

Volume 1, Issue 2

Ask the Guru: Eye Color

Question: Gideon has two blue eyes. Holly has two brown eyes. Foal "April" from both has two blue eyes. We know for sure Gideon's parents both had brown eyes. Holly's dam, we have and has brown eyes. We're not 100 % sure on Holly's sire. Pretty sure they were dark. Holly's sire was a Gypsy named Governor imported from UK. I'm just not sure why April has two blue eyes. Know it takes two to tango.

> Any thoughts ?

Answer: Little is still known about eye color genetics in the equine world. However, please read the interesting article below. It may shed some light on the unique and mysterious world of the blue eyed baby.

Clues to Blue Eyes

by: [Michelle N. Anderson, TheHorse.com Digital Editor](#) Reprinted with permission from [TheHorse.com](#)

The foal flutters his eyelids in the dawning hours during his first day of his life. He stands, wobbles around his dam, and finally nurses, showing the vigorous signs of a healthy newborn.

Now that the foal has safely made its way into the world, the breeder starts inventorying exactly what she has in front of her: a colt. Strong Quarter Horse body. Straight legs. Bay. Three small white socks and a broad blaze down the center of his face. One blue eye.

Where did that come from?

No one really knows for sure, says Cherie Lones, director of the Blue Eyed Horse Association (BEHA) in Rapid City, S.D.

"There's a lot of mystery behind blue eyes in horses," she says. To help gather information on this feature, Lones founded BEHA, a registry to document and track blue-eyed characteristics in horses. Blue eyes in horses are a relatively uncommon and little-studied occurrence, and the association hopes to change both of those facts.

Equine geneticist and coat-color specialist D. Phillip Sponenberg, DVM, PhD, a professor of pathology and genetics at the Virginia-Maryland Regional School of Veterinary Medicine in Blacksburg, Va., sums up what little is understood about blue eye inheritance in horses this way: "You expect to see them on cremellos and perlinos. Sometimes they occur with white spotting (coat color),

and sometimes they occur on dark-colored horses."

Beyond those facts, what is understood about blue-eye inheritance is tied to breeding results and logical guesswork. In this article we'll look at what is known about eye color in horses.

The Basics of Eye Color

Nearly all breeds of horses include individuals with blue eyes. Horses registered with the BEHA include Paints, Pintos, Quarter Horses, Appaloosas, Tennessee Walking Horses, Racking Horses, Miniature Horses, and Gypsy cobs. Examples have even been reported in Arabians and Thoroughbreds.

In the horseman's lexicon, blue-eyed horses have lots of names, including glass eyes, wall eyes, and china eyes. There are also lots of stories and myths about blue eyes to go along with these labels.

To some a blue eye is a sign of wisdom, and to others it shows inherent weakness. No matter the horsemen's tales associated with blue eyes, one fact is for certain: Blue eyes are created by pigmentation, or more correctly, lack of pigmentation.

The colored part of the eye is called the iris, which is named for Iris, the Greek goddess of the rainbow. This colorful area of the eye divides the front of the eyeball from the back and regulates light levels entering the eye through muscles that contract and dilate the black pupil in the center of the iris.

The color reflected from the iris, or plural

irides, comes from pigmentation, specifically the patterning of melanin. Pigment, by definition, is a material that reflects certain wavelengths of light and thereby shows color. Melanin is a brown or dark pigment that creates color in skin and eye.

"If the pigment is only on the back of the eye, then the light scatters and the eye is blue rather than dark," Sponenberg explains. The more melanin in the front of the eye, the darker the eye appears. The expression of two different eye colors in an animal is called heterochromia irides. This effect is rare in humans and limited to less than 1% of the population, although Alexander the Great was described as having two different eye colors. This variant is common in domestic animals, including Australian Shepherds, Siamese cats, and Paint or pinto-colored horses.

The term heterochromia iridium is sometimes used to describe one eye with distinctly different patches of color. In horses, an eye made up of both blue and brown parts is also called a parti-colored eye or blue-chip eye.

American Quarter Horse Association manager of registration Tammy Canida says parti-colored eyes are much less common than full blue eyes.

"We only register a handful of these a year," she says.

Double Dilutes

The most basic and well-understood cause of blue eyes in horses is the occur-

Clues to Blue Eyes, cont.

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rence of a double-dilute coat color caused by the creme gene. All double dilute horses have two light-colored eyes.

Creme single-dilute coat colors include palomino, buckskin, and smoky black.

When two horses of any of these creme colors are bred together, a resulting double-dilute creme foal is possible and can have any of the following colors: cremellos, perlinos, and/or smoky crèmes.

The first dilute gene, which works like the initial coat of whitewash over a dark wall, lightens the horse's red hairs from its original base color of chestnut, bay, or black to palomino, buckskin, or smoky black respectively.

The second dilute gene works like a second coat of whitewash, making the horse's skin pigmentation and coat lighter in color.

The combination of two dilute genes also affects the pigmentation of the horse's eyes, making both irides of a double-dilute horse pale blue.

"The pigmentation just isn't there, so the eyes appear blue instead of the normal brown," Sponenberg says.

White Spotting in Blue Eyes

The BEHA has registered more than 150 horses since its founding in the winter of 2005. "The one consistency we're finding with non-dilute blue-eyed horses is the appearance of white blazes (on the face)," says Lones, who reviews photos and issues papers on BEHA-eligible horses.

Blue eyes often occur in horses with white spotting, generally categorized as overo. The eye, like the patches of white skin, lacks the melanin that makes it dark. According to *Paint Horse Genetics*, published by the American Paint Horse Association (APHA), "The overo's head is often quite extensively marked with white and the eyes are commonly blue."

More specifically, blue eyes are seen in horses with distinct overo patterning or combinations of the different overo markings. "The splashes, frames, and sometimes

even sabinos will have blue eyes," Sponenberg says.

Frame This is a common overo patterning that is sometimes associated with blue eyes. The word "frame" describes the frame of color around the white when viewed from the side.

"The frames usually have dark feet and a lot of white on their heads," Sponenberg says. Frame overos will often have blue eyes, even if the eyes are surrounded by colored skin.

Sabino This describes a white overo-like patterning that causes jagged white patches, usually on the lower half of the horse's body.

"The sabino white is patchy, with flecks or roaning," Sponenberg says. Minimal expression of sabino is often the cause of extra white "chrome" and blue or part-colored eyes in horses otherwise described as solid. Blue eyes in Arabians, Thoroughbreds, and Quarter Horses most likely result from sabino coloring.

Splash Although rare, the splash pattern is often the cause of blue eyes in horses. Splash is usually characterized by two or more white socks and/or stockings and a white blaze.

"The white is usually on the lower part of the body," says Sponenberg. The blaze is often bottom-heavy, starting wide and circling around the muzzle and lips and narrowing toward the forehead. Or the splash blaze can cover the face and eyes, resulting in what's described as a bald or apron face with blue eyes. According to the APHA, splash coloration is possibly tied to deafness, which explains why some horsemen erroneously believe all blue-eyed horses are deaf.

Champagne Baby Blues

According to the Champagne Horse Breeders' & Owners' Association (CHBOA), a registry that records the pedigrees of champagne-colored horses, foals with this dilute gene are born with blue

eyes.

"They're not like other blue eyes," says Vonda Hamilton, a champagne horse breeder and vice president of the CHBOA who also raises blue-eyed sabinos. "The champagne blue is more creamy colored and less defined than the pinto blue eyes."

The champagne gene is dominant in the horse, and it affects pigmentation by diluting the base coat color much like the creme gene. Horses with the champagne gene have a metallic sheen to their coats, pink- or pumpkin-colored skin, and freckling around the eyes, lips, nostrils, genitals, and anus.

Like newborn Caucasian humans, the blue eyes of champagne foals darken over time. After about three months, the champagne foal's irides turn the amber color characteristic to this coat color. "I thought I had a palomino stallion, and then his foals were born with mousy-colored coats and these light blue eyes," Hamilton says. "I didn't know what was going on." With time, the foals' eyes transitioned to green, then amber, and she finally discovered that her stallion was actually a champagne.

Following the Trait

Current equine genetic research might someday shed new light on the inheritance of blue eyes. In the meantime, members of the BEHA hope to follow their association's founding mission. "Our focus is to promote blue-eyed horses, educate the public, and track the trait," Lones says.

She hopes that compiled information will someday allow breeders to select for or against blue eyes. Until then, she'll continue to view blue eyes with wonder.

"Blue eyes are beautiful," she says.