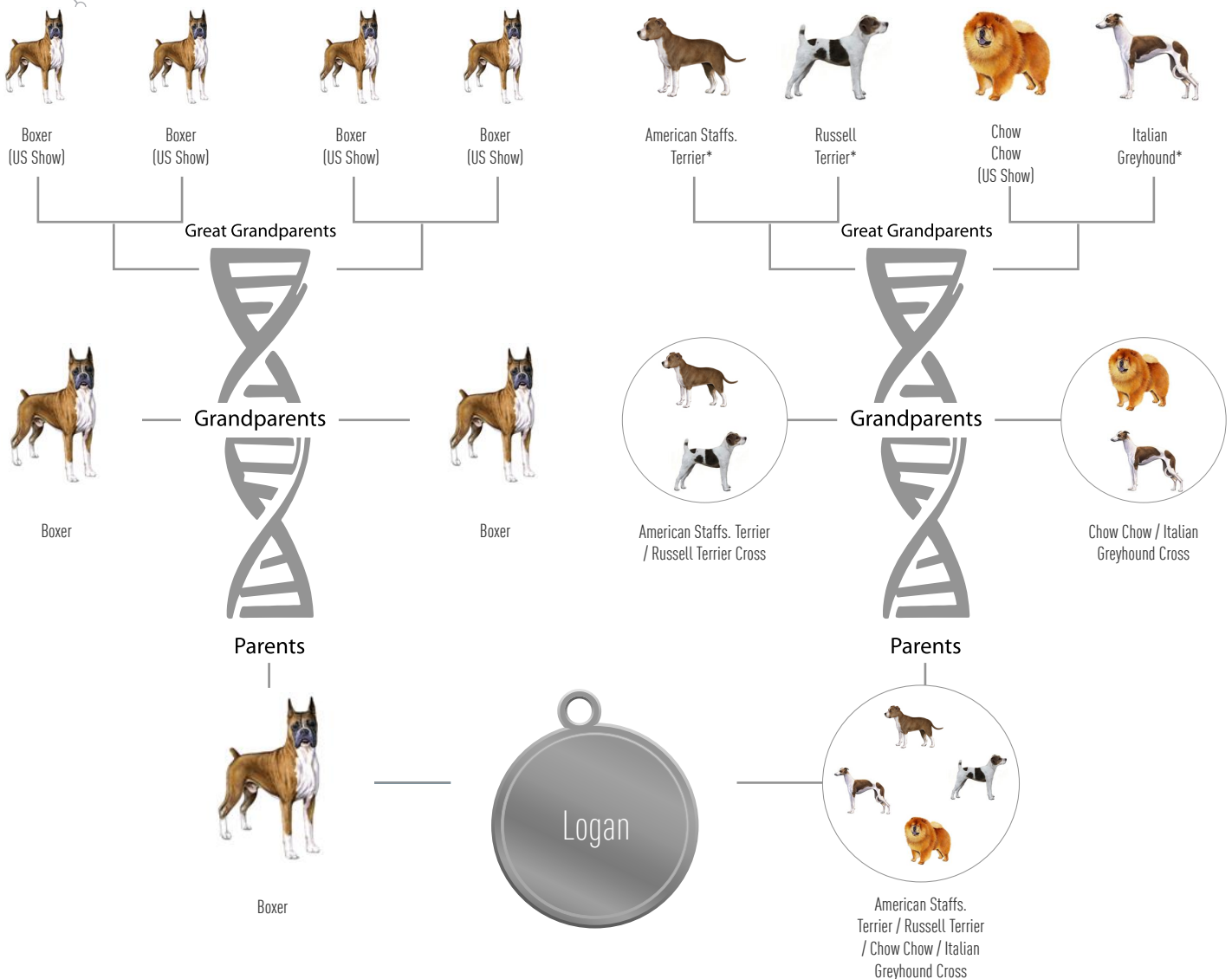
Nutritional Considerations

Genetic Ancestry Certification

# GENEALOGY FINDINGS

## What breeds make up Logan?

The ROYAL CANIN® Genetic Health Analysis™ completed over 17,000,000 iterations and has typed over 12,000 dogs to determine the most likely combination of breeds that best fit the DNA marker pattern observed in your dog, going back three generations.



\*Breed detected, however at a lower confidence. Such results are not included in accuracy calculations.

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## 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.

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## BREED CHARACTERISTICS: LOGAN

**Breed Detected:**  
**Boxer**



**Height:**

21 - 25 in

**Weight (Show):**

55 - 66 lb

**Weight (Pet):**

49 - 77 lb



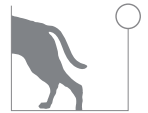
**Ears:**



**Muzzle:**



**Tail:**



The history of the Boxer dates back to nineteenth century Germany, where they were used for hunting deer and boar. The ancestors of the Boxer include the Bullenbeiszer and the Barenbeiszer, which are now both extinct. The crossing of those breeds with the English Bulldogs of the 1830's resulted in the Boxer as we know it today. Boxers were bred to be hunting dogs and they earned their name from the "boxing" pose they are known to take when standing on their hind legs. Later in the breed's development, it was made apparent that they were also well-suited for herding and the Boxer was used in more than a few circus acts due to its ability to learn tricks quickly and perform them on command. The popularity of Boxers started to increase rapidly in the 1860's when the German Boxer Klub was founded. At the turn of the twentieth century the Boxer made its way to the United States and the American Kennel Club recognized the Boxer as a breed in 1904.

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

The AKC breed standard for boxers requires that they come only in fawn and brindle (black and brown stripes) with the fawn ranging from a light tan to mahogany and restricts the amount of white seen on the dog. Accepted traits include a black mask commonly seen in the breed. White boxers also have a following; though do not meet the breed standard.

### Do you recognize any of these Boxer traits in Logan?

- Intelligent, hard working, and playful dogs, with a high amount of energy.
- Eager to learn and respond well to reward-based training using treats and favorite toys.
- Boxers seem to enjoy dog sports such as agility, flyball, rally and competitive obedience.
- Tendency to jump up on people, sometimes boxing with their front feet when doing so.

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## BREED CHARACTERISTICS: LOGAN

**Breed Detected:**

### American Staffordshire Terrier



Height:

17 - 19 in

Weight (Show):

40 - 60 lb

Weight (Pet):

38 - 68 lb

Ears:



Muzzle:



Tail:



The American Staffordshire Terrier can trace its roots all the way back to the nineteenth century in England. The English Staffordshire Terrier was created when various terriers were crossed with the Bulldog. The crossbreeding resulted in the active and powerful breed that came to the attention of the United States public in 1870. American breeders then focused their attention and efforts to increasing the size and weight of the American Staffordshire Terrier. These breeding efforts resulted in a Staffordshire Terrier that was recognized as a separate breed by the American Kennel Club in 1936. In 1972, the current name of "American Staffordshire Terrier" was adopted. The American Staffordshire Terrier was once used primarily for fighting. That practice, however, was banned in the early 1900's and two separate variations of the breed were gradually developed.

The American Staffordshire Terrier can be any color, with solid, particolored, or patched black, brown, tan, brindle (black and brown striped), liver, red or fawn. Black or blue mask, brindle or tan points are commonly seen traits in this breed. Ears may also appear different due to cropping.

### Do you recognize any of these American Staffordshire Terrier traits in Logan?

- Intelligent, hard-working, and stoic dogs.
- American Staffordshire Terriers seem to enjoy dog sports such as agility, flyball, rally and competitive obedience.
- Very loyal to family and usually good with children. May not get along well with other dogs.
- Individual members of this breed will benefit from firm and dedicated training to temper this guarding tendency, and thus help to maintain safety as a household companion.

The American Staffordshire Terrier was originally bred for various purposes including the guarding of people and/or property.

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## BREED CHARACTERISTICS: LOGAN

**Breed Detected:**  
**Chow Chow**



**Height:**

18 - 22 in

**Weight (Show):**

40 - 65 lb

**Weight (Pet):**

42 - 69 lb



**Ears:**



**Muzzle:**



**Tail:**



The Chow Chow is a venerable breed dating back at least two thousand years. Many believe that the breed originated in China, but there is some evidence that indicates the Chow Chow actually migrated to China from Mongolia and Manchuria. While no one can say for sure from which breeds the Chow Chow has descended, it is believed that the breed has Tibetan mastiff and Samoyed in its bloodline. The Chow Chow served a dual purpose in China. Some were used for hunting while others were used to guard the sacred temples from evil entities. The East Indian Company brought the Chow Chow to England in 1781 and Queen Victoria received Chow Chows as a gift in 1865. During the 1880's, the numbers of Chow Chows imported increased drastically. The Chow Chow is one of the oldest known breeds, recognized by the American Kennel Club in 1903.

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

The Chow Chow comes in either rough or smooth coat, with the rough having a more fluffy appearance. The coat may have lighter shading and be one of five colors; black, blue, cinnamon, cream, and red, which varies from a light golden to a deep mahogany. The Chow is famous for its blue mottled tongue, and sometimes has a black mask.

### Do you recognize any of these Chow Chow traits in Logan?

- Reputation as a loyal family dog.
- Reserved and wary with strangers.
- Independent spirit, but responds to reward-based obedience training.

The Chow Chow was originally bred for various purposes including the guarding of people and/or property. Individual members of this breed will benefit from firm and dedicated training to temper this guarding tendency, and thus help to maintain safety as a household companion.

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## BREED CHARACTERISTICS: LOGAN

Breed Detected:

Italian Greyhound



Height:

12 - 15 in

Weight (Show):

6 - 11 lb

Weight (Pet):

5 - 14 lb



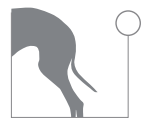
Ears:



Muzzle:



Tail:



The Italian Greyhound can trace its roots all the way back to Greece and Turkey some 2,000 years ago. Mummified Italian Greyhounds have been found in Egypt and pictures of the breed were found in the ruins of Pompeii. Italian Greyhounds were brought to Italy by the Romans during the sixth century and they became popular with royal families all across Southern Europe. The name "Italian Greyhound" stems from the breed's immense popularity in renaissance Italy. By the 1600's, Italian Greyhounds had made their way to England. They were first imported to the United States in the 1860's. Following World War I, Italian Greyhounds faced extinction in Britain, but were repopulated with help from some of the American Italian Greyhounds. They were recognized by the American Kennel Club in 1886. Italian Greyhounds are often referred to as I.G.s or as "Iggys" for short.

The Italian Greyhound comes in black, blue (gray), fawn, red, sable, black and tan, blue and tan, brindle, chocolate and white. These colors may be solid, white, or with white markings. Black or blue masks are also possible in this breed.

### Do you recognize any of these Italian Greyhound traits in Logan?

- Intelligent, playful, and alert dogs.
- Italian Greyhounds enjoy dog sports such as lure coursing, racing, agility, tracking, and both rally and competitive obedience.
- Good watchdogs who may bark or be aloof around strangers, or who may chase wildlife.
- Small size means they may be intimidated or injured by other dogs.

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## BREED CHARACTERISTICS: LOGAN

**Breed Detected:**

**Russell Terrier**



**Height:**

10 - 15 in

**Weight (Show):**

14 - 18 lb

**Weight (Pet):**

12 - 24 lb



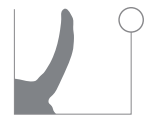
**Ears:**



**Muzzle:**



**Tail:**



The Russell Terrier is also commonly referred to as the Jack Russell Terrier, referring to Reverend John Russell who, in the early 19th century, used his fox working terriers to breed predominantly white working terriers which possessed an innate ability to hunt and to flush out foxes from underground, but that would not harm or kill them. John Russell's first terrier, Trump, is said to be the foundation of his strain of working terriers. It is claimed that following Russell's death some of his bloodlines were crossed with the Welsh Corgi and other terrier breeds, creating a different type dog, the "Jack Russell Terrier." Jack Russell Terriers are a type of working terrier, which have a broad genetic make-up. The term Jack Russell has widely been used to describe a multitude of small white terriers. John Russell maintained his strain of fox terriers bred strictly for working, and the terrier we know today is much the same as the pre-1900 fox terrier. In the USA, a Terrier conforming to the Australian/FCI standard is simply called a Russell Terrier by the American Kennel Club.

The Russell Terrier has a smooth, rough or broken coat which is predominantly white with tan, black, or brown markings.

### Do you recognize any of these Russell Terrier traits in Logan?

- Very intelligent, obedient, active, agile, highly energetic, and watchful dogs.
- Reputation as a good family dog, but with careful training needed to avoid development of "small dog syndrome".
- Russell Terriers enjoy tennis ball retrieving, agility, flyball, 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.

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## MDR1 TEST RESULTS

### MDR1 Genetic Screening Results

CONDITION	GENE	MODE OF INHERITANCE	TEST RESULTS
Multidrug 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 Multidrug 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 multidrug 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 Wisdom Health for use in the ROYAL CANIN® Genetic Health Analysis™ tests.

#### Additional Testing

In addition to the MDR1 genetic mutation screen, Logan 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

### Logan'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.

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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:**  
40 - 63 lbs

**Size Category:**  
Medium

**Age until  
Adulthood:**

< 12 months

**Age until  
Seniority:**

< 7 years

### Logan'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.

Cognitive health can become an important factor in overall health maintenance. Consider talking to your veterinarian about a balanced diet that incorporates antioxidants, omega-3 fatty acids and specific nutrients for the nervous system.

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 **Boxer** 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 support healthy joints by selecting a diet with omega-3 fatty acids, glucosamine and chondroitin

*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.*

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## 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.

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.**

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WE HEREBY CERTIFY THAT

**LOGAN**

IS GENETICALLY COMPOSED OF THE FOLLOWING CANINE BREEDS:



Boxer



American Staffordshire Terrier



Chow Chow



Italian Greyhound



Russell Terrier

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*  
Cynthia Cole, DVM, PhD, DACVCP  
Wisdom Health

ON THIS 16TH DAY OF APRIL IN THE YEAR 2020