

## Laboratory Report

<b>Laboratory #:</b>	191818	<b>Call Name:</b>	Chavo
<b>Order #:</b>	85929	<b>Registered Name:</b>	-
<b>Ordered By:</b>	Zoë Robb	<b>Breed:</b>	Standard Poodle
<b>Ordered:</b>	Aug. 18, 2020	<b>Sex:</b>	Male
<b>Received:</b>	Aug. 31, 2020	<b>DOB:</b>	June 2020
<b>Reported:</b>	Sept. 15, 2020	<b>Registration #:</b>	-
		<b>Microchip #:</b>	604828327

### Results:

Disease	Gene	Genotype	Interpretation
Chondrodysplasia (CDPA)	<i>CFA18 FGF4</i>	cd/cd	No Leg Shortening Associated with CDPA
Chondrodystrophy with Intervertebral Disc Disease Risk Factor (CDDY with IVDD)	<i>CFA12 FGF4</i>	WT/WT	Normal (Clear) - No CDDY or Increased IVDD Risk
Degenerative Myelopathy	<i>SOD1</i>	WT/WT	Normal (clear)
Neonatal Encephalopathy with Seizures	<i>ATF2</i>	WT/WT	Normal (clear)
Progressive Retinal Atrophy, Progressive Rod-Cone Degeneration	<i>PRCD</i>	WT/WT	Normal (clear)
Progressive Retinal Atrophy, Rod-Cone Dysplasia 4	<i>C2orf71</i>	WT/WT	Normal (clear)
Von Willebrand Disease I	<i>VWF</i>	WT/WT	Normal (clear)

WT, wild type (normal); M, mutant; Y, Y chromosome (male)

### Interpretation:

Molecular genetic analysis was performed for seven specific mutations reported to be associated with diseases and traits in dogs. We identified two normal copies of the DNA sequences in the mutations tested.

We identified two normal copies of the DNA sequences for *CFA18 FGF4* associated with CDPA. Thus, this dog does not have shortened legs associated with CDPA. In addition, we identified two normal copies of the DNA sequences for *CFA12 FGF4* associated with CDDY and IVDD risk. Thus, this dog is not affected with CDDY and is not at an increased risk of developing IVDD.

### Recommendations:

No mutations were identified. Thus, this dog is not at an increased risk for the diseases caused by or associated with the mutations tested. Because this dog is "clear" of these mutations, this dog will only pass the normal genes on to its offspring. Normal results do not exclude inherited mutations not tested in these or other genes that may cause medical problems or may be passed on to offspring.

Two genetic mutations are associated with shortened legs in dogs. Both mutations consist of copied sections (duplication) of the canine *FGF4* gene (called an *FGF4*-retrogene) that have been inserted into two aberrant locations in the genome; one in chromosome 12 (*CFA12 FGF4*; associated with CDDY and IVDD risk) and one in chromosome 18 (*CFA18 FGF4*; associated with chondrodysplasia [CDPA], but not associated with IVDD). Appropriate breeding decisions regarding dogs which have inherited the *CFA12 FGF4* mutation (WT/M or M/M) need to address both the potential loss of genetic diversity in a population which would occur if dogs with this

mutation were prohibited from breeding as well as the loss of the short-legged appearance that is a defining physical characteristic for some breeds. In breeds which inherit both mutations, breeders may use genetic testing results to selectively breed for the CDPA (*CFA18 FGF4*) mutation while breeding away from the CDDY and IVDD risk (*CFA12 FGF4*) mutation to reduce IVDD risk and retain the short-legged appearance. However, the frequency of each mutation varies between breeds and, in some cases, may not be conducive to such a breeding strategy. For example, breeds with extreme limb shortening (e.g. Basset hound, Dachshund, Corgi) typically develop their appearance due to inheritance of both the *CFA12 FGF4* and *CFA18 FGF4* mutations. In addition, depending on the breed, offspring born without either the *CFA12 FGF4* or *CFA18 FGF4* mutations may display longer limbs than cohorts and, therefore, not meet specific breed standards.

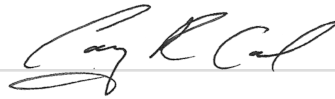
This dog carries two copies of the *cd* allele which does not result in leg shortening. However, the actual leg length of the dog is a result of a combination of factors including the mutation associated with CDDY and IVDD risk (*CFA12 FGF4*) as well as variants in other genes. This dog will pass one copy of *cd* to 100% of its offspring.

No mutation in *CFA12 FGF4* was identified. Thus, this dog is not at an increased risk for Chondrodystrophy (CDDY) and early-onset Intervertebral Disc Disease (IVDD). Because this dog is "clear" of this mutation, this dog will only pass the normal gene on to its offspring. Normal results do not exclude inherited mutations not tested in this gene or other genes that may cause medical problems or may be passed on to offspring.

Paw Print Genetics® has genetic counseling available to you at no additional charge to answer any questions about these test results, their implications and potential outcomes in breeding this dog.



**Blake C Ballif, PhD**  
Laboratory & Scientific Director



**Casey R Carl, DVM**  
Associate Medical Director

Normal results do not exclude inherited mutations not tested in these or other genes that may cause medical problems or may be passed on to offspring. These tests were developed and their performance determined by Paw Print Genetics®. This laboratory has established and verified the tests' accuracy and precision. Because all tests performed are DNA-based, rare genomic variations may interfere with the performance of some tests producing false results. If you think these results are in error, please contact the laboratory immediately for further evaluation. In the event of a valid dispute of results claim, Paw Print Genetics will do its best to resolve such a claim to the customer's satisfaction. If no resolution is possible after investigation by Paw Print Genetics with the cooperation of the customer, the extent of the customer's sole remedy is a refund of the fee paid. In no event shall Paw Print Genetics be liable for indirect, consequential or incidental damages of any kind. Any claim must be asserted within 60 days of the report of the test results.

## Canine Genetic Health Certificate™

<b>Call Name:</b>	Chavo	<b>Laboratory #:</b>	191818
<b>Registered Name:</b>	-	<b>Registration #:</b>	-
<b>Breed:</b>	Standard Poodle	<b>Microchip #:</b>	604828327
<b>Sex:</b>	Male	<b>Certificate Date:</b>	Sept. 15, 2020
<b>DOB:</b>	June 2020		

**This canine's DNA showed the following genotype(s):**

Disease	Gene	Genotype	Interpretation
Chondrodysplasia (CDPA)	<i>CFA18</i> <i>FGF4</i>	cd/cd	No Leg Shortening Associated with CDPA
Chondrodystrophy with Intervertebral Disc Disease Risk Factor (CDDY with IVDD)	<i>CFA12</i> <i>FGF4</i>	WT/WT	Normal (Clear) - No CDDY or Increased IVDD Risk
Degenerative Myelopathy	<i>SOD1</i>	WT/WT	Normal (clear)
Neonatal Encephalopathy with Seizures	<i>ATF2</i>	WT/WT	Normal (clear)
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Progressive Retinal Atrophy, Rod-Cone Dysplasia 4	<i>C2orf71</i>	WT/WT	Normal (clear)
Von Willebrand Disease I	<i>VWF</i>	WT/WT	Normal (clear)

WT, wild type (normal); M, mutant; Y, Y chromosome (male)



**Helen F Smith, PhD**  
Assistant Laboratory Director



**Casey R Carl, DVM**  
Associate Medical Director

Paw Print Genetics® performed the tests listed on this dog. See the Laboratory Report for interpretation and recommendations based on these findings. The genes/diseases reported here were selected by the client. Normal results do not exclude inherited mutations not tested in these or other genes that may cause medical problems or may be passed on to offspring. These tests were developed and their performance determined by Paw Print Genetics. This laboratory has established and verified the tests' accuracy and precision. Because all tests performed are DNA-based, rare genomic variations may interfere with the performance of some tests producing false results. If you think these results are in error, please contact the laboratory immediately for further evaluation. In the event of a valid dispute of results claim, Paw Print Genetics will do its best to resolve such a claim to the customer's satisfaction. If no resolution is possible after investigation by Paw Print Genetics with the cooperation of the customer, the extent of the customer's sole remedy is a refund of the fee paid. In no event shall Paw Print Genetics be liable for indirect, consequential or incidental damages of any kind. Any claim must be asserted within 60 days of the report of the test results. Genetic counseling is available at Paw Print Genetics.

## Coat Color and Trait Certificate

<b>Call Name:</b>	Chavo	<b>Laboratory #:</b>	191818
<b>Registered Name:</b>	-	<b>Registration #:</b>	-
<b>Breed:</b>	Standard Poodle	<b>Microchip #:</b>	604828327
<b>Sex:</b>	Male	<b>Certificate Date:</b>	Sept. 15, 2020
<b>DOB:</b>	June 2020		

### This canine's DNA showed the following genotype(s):

Coat Color/Trait Test	Gene	Genotype	Interpretation
A Locus (Agouti)	<i>ASIP</i>	$A^Y/A^Y$	Sable/fawn
D Locus (Dilute)	<i>MLPH</i>	D/D	Non dilute
E Locus (Yellow/Red)	<i>MC1R</i>	E/e	Black (carries yellow/red)
E <sup>m</sup> Locus (Melanistic Mask)	<i>MC1R</i>	N/N	No melanistic mask
M Locus (Merle)	<i>PMEL</i>	m/m	Non merle

### Interpretation:

This dog carries two copies of **A<sup>Y</sup>** which results in a sable/fawn coat color. However, this dog's coat color is also dependent on the E, K, and B genes. The sable/fawn coat color is only expressed if the dog is also E/E or E/e at the E locus and  $k^Y/k^Y$  at the K locus which allows for agouti gene expression. This dog will pass on **A<sup>Y</sup>** to 100% of its offspring.

This dog carries two copies of **D** which does not result in the "dilution" or lightening of the black and yellow/red pigments that produce the dog's coat color. The base coat color of this dog will be primarily determined by the E, K, A, and B genes. This dog will pass on **D** to 100% of its offspring.

This dog carries one copy of **E** and one copy of **e** which allows for the production of black pigment. However, this dog's coat color is also dependent on the K, A, and B genes. This dog will pass **E** on to 50% of its offspring and **e** to 50% of its offspring, which can produce a yellow/red coat (including shades of white, cream, yellow, apricot or red) if inherited with another copy of **e**.

This dog carries two copies of **N** which does not result in a melanistic mask on the muzzle of the dog. This dog will pass on **N** to 100% of its offspring.

This dog carries two copies of **m**, the non-merle, wild-type allele of the *PMEL* gene, and, therefore, does not have a merle coat color/pattern. This dog will pass on one copy of the **m** allele to 100% of its offspring.

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