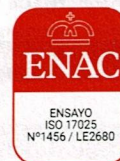




ANALYSIS REPORT GENETIC COAT COLOR ANALYSIS (243)



Report Nr:	4412761
Date of analysis:	29/05/2024

Sample code:	EQ-AAR3660
Sample type:	Blood

Client

Name:	Libro Genealógico PRE ANCCE
Address:	Edif. Indotorre · Avda. del Reino Unido 11, pl. 3ª 2
City:	41012 - Sevilla - Sevilla

Information Provided by the Client

Horse

Name:	ELITE DEL JARAMA	Sex:	Male
Microchip:	10010000724120002302477	UELN:	724015140305451

Method of Analysis

Internal laboratory procedure PL03: COAT COLOR ANALYSIS. Revision 10 (04/05/2023).

This study analyzes the two genes that are responsible for the type and location of pigment (Extension and Agouti), the dilution factors of Cream and Pearl, as well as the gene that is responsible for the appearance of the gray coat color (Grey). PCR of the specific regions for each marker is performed as well as an analysis of polymorphisms.

Results

Grey	gg
Agouti	aa
Extension	EE
Cream	CC
Pearl	NN

Julia Poyato Bonilla, PhD
Lab Technician
29 May 2024

Observations

The result of this report only affects the sample received and analyzed by this Laboratory. Not only the ID sample but also horse-related information have been provided by the end client, therefore, the Laboratory is not responsible for these. No part of this report may be altered or reproduced, whether in part or in full, using any means.

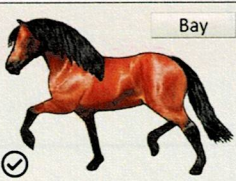
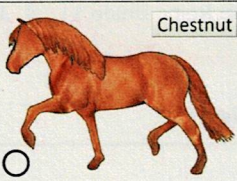
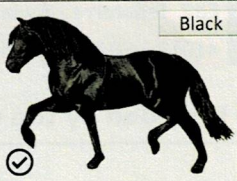
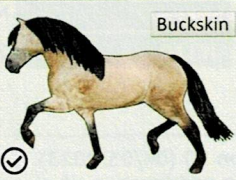
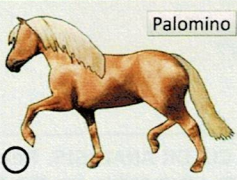
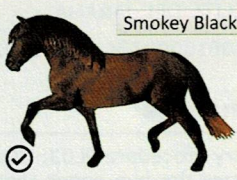
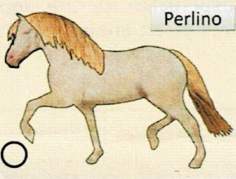
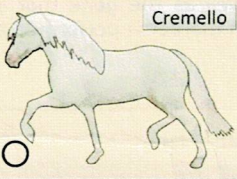
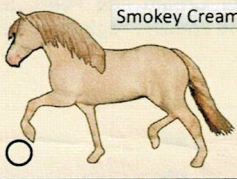
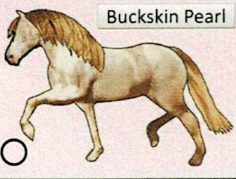
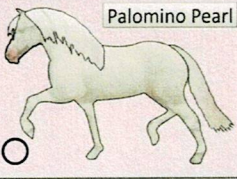
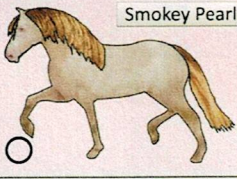
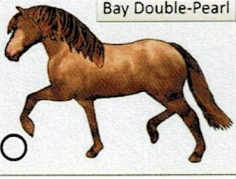
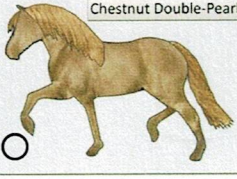
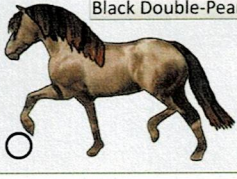
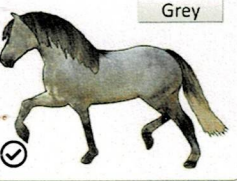
GENETIC COAT COLOUR*

Black

* In addition to the said genes, there are others that have not been contemplated in this study, and that could alter the phenotype. Coat colours were updated as of 11/03/2020. For those names that have changed, the former name appears in parenthesis.

Analyzing Descendants

The horse analyzed, based on its genotype and the genotype it is crossed with, and without taking into account other genes involved in coat colour, could have progeny with the following coat colours:

	Bay Line E_ A_	Chestnut Line ee, _	Black line E_ aa
Basic coat colours gg,_,_,CC,NN gg,_,_,CC,NPrI	 Bay	 Chestnut	 Black
Simple Cream dilution gg,_,_,CCr,NN	 Buckskin	 Palomino	 Smokey Black
Double Cream dilution gg,_,_,CrCr,NN	 Perlino	 Cremello	 Smokey Cream
Cream-Pearl dilution gg,_,_,CCr,NPrI	 Buckskin Pearl	 Palomino Pearl	 Smokey Pearl
Double Pearl dilution gg,_,_,CC,PrPrI	 Bay Double-Pearl	 Chestnut Double-Pearl	 Black Double-Pearl
Dominant Grey G_ _ _ _	 Grey	<p>This diagram shows representative examples of each genotype, although all of them are subject to variations in shades that, in some cases, may be very similar to the examples of other genotypes.</p>	

Changes in Coat Colour Names

There have been the following changes in Coat Colour Names *:

GENOTYPES	PREVIOUS NAME	CURRENT NAME
Horses with a base colour of Bay with double Cream dilution genes (ggA_E_CrCrNN)**	Pearl	Perlina
Horses with a base colour of Bay with Cream and Pearl dilution genes (ggA_E_CCrNPrl)	Perlina	Buckskin Pearl
Horses with a base colour of Chestnut with Cream and Pearl dilution genes (gg__eeCCrNPrl)	Perlina	Palomino Pearl
Horses with a base colour of Black with Cream and Pearl dilution genes (ggaaE_CCrNPrl)	Perlina	Smokey Pearl
Horses with a base colour of Bay with double Pearl dilution genes (ggA_E_CCPrlPrl)	Isabella	Bay Double-Pearl
Horses with a base colour of Chestnut with double Pearl dilution genes (gg eeCCPrIprI)	Isabella	Chestnut Double-Pearl
Horses with a base colour of Black with double Pearl dilution genes (ggaaE_CCPrlPrl)	Isabella	Black Double-Pearl

* All other coat colours retain their names.

** A_ = AA or Aa / E_ = EE or Ee

Genes Involved in Determining the Coat Colour

GENE	EXAMPLE	PROGENY
Grey	GG The horse will be Grey, independently of the rest of the genetic formula. The loss of pigment and progression towards a white coat is much faster.	All descendants will be Grey, independently of the mating.
	Gg Pigmentation is masked. The horse will be Grey regardless of the rest of the genetic formula. The lightening process is less consistent and re-pigmentation speckles (flea-bitten) are more likely to appear.	This horse could have both Grey and Non-Grey progeny, depending on the mate used.
	gg Pigmentation is not masked. The horse will be phenotypically NOT GREY, presenting the coat colour (phenotype) determined by the rest of the genes making up the genetic formula (genotype).	This horse could have both Grey and Non-Grey progeny, depending on the mate used.
GENE	EXAMPLE	PROGENY
Extension	EE Black pigmentation is produced in areas which are not restricted by the Agouti gene. In the absence of "diluted genes" (CCr or CrCr, for example), the horse could be Bay or Black, depending on the location of the pigment.	Provides all descendants with Black pigmentation in those areas that are not restricted by the agouti gene. Horses with this combination cannot have Chestnut progeny, whatever the genotype of the mate.
	Ee Black pigmentation is produced in areas which are not restricted by the Agouti gene. In the absence of "diluted genes" (CCr or CrCr, for example), the horse could be Bay or Black depending on the location of the pigments.	Provides 50% of all descendants with the production of Black pigments in areas that are not restricted by the agouti gene. Horses with this combination may have Chestnut, Bay or Black progeny.
	ee Only produces red pigment. A Chestnut horse in absence of diluting genes (CCr or CrCr, for example).	Only provides descendants with red pigment.
GENE	EXAMPLE	PROGENY
Agouti	AA The presence of "A" restricts Black pigment to manes, tails and lower-legs. The horse will be Bay if and when it produces Black pigment (EE or Ee) and when diluted genes are absent (CCr and CrCr, for example).	This horse cannot have offspring with a Black coat, no matter what its mate's genotype may be.
	Aa The presence of "A" restricts Black pigment to manes, tails and lower-legs. The horse will be Bay if and when it produces Black pigment (EE or Ee) and when diluted genes are absent (CCr and CrCr, for example).	This horse could have Black or Bay progeny, as long as black pigment can be produced (EE or Ee)
	aa Black pigment is distributed all over the body. The horse will always be Black when Black pigment is produced (EE or Ee) and in the absence of diluted genes (CCr and CrCr, for example).	Only contributes information to produce Black progeny, as long as black pigment can be produced (EE or Ee).

GENE		EXAMPLE	PROGENY
Cream - Pearl	CC NN	There is no colour dilution. The horse will be Bay, Chestnut or Black, depending on basic coat colour and in the absence of other dilution genes.	Does not contribute dilution genes to its progeny.
	CCr NN	There is a simple colour dilution. The horse will be Buckskin, Palomino or Smokey Black, depending on the basic coat colour and in the absence of other dilution genes.	50% of all progeny will have the Cream dilution allele.
	CrCr NN	There is a double colour dilution. The horse will be Perlino, Cremello or Smokey Cream, depending on the basic coat colour and in the absence of other dilution genes.	All progeny will have at least one dilution gene and will be Buckskin, Palomino or Smokey Black depending on the basic coat colour, and in the absence of other dilution genes.
	CC NPrI	A copy of the altered sequence has been detected. There is no colour dilution. The horse will be Bay, Chestnut or Black, depending on the basic coat colour and in the absence of other dilution genes.	50% of the progeny will have the Pearl dilution allele.
	CC PrIPrI	Both copies of the sequence are altered. The horse's phenotype is Bay Double-Pearl, Black Double-Pearl, or Chestnut Double-Pearl, depending on the basic coat colour and in the absence of other dilution genes.	All progeny would have at least one dilution gene, thus its phenotype would depend on the presence of other dilution genes.
	CCr NPrI	The horse would have a Buckskin Pearl, Palomino Pearl or Smokey Pearl phenotype, depending on the basic coat colour and the absence of other dilution genes.	50% of the progeny would have the Cream dilution allele while the other 50% would have the Pearl dilution allele.

Two different mutations present in the same gene are studied. These represent different alleles and they are not inherited independently.

Basic and Diluted Coat Colours

Basic Coat Colours

Bay, Chestnut and Black: to generate one of these coat colours, the Grey mutation must not be present at either Grey locus and there must not be any Cream or Pearl dilution alleles.

- **Black:** There is at least one allele that produces eumelanin (EE or Ee, symbolized as E_) and no partial pigment accumulation allele at the Agouti locus. The genotype would be aa.
- **Bay:** There is at least one eumelanin production allele (EE or Ee, symbolized as E_) and at least one partial pigment accumulation allele (AA or Aa, symbolized as A_)
- **Chestnut:** the requirement for this coat colour is that there is no eumelanin or black pigment production allele. The genotype would be ee in combination with AA, or Aa, or aa at the Agouti locus.

Diluted Coat Colours

The presence of Cream or Pearl (symbolized as Cr or PrI) dilution factors and their combinations generate the following phenotypes:

- In the absence of Pearl, the Cream dilution in horses that are Bay, Chestnut or Black generate *Buckskin* or *Perlino*, *Palomino* or *Cremello* and *Smokey Black* or *Smokey Cream* respectively.
- The combination of a Cream dilution and a Pearl dilution on Bay, Chestnut or Black horses generates *Buckskin Pearl*, *Palomino Pearl* or *Smokey Pearl*. This phenotype is similar to the one generated by *double Cream dilution*.
- The presence of double Pearl dilution gives rise to *Bay Double-Pearl*, *Chestnut Double-Pearl*, or *Black Double-Pearl* phenotypes.
- In horses with double dilution CrCrNN and CCrNPrI, whose skin is pink, the presence of G alleles may be masked by the extreme lack of pigmentation.
- The presence of multiple dilution factors produces horses with very light coat colours, which are sometimes confused with albinos.

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* National Accreditation Body

Basic prediction for progeny

The following table shows the phenotypes, as well as the proportions for each coat colour expected upon breeding with the horse. In this case, if it breeds with Bay homozygotes Bay, 100% of its progeny will have Bay coats.

ggAAEECCNN	Bay	100 %	Bay	100 %
ggAAEECCrNN	Bay	50 %	Buckskin	50 %
ggAAEECCNPrl	Bay	100 %	Bay	100 %
ggAAEECCrCrNN	Buckskin	100 %	Buckskin	100 %
ggAAEECCrNPrl	Buckskin	50 %	Bay	50 %
ggAAEECCPrIPrl	Bay	100 %	Bay	100 %
ggAaEECCNN	Black	50 %	Bay	50 %
ggAaEECCrNN	Black	25 %	Smokey Black	25 %
ggAaEECCNPrl	Black	50 %	Bay	50 %
ggAaEECCrCrNN	Smokey Black	50 %	Buckskin	50 %
ggAaEECCrNPrl	Smokey Black	25 %	Black	25 %
ggAaEECCPrIPrl	Black	50 %	Bay	50 %
ggaaEECCNN	Black	100 %	Smokey Black	50 %
ggaaEECCrNN	Black	50 %	Smokey Black	50 %
ggaaEECCNPrl	Black	100 %	Smokey Black	100 %
ggaaEECCrCrNN	Smokey Black	50 %	Black	50 %
ggaaEECCrNPrl	Black	100 %	Black	100 %
ggAAEECCNN	Bay	100 %	Bay	100 %
ggAAEECCrNN	Bay	50 %	Buckskin	50 %
ggAAEECCNPrl	Bay	100 %	Bay	100 %
ggAAEECCrCrNN	Buckskin	100 %	Buckskin	100 %
ggAAEECCrNPrl	Buckskin	50 %	Bay	50 %
ggAAEECCPrIPrl	Bay	100 %	Bay	100 %
ggAaEECCNN	Black	50 %	Bay	50 %
ggAaEECCrNN	Black	25 %	Smokey Black	25 %
ggAaEECCNPrl	Black	50 %	Bay	50 %
ggAaEECCrCrNN	Smokey Black	50 %	Buckskin	50 %
ggAaEECCrNPrl	Smokey Black	25 %	Black	25 %
ggAaEECCPrIPrl	Black	50 %	Bay	50 %
ggaaEECCNN	Black	100 %	Smokey Black	50 %
ggaaEECCrNN	Black	50 %	Smokey Black	50 %
ggaaEECCNPrl	Black	100 %	Smokey Black	100 %
ggaaEECCrCrNN	Smokey Black	50 %	Black	50 %
ggaaEECCrNPrl	Black	100 %	Black	100 %
ggAAEECCNN	Bay	100 %	Bay	100 %
ggAAEECCrNN	Bay	50 %	Buckskin	50 %
ggAAEECCNPrl	Bay	100 %	Bay	100 %
ggAAEECCrCrNN	Buckskin	100 %	Buckskin	100 %
ggAAEECCrNPrl	Buckskin	50 %	Bay	50 %
ggAAEECCPrIPrl	Bay	100 %	Bay	100 %
ggAaEECCNN	Black	50 %	Bay	50 %

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ggAaEeCCrNN	Black 25 %	Smokey Black 25 %	Bay 25 %	Buckskin 25 %
ggAaEeCCNPrl	Black 50 %	Bay 50 %		
ggAaEeCCrNN	Smokey Black 50 %	Buckskin 50 %		
ggAaEeCCrNPrl	Smokey Black 25 %	Black 25 %	Buckskin 25 %	Bay 25 %
ggAaEeCCPrIPrl	Black 50 %	Bay 50 %		
ggaaEeCCNN	Black 100 %			
ggaaEeCCrNN	Black 50 %	Smokey Black 50 %		
ggaaEeCCNPrl	Black 100 %			
ggaaEeCCrNN	Smokey Black 100 %			
ggaaEeCCrNPrl	Smokey Black 50 %	Black 50 %		
ggaaEeCCPrIPrl	Black 100 %			
ggAAeeCCNN	Bay 100 %			
ggAAeeCCrNN	Bay 50 %	Buckskin 50 %		
ggAAeeCCNPrl	Bay 100 %			
ggAAeeCCrNN	Buckskin 100 %			
ggAAeeCCrNPrl	Buckskin 50 %	Bay 50 %		
ggAAeeCCPrIPrl	Bay 100 %			
ggAaeeCCNN	Black 50 %	Bay 50 %		
ggAaeeCCrNN	Black 25 %	Smokey Black 25 %	Bay 25 %	Buckskin 25 %
ggAaeeCCNPrl	Black 50 %	Bay 50 %		
ggAaeeCCrNN	Smokey Black 50 %	Buckskin 50 %		
ggAaeeCCrNPrl	Smokey Black 25 %	Black 25 %	Buckskin 25 %	Bay 25 %
ggAaeeCCPrIPrl	Black 50 %	Bay 50 %		
ggaaeeCCNN	Black 100 %			
ggaaeeCCrNN	Black 50 %	Smokey Black 50 %		
ggaaeeCCNPrl	Black 100 %			
ggaaeeCCrNN	Smokey Black 100 %			

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ggaaeeCCrNPrl	Smokey Black	Black	50 %	
ggaaeeCCrNPrl	Black			
ggaaeeCCrNPrl	100 %			
GgAAEECCNN	Bay	Grey		
GgAAEECCrNN	Bay	Buckskin	50 %	Grey
GgAAEECCrNN	25 %	25 %		50 %
GgAAEECCrNPrl	Bay	Grey		
GgAAEECCrNPrl	Buckskin	Grey	50 %	
GgAAEECCrNPrl	50 %	50 %		
GgAAEECCrNPrl	Buckskin	Bay	25 %	Grey
GgAAEECCrNPrl	25 %	Grey	50 %	
GgAAEECCrNPrl	50 %	50 %		
GgAAEECCrNPrl	Black	Bay	25 %	Grey
GgAAEECCrNPrl	Black	Smokey Black	50 %	
GgAAEECCrNPrl	12.5 %	12.5 %		Buckskin
GgAAEECCrNPrl	25 %	25 %		12.5 %
GgAAEECCrNPrl	25 %	25 %		50 %
GgAAEECCrNPrl	Smokey Black	Buckskin	50 %	
GgAAEECCrNPrl	25 %	25 %		50 %
GgAAEECCrNPrl	Smokey Black	Black	12.5 %	Buckskin
GgAAEECCrNPrl	12.5 %	12.5 %		12.5 %
GgAAEECCrNPrl	Black	Bay	25 %	Grey
GgAAEECCrNPrl	25 %	25 %		50 %
GgAAEECCrNPrl	Black	Grey	50 %	
GgAAEECCrNPrl	Black	Smokey Black	Grey	
GgAAEECCrNPrl	25 %	25 %		50 %
GgAAEECCrNPrl	Black	Grey	50 %	
GgAAEECCrNPrl	Smokey Black	Grey	50 %	
GgAAEECCrNPrl	50 %	50 %		
GgAAEECCrNPrl	Smokey Black	Black	50 %	Grey
GgAAEECCrNPrl	25 %	25 %		50 %
GgAAEECCrNPrl	Black	Grey		
GgAAEECCrNPrl	50 %	50 %		
GgAAEECCrNPrl	Bay	Grey	50 %	
GgAAEECCrNPrl	Bay	Buckskin	25 %	50 %
GgAAEECCrNPrl	Bay	Grey		
GgAAEECCrNPrl	Buckskin	Grey	50 %	
GgAAEECCrNPrl	50 %	50 %		
GgAAEECCrNPrl	Buckskin	Bay	25 %	Grey
GgAAEECCrNPrl	25 %	25 %		50 %
GgAAEECCrNPrl	Bay	Grey	50 %	
GgAAEECCrNPrl	Black	Bay	25 %	Grey
GgAAEECCrNPrl	25 %	25 %		50 %

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GgAaEeCCrNN	Black 12.5 %	Smokey Black 12.5 %	Bay 12.5 %	Buckskin 12.5 %	Grey 50 %
GgAaEeCCNPrl	Black 25 %	Bay 25 %	Grey 50 %		
GgAaEeCrCrNN	Smokey Black 25 %	Buckskin 25 %	Grey 50 %		
GgAaEeCCrNPrl	Smokey Black 12.5 %	Black 12.5 %	Buckskin 12.5 %	Bay 12.5 %	Grey 50 %
GgAaEeCCPrIPrl	Black 25 %	Bay 25 %	Grey 50 %		
GgaaEeCCNN	Black 50 %	Grey 50 %			
GgaaEeCCrNN	Black 25 %	Smokey Black 25 %	Grey 50 %		
GgaaEeCCNPrl	Black 50 %	Grey 50 %			
GgaaEeCrCrNN	Smokey Black 50 %	Grey 50 %			
GgaaEeCCrNPrl	Smokey Black 25 %	Black 25 %	Grey 50 %		
GgaaEeCCPrIPrl	Black 50 %	Grey 50 %			
GgAAeECCNN	Bay 50 %	Grey 50 %			
GgAAeECCrNN	Bay 25 %	Buckskin 25 %	Grey 50 %		
GgAAeECCNPrl	Bay 50 %	Grey 50 %			
GgAAeECCrCrNN	Buckskin 50 %	Grey 50 %			
GgAAeECCrNPrl	Buckskin 25 %	Bay 25 %	Grey 50 %		
GgAAeECCPrIPrl	Bay 50 %	Grey 50 %			
GgAaeECCNN	Black 25 %	Bay 25 %	Grey 50 %		
GgAaeECCrNN	Black 12.5 %	Smokey Black 12.5 %	Bay 12.5 %	Buckskin 12.5 %	Grey 50 %
GgAaeECCNPrl	Black 25 %	Bay 25 %	Grey 50 %		
GgAaeECCrCrNN	Smokey Black 25 %	Buckskin 25 %	Grey 50 %		
GgAaeECCrNPrl	Smokey Black 12.5 %	Black 12.5 %	Buckskin 12.5 %	Bay 12.5 %	Grey 50 %
GgAaeECCPrIPrl	Black 25 %	Bay 25 %	Grey 50 %		
GgaeeECCNN	Black 50 %	Grey 50 %			
GgaeeECCrNN	Black 25 %	Smokey Black 25 %	Grey 50 %		
GgaeeECCNPrl	Black 50 %	Grey 50 %			
GgaeeECCrCrNN	Smokey Black 50 %	Grey 50 %			



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GgaeeeCCrNPri	Smokey Black	Black	Grey
	25 %	25 %	50 %
GgaeeeCCPrIPri	Black	Grey	
	50 %	50 %	

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