

# Franky

**AKC & CKC Red Miniature Poodle**

13 lb, 14.5" to shoulders

Franky is the son of our Charlie and Luna and he was our breeder's pick from our first litter. He inherited his dad's laid-back and loving personality and deep red color.

The main difference between Charlie and Franky is that Franky carries the parti (sp) gene and he has zero copies of the CDDY gene. That means he can produce solid-colored puppies or puppies that are abstract (few small white patches) or parti (50% white, 50% color) depending on the color genetics of the female to which he is bred.

Franky is 100% clear of all genetic diseases including the CDDY gene, as verified by both the UC Davis and Animal Genetics test laboratories, which is rare for small poodles. His subloci for the Intense Red gene is 10 out of 10 which is also quite exceptional.

## **AVAILABLE FOR STUD SERVICE:**

Franky is only available for natural breeding/LIVE COVER in Houston

\*\*\*Franky does NOT collect for Artificial Insemination Breedings\*\*\*

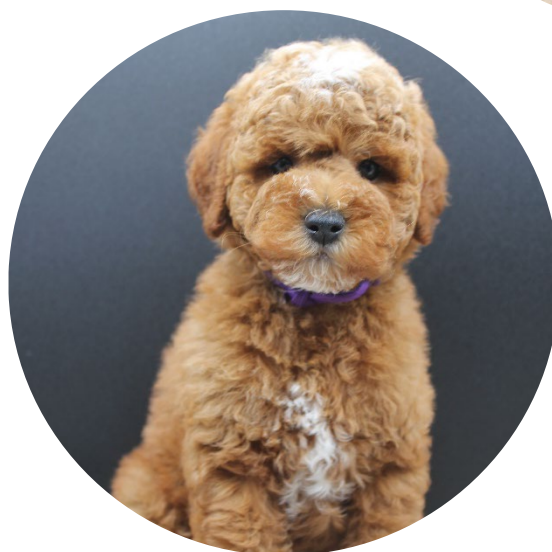
Please contact us for a quotation: [info@klauspoodles.com](mailto:info@klauspoodles.com)

[www.klauspoodles.com](http://www.klauspoodles.com)



# Puppies Sired by Franky

[Click here](#) for more photo albums



OWNER'S NAME: Crystal Klaus

DOG'S NAME: Franky

TEST DATE: August 2nd, 2021

OWNER SUPPLIED BREED: Poodle (Miniature)

REGISTRATION ORGANIZATION: --

REGISTRATION NUMBER: --

This certifies the authenticity of **Franky's** canine genetic background as determined following careful analysis of more than 200,000 genetic markers.

MATERNAL **A340**  
HAPLOTYPE

PATERNAL **Ha.7**  
HAPLOTYPE

Purebred certification is separate from genetic ancestry. Purebred status is defined by pedigrees at registration bodies. Ancestry looks at segments of shared DNA.

## POODLE



82.4% Poodle (Small)



17.6% Poodle (Standard)

Welcome to the  
**Embark** family!



Adam Boyko, Ph.D.  
CHIEF SCIENCE OFFICER



Ryan Boyko  
CHIEF EXECUTIVE OFFICER



AMERICAN KENNEL CLUB • FOUNDED 1884

# Certified Pedigree

Sire **HERALYS RED FLY CHARLIE BOY**  
PR22174505 (10-20) RD AKC DNA #V924685

**KLAUS POODLES FRANKFURTER DER  
FREIHERR VON ROT**

PR24232701  
POODLE MALE RD  
Date Whelped: 06/23/2021  
Breeder: CRYSTAL KLAUS

Dam **IDAJEWELS LUNA GIRL KLAUS**  
PR22474802 (10-21) EYE11 RD & WH



**AMERICAN  
KENNEL CLUB®**

*Gina Di Nardo*  
Executive Secretary

**HERALY'S SIR ASHFORD WAYNE**  
PR19238003 (04-18) RD AKC DNA  
#V862707

**RED FLY YUNONA MAGIC GALAXY**  
PR20853801 (03-19) RD (RUS) AKC DNA  
#V873268

**IDAHO JEWELS RED PARTI TEE I  
DOUBLEGURR**  
PR21592606 (05-20) RD & WH AKC DNA  
#V917403

**IDAHO JEWELS RED PARTI MIZZY**  
PR20371504 (10-18) OFA31G RD & WH  
AKC DNA #V881162

**POCHE'S OPIE OF HUCKLEBERRY**  
PR16854502 (05-14) RD AKC DNA #V736980

**POCHE'S CHERRY OF HUCKLEBERRY**  
PR18502701 (09-16) RD AKC DNA #V870339

**OCHAROVANIE BLESK KURAZHA**  
RKF 4016469

**RED FLY GERMIONA**  
RKF 3680088

**BELAIRE'S MR. RIGHT ROMEO**  
PR19452602 (01-18) OFA27E RD & WH AKC  
DNA #V876829

**IDAHO JEWELS RED PARTI BLESSED  
BECKY**  
PR20857602 (06-19) RD & WH

**IDAHO JEWELS PARTI RED RANGER**  
PR18705903 (01-17) OFA24E RD & WH AKC  
DNA #V808628

**IDAHO JEWELS RED TOGA PARTI MYLEE**  
PR18651401 (12-16) OFA28E RD & WH

**LIGHT MY FIRE**  
PR12899101 (10-10) RD AKC DNA #V625193

**WILDWOODS FAMILY TRADITION**  
PR08910803 (06-08) RD

**LIGHT MY FIRE**  
PR12899101 (10-10) RD AKC DNA #V625193

**WILDWOOD MAKES HEARTS FLY**  
PR05913601 (11-14) RD

**TINKILEES REBEL ROUSER**  
CKC WN305721

**OCHAROVANIE LORETTA**  
RKF 2186952

**DELISS SERPANTIN ORLANDO**  
RKF 1852119

**ULTRA IZ ZVEZDNOY KOLLECKII**  
RKF 2900474

**WILDWOOD FIRE & ICE**  
PR17866601 (12-16) RD & WH

**ANGELBABIES FIERY RED DELITE**  
PR10187004 (10-09) RD

**IDAHO JEWELS MAHOGANY MISTER CHEVY**  
PR18343802 (10-16) RD WH MKGS AKC DNA  
#V805991

**KARENAS LUCKY WHITE TOUCH OF VELVET**  
PR15150602 (01-13) WH AKC DNA #V698016

**PRINCE TINY WHITEY QUICK**  
PR16374804 (01-14) CR BLK MKGS AKC DNA  
#V719855

**LITTLE MISS PENELOPE X**  
PR17072303 (01-16) APCT

**CERBERUS PARTI AT MY PLACE**  
PR17755608 (12-15) RD WH MKGS AKC DNA  
#V809600

**CERBERUS TOGA PARTI**  
PR16942101 (12-15) RD & WH

The Seal of The American Kennel Club affixed hereto certifies that this pedigree was compiled from official Stud Book records on August 10, 2021.

## Intensity Loci LINKAGE

## Any pigmented hair likely apricot or red (Intense Red Pigmentation)

Areas of a dog's coat where dark (black or brown) pigment is not expressed either contain red/yellow pigment, or no pigment at all. Five locations across five chromosomes explain approximately 70% of red pigmentation "intensity" variation across all dogs. Dogs with a result of **Intense Red Pigmentation** will likely have deep red hair like an Irish Setter or "apricot" hair like some Poodles, dogs with a result of **Intermediate Red Pigmentation** will likely have tan or yellow hair like a Soft-Coated Wheaten Terrier, and dogs with **Dilute Red Pigmentation** will likely have cream or white hair like a Samoyed. Because the mutations we test may not directly cause differences in red pigmentation intensity, we consider this to be a linkage test. [WHAT'S THIS?](#)

This trait summarizes these results for the individual subloci:

Intensity_red_pigment_chr2	Red/Red
Intensity_red_pigment_KITLG	Red/Red
Intensity_red_pigment_chr18	Red/Red
Intensity_red_pigment_MFSD12	Red/Red
Intensity_red_pigment_chr21	Red/Red

### Citations

[Hedan et al 2019](#) , [Weich et al 2020](#) , [Slavney et al 2021](#)





SUBURBIA NORTH ANIMAL HOSPITAL  
2005 FM 1960  
HOUSTON, TX 77073  
PHONE (281) 443-2362 FAX: (281) 443-4950  
EMAIL: [askjennifer@suburbiavet.com](mailto:askjennifer@suburbiavet.com)

## Chilled Semen Report

Collection Date: 9/28/2022  
Collection Time: 8:15A  
Libido: Good  
Teaser: Y or N  
Ease of Collection: Fair  
Collection Technique: manual  
Color: white slava  
Semen Volume: 1.5mL  
Concentration (ml): 484 million/mL  
% Motility: 95%  
Extender Added (ml): 3mL

KLAUS, CRYSTAL

SPRING, TX 77386

Franky (Canine)

Breed: Poodle, Miniature

Color: Red

Sex: Male

### Total Motile Sperm:

%Normal:

% Primary:

% Secondary:

Head abnormalities: 2 %

Midpiece abnormalities: 2 %

Tail abnormalities: 2 %

648 million

mt, 100%

Send To:

Name:

Hospital:

Address:

City:

State:

Phone:

Zip:

Comments:



# FRANKY



DNA Test Report

Test Date: August 2nd, 2021

[embk.me/frankklaus](https://embk.me/frankklaus)

## HEALTH REPORT

### How to interpret Franky's genetic health results:

If Franky 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 Franky 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.



### Good news!

Franky is not at increased risk for the genetic health conditions that Embark tests.

**Breed-Relevant Genetic Conditions**

**7 variants not detected**



**Additional Genetic Conditions**

**201 variants not detected**





# FRANKY



DNA Test Report

Test Date: August 2nd, 2021

[embk.me/frankklaus](https://embk.me/frankklaus)

## BREED-RELEVANT CONDITIONS TESTED



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

- ✓ Von Willebrand Disease Type I, Type I vWD (VWF)
- ✓ Progressive Retinal Atrophy, prcd (PRCD Exon 1)
- ✓ GM2 Gangliosidosis (HEXB, Poodle Variant)
- ✓ Degenerative Myelopathy, DM (SOD1A)
- ✓ Neonatal Encephalopathy with Seizures, NEWS (ATF2)
- ✓ Osteochondrodysplasia, Skeletal Dwarfism (SLC13A1, Poodle Variant)
- ✓ Chondrodystrophy and Intervertebral Disc Disease, CDDY/IVDD, Type I IVDD (FGF4 retrogene - CFA12)



# CHONDRODYSTROPHY (CDDY) AND CHONDRODYSPLASIA (CDPA) TEST REPORT

<b>Provided Information:</b>  Name: <b>FRANKFURTER</b>  Registration:	<b>Case: NCD167790</b> Date Received: 23-Aug-2021 Report Issue Date: 12-Sep-2021 Report ID: 8566-2839-0191-2124  Verify report at <a href="http://www.vgl.ucdavis.edu/verify">www.vgl.ucdavis.edu/verify</a>
DOB: <b>06/23/2021</b> Sex: <b>Male</b> Breed: <b>Poodle, Miniature</b>	
Sire: CHARLIE Reg: AKC #PR22174505 Microchip:	Dam: LUNA Reg: AKC #PR22474802 Microchip:

## RESULT

## INTERPRETATION

<b>Chondrodystrophy (CDDY)</b>	<b>N/N</b>	No copies of CDDY mutation.
<b>Chondrodysplasia (CDPA)</b>	<b>N/N</b>	No copies of CDPA mutation

## Canine Genetic Testing Report



Submitted By

Crystal Klaus  
Kalus Poodles  
Spring, TX 77386  
United States

**Subject Dog** 00275191

Date Received: 7/1/2021

Dog Name: **Frank (Dark Boy)**  
Breed: **Poodle**  
Phenotype: **Red**

Registration:  
Microchip:  
Sex: **Male** Birth:

**Sire**

Sire Name: **Charlie**  
Breed: **Poodle**  
Registration: **PR22174505**  
Phenotype: **Red**

**Dam**

Dam Name: **Luna**  
Breed: **Poodle**  
Registration: **PR22474802**  
Phenotype: **Apricot & White**

### Coat Color Testing

A Locus-Ay	Not Tested
A Locus-Aw	Not Tested
A Locus-At	Not Tested
A Locus-a	Not Tested
B Locus	Not Tested
Cocoa	Not Tested
D Locus	Not Tested
E Locus- EM	Not Tested
E Locus- e	Not Tested
K Locus-KB	Not Tested
Spotting	Not Tested
Harlequin	Not Tested
Merle	Not Tested

### Genetic Disorders

<b>X</b>	CDDY	<b>N/N</b>	Dog is negative for the CDDY mutation.
<b>X</b>	CDPA	<b>N/N</b>	Dog is negative for the CDPA mutation.
	DM		Not Tested
	MH		Not Tested
	MDR1		Not Tested
	NEwS		Not Tested
	prcd-PRA		Not Tested
	vWD1		Not Tested

### Genetic Marker Results

Run Date: Not Tested

-	-	-	-	-	-	-
AHT121	AHT137	AHT171	AHT260	AHT211	AHT253	C22-279
-	-	-	-	-	-	-
CAN-AMEL	FH2054	FH2848	INRA21	INU005	INU030	INU055
-	-	-	-	-		
REN54P11	REN162C04	REN169D01	REN169O18	REN247M23		

### Additional Comments

None

### Coat Type Testing

Hair Length	Not Tested
Hair Curl	Not Tested
Furnishings	Not Tested
Shedding	Not Tested

## PennHIP Report

Referring Veterinarian: Dr Matthew Dikeman  
 Email: bahxrays@gmail.com

Clinic Name: Brittmoore Animal Hospital  
 Clinic Address: 1236 Brittmoore Rd.  
 Houston, TX 77043  
 Phone: (713) 468-8253  
 Fax: (713) 468-8995

## Patient Information

Client: Klaus, Crystal  
 Patient Name: Franky  
 Reg. Name: Klaus Poodles Frankfurter Der  
 Freiherr Von Rot  
 PennHIP Num: 175636  
 Species: Canine  
 Date of Birth: 23 Jun 2021  
 Sex: Male  
 Date of Study: 27 Jun 2022  
 Date of Report: 28 Jun 2022

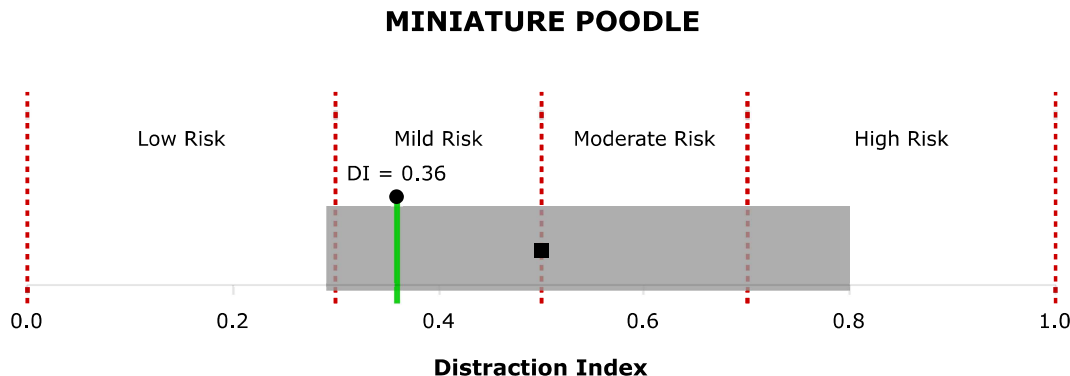
Tattoo Num: n/a  
 Patient ID: 122765  
 Registration Num: PR24262701  
 Microchip Num: 956000013949029  
 Breed: MINIATURE POODLE  
 Age: 12 months  
 Weight: 12.5 lbs/5.7 kgs  
 Date Submitted: 28 Jun 2022

## Findings

Distraction Index (DI): Right DI = 0.36, Left DI = 0.34.  
 Osteoarthritis (OA): No radiographic evidence of OA for either hip.  
 Cavitation/Other Findings: No cavitation present.

## Interpretation

Distraction Index (DI): The laxity ranking is based on the hip with the greater laxity (larger DI). In this case the DI used is 0.36.  
 OA Risk Category: The DI is between 0.31 and 0.49. This patient is at mild risk for hip OA.  
 Distraction Index Chart:



**BREED STATISTICS:** This interpretation is based on a cross-section of 440 canine patients of the MINIATURE POODLE breed in the AIS PennHIP database. The gray strip represents the central 90% range of DIs (0.29 - 0.80) for the breed. The breed average DI is 0.50 (solid square). The patient DI is the solid circle (0.36).

**SUMMARY:** The degree of laxity (DI = 0.36) falls within the central 90% range of DIs for the breed. This amount of hip laxity places the hip at a mild risk to develop hip OA. **No radiographic evidence of OA for either hip.**

**INTERPRETATION AND RECOMMENDATIONS:** No OA/Mild Risk: Low risk to develop radiographic evidence of hip OA early in life, however OA may manifest after 6 years of age or later. Risk of OA increases as DI, age, body weight, and activity level increase. OA susceptibility is breed specific, larger breeds being more susceptible. **Recommendations:** Evidence-based strategies to lower the risk of dogs developing hip OA or to treat those having OA fall into 5 modalities.\* For detailed information, consult these documents.\* Use any or all of these modalities as needed:

- 1) For acute or chronic pain prescribe NSAID PO short or long term. Amantadine can be added if response is marginal or if a neuropathic component to the pain is suspected.
- 2) Optimize body weight, keep lean, at BCS = 5/9.
- 3) Prescribe therapeutic exercise at intensities that do not precipitate lameness.
- 4) Administer polysulfated glycosaminoglycans IM or SQ, so-called DMOAD.
- 5) Feed an EPA-rich prescription diet preventatively for dogs at risk for OA or therapeutically for dogs already showing radiographic signs of OA.

At the present time there is inadequate evidence to confidently recommend any of the many other remedies to prevent or treat OA. Studies are in progress. Consider repeating radiographs at periodic intervals to determine the rate of OA progression and adjust treatment accordingly. Older dogs may show clinical signs such as chronic pain, reluctance to go stairs or jump onto the bed, and stiffness particularly after resting. It is unlikely that end-stage hip disease will develop for dogs at this risk level so surgical therapy for the pain of hip OA would rarely be indicated.

**Breeding Recommendations:** Please consult the PennHIP Manual.

\* From WSAVA Global Pain Council Guidelines and the 2015 AAHA/AAFP Pain Management Guidelines

## **COMMENTS:**

None



## ORTHOPEDIC FOUNDATION FOR ANIMALS, INC.

KLAUS POODLES FRANKFURTER DER FREIHERR VON ROT PR24232701, PD05385566  
*registered name* *registration no.*

POODLE, MINIATURE  
*sex/breed*

M

*film/test/lab #*

956000013949029  
*tattoo/microchip/DNA profile*

06/23/2021  
*date of birth*

2345391  
*application number*

12  
*age at evaluation in months*



A Not-For-Profit Organization

07/05/2022  
*date of report*

### RESULTS:

Normal cardiovascular examination via auscultation - No evidence of congenital or acquired heart disease was noted. Since acquired heart disease may develop later, these evaluation results remain valid for one year, and annual examinations are recommended to continue to monitor cardiac health.

NORMAL/CLEAR - SPECIALIST

*owner* CRYSTAL KLAUS  
SPRING TX 77386

OFA eCert



Verify QR scan

PO-BCA2820/12M/S-VPI  
O.F.A. NUMBER

*This number issued with the right to correct or  
revoke by the Orthopedic Foundation for Animals.*

*G.G. Keller, D.V.M., M.S., DACVR*

G.G.KELLER, D.V.M., M.S., DACVR  
CHIEF OF VETERINARY SERVICES

[www.ofa.org](http://www.ofa.org)

This electronic OFA certificate was generated on: 07/05/2022

This certification can be verified on the OFA website by entering the dog's registration number into the orange search box located at the top of the page or by scanning the QR code above.

If there are any errors on this certificate, please email [CORRECTIONS@OFFA.ORG](mailto:CORRECTIONS@OFFA.ORG) to request a correction.

Orthopedic Foundation for Animals, Inc.  
2300 E. Nifong Blvd.  
Columbia, MO 65201-3806

OFA website: [www.ofa.org](http://www.ofa.org)  
E-mail address: [ofa@offa.org](mailto:ofa@offa.org)  
Phone number: 573-442-0418  
Fax number: 573-875-5073

**ORTHOPEDIC FOUNDATION FOR ANIMALS, INC.**

KLAUS POODLES FRANKFURTER DER FREIHERR VON ROT PR24232701  
*registered name* *registration no.*

POODLE, MINIATURE  
*sex/breed*

659813  
*film/test/lab #*

956000013949029  
*tattoo/microchip/DNA profile*

2345391  
*application number*

04/14/2022  
*date of report*

**RESULTS:**

Based upon the exam dated 04/08/2022, this dog has been found to be free of observable inherited eye disease and has been issued an Eye Certification Registry Number which is valid for one year from the time of the exam.

M

06/23/2021  
*date of birth*

9  
*age at evaluation in months*



A Not-For-Profit Organization

PO-EYE9064/9M-VPI  
*O.F.A. NUMBER*

*This number issued with the right to correct or  
revoke by the Orthopedic Foundation for Animals.*

NORMAL

**owner** CRYSTAL KLAUS  
SPRING TX 77386

OFA eCert



Verify QR scan

*G.G. Keller, D.V.M., M.S., DACVR*

G.G.KELLER, D.V.M., M.S., DACVR  
CHIEF OF VETERINARY SERVICES

[www.ofa.org](http://www.ofa.org)

This electronic OFA certificate was generated on: 04/14/2022

This certification can be verified on the OFA website by entering the dog's registration number into the orange search box located at the top of the page or by scanning the QR code above.

If there are any errors on this certificate, please email [CORRECTIONS@OFFA.ORG](mailto:CORRECTIONS@OFFA.ORG) to request a correction.

Orthopedic Foundation for Animals, Inc.  
2300 E. Nifong Blvd.  
Columbia, MO 65201-3806

OFA website: [www.ofa.org](http://www.ofa.org)  
E-mail address: [ofa@offa.org](mailto:ofa@offa.org)  
Phone number: 573-442-0418  
Fax number: 573-875-5073

## ORTHOPEDIC FOUNDATION FOR ANIMALS, INC.

KLAUS POODLES FRANKFURTER DER FREIHERR VON ROT PR24232701, PD05385566  
*registered name* *registration no.*

POODLE, MINIATURE  
*sex/breed*

M

06/23/2021  
*date of birth*

*film/test/lab #*

956000013949029  
*tattoo/microchip/DNA profile*

12  
*age at evaluation in months*



A Not-For-Profit Organization

2345391  
*application number*

07/05/2022  
*date of report*

PO-PA9000/12M/S-VPI  
*O.F.A. NUMBER*

*This number issued with the right to correct or  
revoke by the Orthopedic Foundation for Animals.*

### RESULTS:

The results of the examination submitted to OFA indicate that no evidence of patellar luxation was recognized.

NORMAL - SPECIALIST

**owner** CRYSTAL KLAUS  
SPRING TX 77386

OFA eCert



Verify QR scan

*G.G. Keller, D.V.M., M.S., DACVR*

G.G. KELLER, D.V.M., M.S., DACVR  
CHIEF OF VETERINARY SERVICES

[www.ofa.org](http://www.ofa.org)

This electronic OFA certificate was generated on: 07/05/2022

This certification can be verified on the OFA website by entering the dog's registration number into the orange search box located at the top of the page or by scanning the QR code above.

If there are any errors on this certificate, please email [CORRECTIONS@OFFA.ORG](mailto:CORRECTIONS@OFFA.ORG) to request a correction.

Orthopedic Foundation for Animals, Inc.  
2300 E. Nifong Blvd.  
Columbia, MO 65201-3806

OFA website: [www.ofa.org](http://www.ofa.org)  
E-mail address: [ofa@offa.org](mailto:ofa@offa.org)  
Phone number: 573-442-0418  
Fax number: 573-875-5073

# OFA CANINE HEALTH INFORMATION CENTER

KLAUS POODLES FRANKFURTER DER FREIHERR VON ROT PR24232701, PD05385566

registered name

registration no.

POODLE, MINIATURE

breed

M

sex

06/23/2021

date of birth

956000013949029

tattoo/microchip/DNA profile

07/19/2022

date of report

**CHIC#: 172560**

PROGRESSIVE RETINAL ATROPHY

EYES

PATELLA

PENNHIP HIPS

## REQUIRED TESTS

OFA	PO-PRA3331/1M-PI	08/02/2021
OFA	PO-EYE9064/9M-VPI	04/08/2022
OFA	PO-PA9000/12M/S-VPI	06/27/2022
PENNHIP	LDI=.34; RDI=.36	06/27/2022

## OTHER TESTS

OFA	PO-GM2-500/1M-PI	08/02/2021
OFA	PO-NES2183/1M-PI	08/02/2021
OFA	PO-OC1055/1M-PI	08/02/2021
OFA	PO-CDY284/1M-PI	08/02/2021
OFA	PO-DM3128/1M-PI	08/02/2021
OFA	PO-VW3479/1M-PI	08/02/2021
OFA	PO-BCA2820/12M/S-VPI	06/27/2022

GM2-GANGLIOSIDOSIS

NEONATAL ENCEPHALOPATHY W/SEIZURES

OSTEOCHONDRODYSPLASIA

CHONDRODYSSTROPHY (CDDY)

DEGENERATIVE MYELOPATHY

VON WILLEBRANDS

BASIC CARDIAC

owner

CRYSTAL KLAUS  
SPRING TX 77386

OFA eCert



with QR scan

*G.G. Keller, D.V.M.*

G.G. KELLER, D.V.M., M.S., DACVR  
CHIEF OF VETERINARY SERVICES

[www.ofa.org](http://www.ofa.org)

This electronic OFA certificate was generated on: 07/19/2022

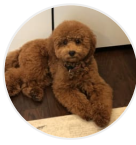
This certification can be verified on the OFA website by entering the dog's registration number into the orange search box located at the top of the page or by scanning the QR code above.

If there are any errors on this certificate, please email [CORRECTIONS@OFFA.ORG](mailto:CORRECTIONS@OFFA.ORG) to request a correction.

Orthopedic Foundation for Animals, Inc.  
2300 E. Nifong Blvd.  
Columbia, MO 65201-3806

OFA website: [www.ofa.org](http://www.ofa.org)  
E-mail address: [ofa@offa.org](mailto:ofa@offa.org)  
Phone number: 573-442-0418  
Fax number: 573-875-5073





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

**Not expressed (K<sup>B</sup>k<sup>Y</sup>)**



## TRAITS: COAT COLOR (CONTINUED)

TRAIT	RESULT
-------	--------

### Intensity Loci LINKAGE

Areas of a dog's coat where dark (black or brown) pigment is not expressed either contain red/yellow pigment, or no pigment at all. Five locations across five chromosomes explain approximately 70% of red pigmentation "intensity" variation across all dogs. Dogs with a result of **Intense Red Pigmentation** will likely have deep red hair like an Irish Setter or "apricot" hair like some Poodles, dogs with a result of **Intermediate Red Pigmentation** will likely have tan or yellow hair like a Soft-Coated Wheaten Terrier, and dogs with **Dilute Red Pigmentation** will likely have cream or white hair like a Samoyed. Because the mutations we test may not directly cause differences in red pigmentation intensity, we consider this to be a linkage test.

**Any pigmented hair likely apricot or red (Intense Red Pigmentation)**

### A Locus (ASIP)

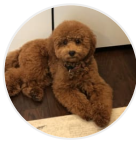
The A Locus controls switching between black and red pigment in hair cells, but it will only be expressed in dogs that are not **ee** at the E Locus and are **k<sup>Y</sup>k<sup>Y</sup>** at the K Locus. Sable (also called "Fawn") dogs have a mostly or entirely red coat with some interspersed black hairs. 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<sup>Y</sup>a<sup>t</sup>)**

### D Locus (MLPH)

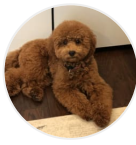
The D locus result that we report is determined by two different genetic variants that can work together to cause diluted pigmentation. These are the common **d** allele, also known as "**d1**", and a less common allele known as "**d2**". Dogs with two **d** alleles, regardless of which variant, will 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 in certain breeds, dilute dogs have a higher incidence of Color Dilution Alopecia. Dogs with one **d** allele will not be dilute, but can pass the **d** allele on to their puppies. To view your dog's **d1** and **d2** test results, click the "SEE DETAILS" link in the upper right hand corner of the "Base Coat Color" section of the Traits page, and then click the "VIEW SUBLOCUS RESULTS" link at the bottom of the page.

**Not expressed (DD)**



## TRAITS: COAT COLOR (CONTINUED)

TRAIT	RESULT
<b>Cocoa (HPS3)</b>  Dogs with the <b>coco</b> genotype will produce dark brown pigment instead of black in both their hair and skin. Dogs with the <b>Nco</b> genotype will produce black pigment, but can pass the <b>co</b> allele on to their puppies. Dogs that have the <b>coco</b> genotype as well as the <b>bb</b> genotype at the B locus are generally a lighter brown than dogs that have the <b>Bbb</b> or <b>BB</b> genotypes at the B locus.	<b>No co alleles, not expressed (NN)</b>
<b>B Locus (TYRP1)</b>  Dogs with two copies of the <b>b</b> allele produce brown pigment instead of black in both their hair and skin. Dogs with one copy of the <b>b</b> allele will produce black pigment, but can pass the <b>b</b> allele on to their puppies. E Locus <b>ee</b> dogs that carry two <b>b</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".	<b>Likely black colored nose/feet (BB)</b>
<b>Saddle Tan (RALY)</b>  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 <b>ll</b> 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 <b>a<sup>t</sup></b> allele, so dogs that do not express <b>a<sup>t</sup></b> are not influenced by this gene.	<b>Not expressed (NI)</b>
<b>S Locus (MITF)</b>  The S Locus determines white spotting and pigment distribution. MITF controls where pigment is produced, and an insertion in the MITF gene causes a loss of pigment in the coat and skin, resulting in white hair and/or pink skin. Dogs with two copies of this variant will likely have breed-dependent white patterning, with a nearly white, parti, or piebald coat. Dogs with one copy of this variant will have more limited white spotting and may be considered flash, parti or piebald. This MITF variant does not explain all white spotting patterns in dogs and other variants are currently being researched. Some dogs may have small amounts of white on the paws, chest, face, or tail regardless of their S Locus genotype.	<b>Likely solid colored, but may have small amounts of white (Ssp)</b>



## 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 "non-expressing" merle, meaning that the merle pattern is very subtle or not at all evident in their coat. 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.

**No merle alleles (mm)**

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.

### R Locus (USH2A) LINKAGE

The R Locus regulates the presence or absence of the roan coat color pattern. Partial duplication of the USH2A gene is strongly associated with this coat pattern. Dogs with at least one **R** allele will likely have roaning on otherwise uniformly unpigmented white areas. Roan appears in white areas controlled by the S Locus but not in other white or cream areas created by other loci, such as the E Locus with **ee** along with Dilute Red Pigmentation by I Locus (for example, in Samoyeds). Mechanisms for controlling the extent of roaning are currently unknown, and roaning can appear in a uniform or non-uniform pattern. Further, non-uniform roaning may appear as ticked, and not obviously roan. The roan pattern can appear with or without ticking.

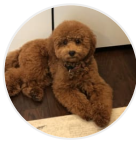
**Likely no impact on coat pattern (rr)**

### H Locus (Harlequin)

This pattern is recognized in Great Danes and causes dogs to have a white coat with patches of darker pigment. A dog with an **Hh** result will be harlequin if they are also **M\*m** or **M\*M\*** at the M Locus and are not **ee** at the E locus. Dogs with a result of **hh** will not be harlequin. This trait is thought to be homozygous lethal; a living dog with an **HH** genotype has never been found.

**No harlequin alleles (hh)**





## TRAITS: OTHER COAT TRAITS

TRAIT	RESULT
-------	--------

### Furnishings (RSPO2) 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 furnished**  
(mustache, beard,  
and/or eyebrows) (FF)

### 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 RSPO2 (the furnishings gene) tend to be low shedders regardless of their genotype at this gene.

**Likely light shedding**  
(TT)

### 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)**

### 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)**