Horse Coat Color Genetics and Identification

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Basics

• Base colors: Black, Bay, Chestnut
• Extension (E) - whether or not true black pigment (eumelanin) can be formed in the hair
• Agouti (A) - controls the restriction of eumelanin in the coat – usually points
• Gower’s Hypothesis: Agouti locus also affects chestnut shade
  – Multiple Alleles: A⁺ dominant over all, A⁻ recessive to all
    • A⁺/-- Light Chestnut
    • Aᴬ/-- Red Chestnut – Aᴬ/Aᴬ being reddest
    • Aᵗ/-- Standard Chestnut
    • Aᵃ/Aᵃ – Liver Chestnut
• Grey (G) – dominant. horse born non-grey but whitens to grey or fleabitten grey with age.
Dilutions

- **Dun (D)** - controls the saturation or intensity of pigment in the coat, is simple dominant, affects eumelanin and pheomelanin (red/yellow pigment) equally, does not affect eyes or skin.
- **Cream (Cr)** - incomplete dominant allele - distinct dosage effect
  - 1= it dilutes "red" pigment to yellow or gold (stronger effect on the mane and tail), but not black. Minimal impact on eye color.
  - 2= both red and black pigments affected, will be blue-eyed red hairs = cream black hairs = reddish
- **Champagne (Ch)** - simple dominant.
  - Distinctive traits: hazel eyes and pinkish, freckled skin
  - Red hair = gold, black = chocolate. (chestnut = gold champagne, bay = amber champagne, seal brown = sable champagne, black = classic)
- **Silver (Z)** - dominant, dilutes eumelanin
  - mane/tail = flaxen,
  - body = chocolate (bays retain red color since no eumelanin)
  - Often associated with eye defects
- **Pearl (Barlink Factor) (Prl)** – dilution, recessive.
  - Pale skin, blue/green eyes
  - Uniform apricot color
White markings

- **Tobiano (TO)** – dominant
  - Pinto patterning.
    - White usually rounded with vertical orientation.
    - White extends across back, face/tail usually dark.

- **Frame Overo (O, Fr, or FrO)** – dominant.
  - White has horizontal orientation, jagged edges.
  - White face. Colored legs. White not cross back.
  - Associated with lethal white.

- **White (W)** – dominant.
  - Lethal when homozygous.
  - Pink skin, white hair, brown eyes. White from birth.

- **Roan (Rn)** – dominant.
  - White hairs mixed in with base coat.

- **Sabino (Sb)** – dominant.
  - Paint/roan markings.
  - Gene complex. Mostly not understood.
  - **Sb1** only one currently detected. Does not cause sabino in Arabs or Clydes.

- **Chrome** – unknown. Term used to describe white markings on face and legs.
Apaloosa

- Varnish Roan (Leopard Complex, Lp) is “master switch”
  - Incomplete dominant
- One copy = spotted
- Two copies = few spots
- All with Lp will show classic Apaloosa characteristics:
  - Mottled skin
  - White sclera visible
  - Striped hooves
Pangaré

- Pangaré features pale hair around the eyes and muzzle and underside of the body
  - pale areas can extend up to the flanks, throat and chest, behind the elbows, in front of the stifle, and up the buttock
  - The color of these lighter areas depends on the underlying color and ranges from off-white to light
  - most often found in primitive breeds
• E/- a/a d/d ch/ch z/z cr/cr prl/prl
• Must be completely black - white on face and some on legs allowed but BLACK POINTS
• Black skin
• Dark eyes
Bay

- E/- A/- d/d ch/ch z/z cr/cr prl/prl
- Chestnut body black points.
- White on legs and face allowed
- Sometimes primitive markings (Wild Bay)
- Black skin
- Dark eyes
- e/e +/- d/d ch/ch +/- cr/cr prl/prl
- Black skin
- White allowed on face/legs
- Color varies from orange to dark brown (liver chestnut)
  - Mechanism for variance unknown
- Dark eyes

Chestnut
• Genetically chestnut
  - Propossed «Sorrel gene»
• Chestnut body, light mane and tail
Bay Dun

Tan body, black points
Black skin
Often primitive markings - always dorsal stripe
White uncommon on face and legs
Dark eyes
Red Dun

- e/e -/- D/- ch/ch -/- cr/cr prl/prl
- Dun on chestnut
- Rust coat with red points
- Black skin
- Rarely primitive markings - always dorsal stripe
- White uncommon on face and legs
- E/- a/a D/- ch/ch z/z cr/cr prl/prl
- Often primitive markings – always dorsal stripe
- Dun on black
- Dark Skin
- Dark eyes
- White uncommon on face and legs

Grullo
- E/- A/- d/d CH/- z/z cr/cr prl/prl
- Champagne on bay
- Similar in appearance to red dun
  - No dorsal stripe, light points
- Light eyes
- Pink skin - freckles

Amber Champagne
- e/e -/- d/d CH/- -/- cr/cr prl/prl
- Champagne on Chestnut
- Mane and tail can also be darker than body (Dark Gold)
- Zippos Millenium Bug

Gold Champagne
Classic Champagne

- E/- a/a d/d CH/- z/z cr/cr prl/prl
- Rarest
- Base color black
- Black/tan body, dark red points

Classc Champagne
Silver Bay

- E/-  A/-  d/d  ch/ch  Z/-  cr/cr  prl/prl
- Not very common
- Chestnut body, silver points
- Black skin
• E/- a/a d/d ch/ch Z/- cr/cr prl/prl
• Famous in Rocky Mountain Horses and Icelandics
• Chocolate body and silver points
• Black skin

Silver Black
Smoky Black

- Slightly lighter than black – may look liver chestnut/dark bay
- Red pigment in loin, ears, and hair tips
Smokey Cream

- Ivory/rusty color
- This horse has tobiano on top
Buckskin

- E/- A/- d/d ch/ch z/z CR/cr prl/prl
- Dun on Bay with single added Cream
  - Single dilution
- NO DORSAL STRIPE
- No primitive markings
- Often lighter in color than Dun
Perlino

- E/- A/- d/d ch/ch z/z CR/CR prl/prl
- Double cream on bay
- Red highlights in mane and tail
  - left over black pigment
- Pink skin
- Blue eyes not uncommon
Palomino

- Palominos in Spanish Breeds tend to be much lighter—almost cream color
- Golden body (not chestnut), flaxen mane and tail
- Grey skin
- Dark eyes
- Dappling not characteristic
Cremello

- e/e \(-/-\) d/d ch/ch z/z CR/CR prl/prl
- Uniform cream color
- Pink skin
- Blue eyes
Bay Pearl

- E/- A/- d/d ch/ch z/z cr/cr PRL/prl
- Recessive — need 2 copies
- Guarantee genotype
Bay Double Pearl

• E/~ A/~ d/d ch/ch z/z
cr/cr PRL/PRL
• RARE!!!
• Uniform apricot color
• Dark tan eyes
Apricot Chestnut Double Pearl

- e/e —/— d/d
- ch/ch z/z cr/cr
- PRL/PRL
- RARE!!! (Iberian/QH/PH)
Black Double Pearl

- E/- a/a d/d ch/ch z/z cr/cr PRL/PRL
- RARE!!!!
- Some black pigment remains at roots of mane and tail
Red Roan

- Even mix of white and red hairs on body
- No lethality in question
- Present at birth
- Corn marks:
  - spots where skin has been damaged. Hair grows in normal color.
Bay Roan

- Roan on bay
- Inverted black legs
Blue Roan

- Roan on black
- Sometimes called blue corn
• White pattern over any base coat
• Usually white legs and large, rounded spots
• White usually crosses the back
Splash White

- AKA Overo
- White comes up from legs, ‘war shield’ on neck, white face
- Often blue eyes
- Tests are going on now- (1/27/12)
  - Finishing as of 2/28/12
- Three identified genes- SW₁, SW₂, SW₃
- Eyes can be strikingly blue
- Mini is homozygous splash 1 (SW₁-SW₁) and shows classic splash
SW2

- Pattern slightly different from Classic Splash – note how white is confined to legs and face.
- Heterozygous SW1 and SW2
- Colt negative SW1 heterozygous SW2
• Horse shows loud sabino
• Minimal sabino often just at girth
• Jagged edges - little spots
Seal Brown

- Caused by $A^t$—needs to be either $A^t/A^t$ or $A^t/a$ with $E$.
- Black body with light elbows, loins, muzzle, and eyes.
Varnish Roan

- Has Lp but not genes for spotting
- On top of base coat
  - Changes with age
- Characterized by dark patches on upper legs, neck, and cheekbones.
Leopard Appaloosa

- Black can partially suppress leopard
- Even spotting over whole body
Suppressed Leopard

(Before Supression)
Suppressed Leopard
(After Suppression)
Suppressed Leopard
Leopard Double Varnish

- Two copies = no spots but white coat
Blanket Appaloosa

- Homozygous blanket appaloosas end up as snowcaps.
Blanket Double Varnish
• Dark skin
• Fleabitten or standard
• Born any color, grey out as age
• Dominant over pretty much anything else
Bloody Shoulder

- Rare – usually in Arabs
- Heavy concentration of fleabitten spots on any part of body
- Common spots are shoulder, neck, barrel, loin, back.
White

- W- Dominant white
- Many forms - white to sabino look-alike
- Not really understood yet
- Suspected Lethal when homozygous
- No pigment except in eyes
- White may fade over time
Works Cited

• The majority of photos copyright Leslie Kathman, Elizabeth Azevedo, and Bob Langrish- others copyright their respective owners. Used for educational purposes only.
• The Equine Tapestry – Leslie Kathman
• Wikipedia
• Double-dilute.com
• Horse-genetics.com
• International Champagne Horse Registry
• The Horse
Guessing game

• WARNING: this game is meant to demonstrate the variance in horse coat color and to show some unique colors. This was not meant to be easy.
Cloud

• Things of Note:
  – Spanish Mustang
  – Stallion
  – Palomino dam
  – Black sire
  – Has Palomino offspring, brown offspring, buckskin offspring

• My assessment: Palomino
Dommino

- Things of note:
  - Aged Gelding
  - Gelding is Swedish Warmblood
  - No white on near side
  - Small star on forehead

- My assessment: Black
Blue-Eyed Dream

• Things of note:
  – Aged Mare
  – Mare has QH or Paint background
  – One blue eye on off side
  – Off fore has white sock

• My assessment: SW2
Mikey

• Things of note:
  – Mid-Age Gelding
  – two dark eyes
  – Stripe on face
  – Arabian Background

• My assessment: Grey
Little Blonde Nightmare

Things of note:
- Mare
- Two dark eyes
- Asymmetrical white on face
- QH background

My assessment: Palomino
Take the Money and Run

• Things of Note:
  – 9 year old gelding
  – No white on off side
  – Two dark eyes
  – Thoroughbred background

• My assessment: Seal Brown
Hollycroft Bandmaster

- Things of Note:
  - Gelding
  - White stripe on face
  - Two dark eyes
  - Morgan background

- My assessment: Chestnut
Nesha

• Things of Note:
  – 9 year old Mare
  – No white on face
  – No white on off sided
  – Not dorsal stripe
  – Arabian background

• My assessment: Bay
Ace of Spades

• Things of note:
  – Younger than 10
  – White on near side
  – Two dark eyes
  – Spade-shaped star
  – Shire and Stock horse backgrounds

• My assessment: Tobiano
• Things of note:
  – Age unknown
    • Early teens?
  – Two dark eyes
  – No white on off side
  – Flaxen mane
  – QH background
• My assessment: Palomino
Coqueto-RH

- Things of Note:
  - Young PRE Stallion
- My assessment: Wild Bay/Dun in the process of greying out
Ranchero 06

• Things of Note:
  – Young PRE Stallion
• My assessment: Dark Bay
Things of Note:
- 6-7 year old PRE stallion

My assessment: bay graying out