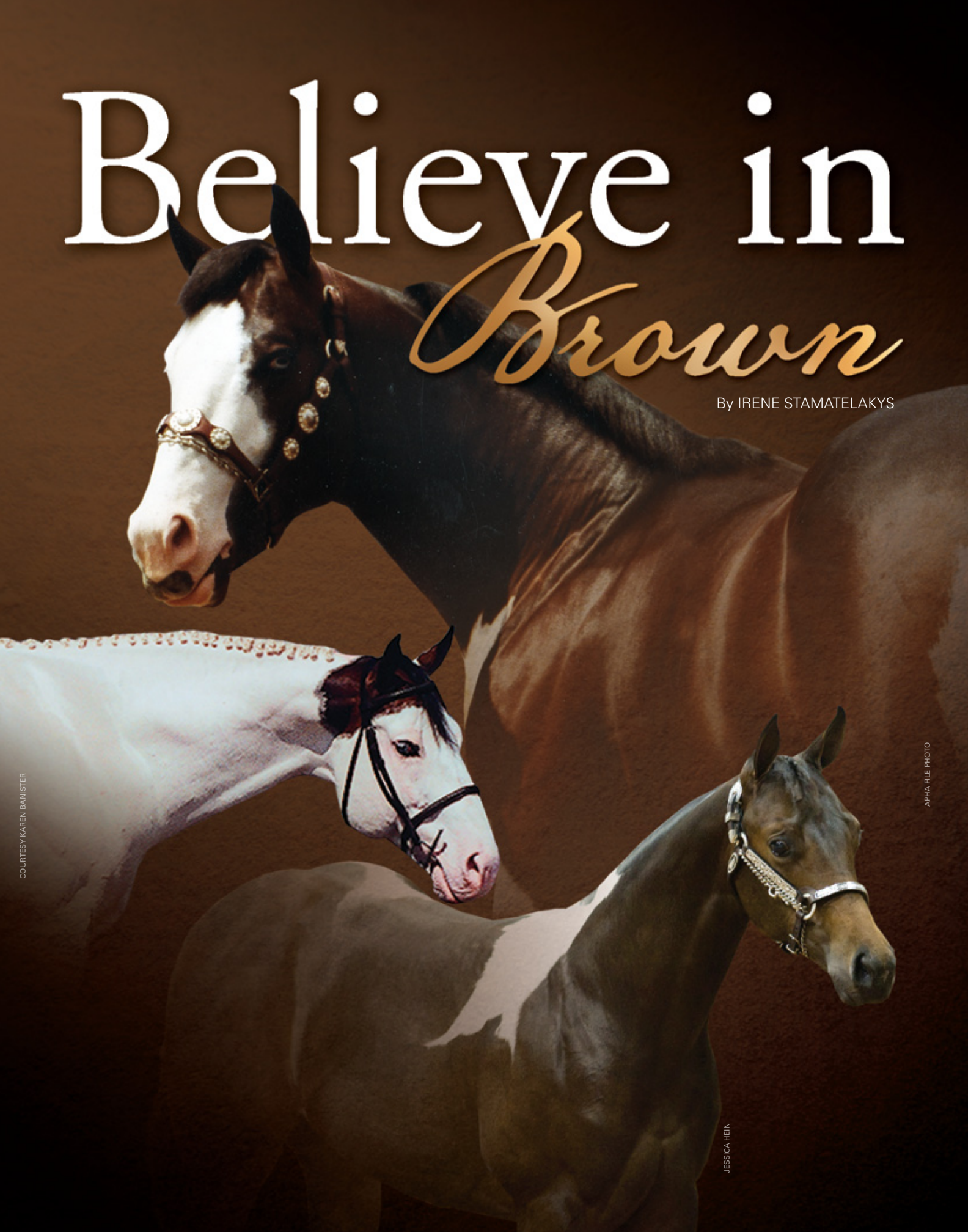
Believe in Brown

By IRENE STAMATELAKYS



COURTESY KAREN BANISTER

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JESSICA HEIN

There's no denying that seal brown exists—even if this equine chameleon could easily pass for a dark bay, liver chestnut or sun-bleached black.

As any horse-crazy 5-year-old girl will tell you, the brown crayon don't last very long in a box of Crayolas®. But as she grows older and wiser, and her artistic endeavors turn to drawing bays and blacks, sorrels and palominos, that poor brown crayon is forgotten. Her equine vocabulary expands to include buckskins and blue roans, until one day, she stops using brown altogether—brown no longer exists in her mind.

If you too believe there is no such thing as a brown horse, you're not alone. It's a widely-accepted myth that there are no brown horses—only dark bays, liver chestnuts and faded blacks.

The truth is, brown existed long before the first Paint Horse was registered, and it is genetically distinct from bay and black. And while only 4.6 percent of registered Paints are classified as brown, there are certainly more—some mis-registered, others further disguised with a dilution gene or extensive white spotting.

In fact, brown genetics run deeper in the Paint Horse breed than many realize, as a significant number of sorrels, chestnuts and bays carry the gene but don't express it. That could have a major impact if you are breeding for a specific color, say buckskin. Curious? Read on. What you'll learn will turn you into a brown believer.

The brown spectrum

The terms "brown" and "seal brown" are used fairly interchangeably for this equine coat color described as a very dark brown or a natural black, with brown/tan highlights—similar to an adult seal. According to APHA, a brown horse has a brown or black body, with light areas at muzzle, eyes, flank and inside upper legs. The mane and tail are usually black.

If anyone can explain seal brown genetics in layman's terms, it's Joycelyn Kasmir. With her husband Jeff, she owns Diamond J Farms in Needville, Texas. They stand a 1985 brown son of Secretariat, Country Side JC, and his Paint son, Country Picasso, a 2002 sorrel tobiano. Over the years, she's seen her share of seal browns.

"We get a lot of brown foals with 'Country.' I've got a lot of Thoroughbreds in my herd, so there are a lot of brown genes floating around." said Kasmir. "For a very long time, back in England, the Thoroughbred was predominantly dark bay or brown, and every once in a while a black would show up. The fashion was dark bay or brown."

And those brown genes were injected into the Western stock horse breeds when they were out-crossed with Thoroughbreds.

"A brown horse is going to look very close to a black horse," said Kasmir. But even with her experience spotting a seal brown, she says she's been fooled occasionally. "It's really hard to tell the difference between a sooty dark bay and a seal brown."

In some cases, only genetic testing can differentiate between the two colors, which are determined by the *Agouti* gene.

"There are two categories of horses—the black-based horses and the red-based horses," explained Kasmir. "The *Extension* gene is the black gene. If the horse has an *E*, then it has the ability to make black hair.

"Then you need to look at the *Agouti* gene to see how much the black is restricted," she said. Unlike the *Extension* gene—which has two alleles—*E* for black hair and *e* for red hair—the *Agouti* gene has multiple alleles. "The *A* is bay. We use *At* to designate seal brown. And *a* is black," said Kasmir.

"*A* is the most dominant. It has the most restriction on the body. It restricts the black hair to the points. If a horse is *AA*, *AAt* or *Aa*, it is going to be bay because it has the most dominant allele.

"With *AtAt* or *Ata*, you'll get a brown. *At* restricts black hair, but not as much as a bay. You'll see a little red showing through. It is dominant over *a*, which is the most recessive. But *At* is recessive to the true bay, or *A*.

"If the horse is *aa*, he's true black. The *a* allele doesn't restrict the black at all."

If you have a red-based horse—a sorrel, chestnut, palomino, red dun or cremello—it can't make black hair. Genetic testing is the only way to determine its *Agouti* status, searching for all three alleles—*A*, *At* and *a*.

Most foal owners, however, don't have time for genetic testing before

COURTESY JULIA LORD

COURTESY BRIELLE MATSON

The seal brown color can be modified by other genes. Dusted With Gold (above) is a seal brown and cream, and Champs Guthrie AQHA (right) expresses seal brown and silver. Cute Black Buttons (below, right) is an example of seal brown, registered as brown.

APHA FILE PHOTO

they submit registration applications. And foal coats can be very deceiving, as Kasmir can attest.

"Most often, if it's born bay or black-looking, it's actually a brown," she said. "The true black babies, they have more of a gray tinge on them—it looks like pewter. If they look dark, then often they're actually brown."

Most bay foals are born with light-colored legs—not the black you would expect. And most brown foals—who look bay—often have black legs. They don't turn brown until they shed. So it's easy to understand why sometimes those browns that are registered early are misclassified as bays.

Add a dilution gene, and the situation gets even more complicated.

"Now that seal brown has been identified and proven as a real color, the problem is registries don't have names for brown dilutes," said Kasmir.

Take the cream gene for example. On a sorrel base coat, one cream allele will give you a palomino. Add cream to bay, and you get a buckskin. Add cream to black, and you have a smoky black. But what do you call a seal brown with cream? The jury is still out. They have been called brown buckskins, smoky browns or sooty buckskins.

"The cream gene only lightens the non-black hair. And on a seal brown, there's not much non-black hair to lighten. In a brown, which has only a few reddish areas, it's almost goldish," said Kasmir. "There's more profit in calling them a buckskin, but they don't necessarily look like a buckskin."

The same goes for the dun gene. On a sorrel base coat, a dun allele will give you a red dun. The typical dun is a bay with a dun gene. Add dun to black, and you get a grulla. But what about seal brown?

"There's no name for brown with the dun gene," explained Kasmir. "They generally fall in the grulla category because they are almost black. But then they've got that brownish muzzle and they don't really look like a grulla."

Another rare, but legitimate, possibility is a brown with a silver gene. This dilution gene is unique because

Mixing brown Paint

Breeding brown? Brush up on your genetics beforehand.

Q: Can two black horses produce a brown foal?
A: No. Two true black horses—both tested *aa*—will never make a brown baby. Neither carries the *At* allele necessary to make seal brown.

Q: Can a brown horse produce a bay?
A: A brown stallion, bred to a black or brown mare, cannot make a bay foal as neither parent carries the necessary *A* allele. But, if you breed a brown stallion with a red-based mare, unless you know her *Agouti* status, bay is one possibility. On the other hand, a bay could produce a brown if the bay carried both the *A* and *At* alleles.

Q: Can a brown horse produce a buckskin?
A: No, a brown horse cannot produce a buckskin, unless you cross it with one carrying both the cream and bay genes. A palomino, for example, carries cream but because it's a red-based color, genetic testing is required to determine the *Agouti* status.

Q: Are all Agouti *tests the same?*
A: No. Most labs test for the recessive *a* (black) allele. If they find something other than *a*, they report it as dominant *A* (bay) although it could be *At* (seal brown). Only one laboratory looks for the *At* (seal brown) allele—Pet DNA Services of AZ®.

COURTESY GAYLE THOMPSON

it dilutes only the black pigment in the hair, leaving the red pigment untouched. Generally, the mane and tail are more strongly diluted than the body, although this varies from a slight lightening to platinum blond.

"The only registry that has a name for a brown dilute is the International Champagne Horse Registry (ICHR)," Kasmir continued. "They call brown with a champagne gene a sable."

If you do have a diluted seal brown, perhaps the simplest solution is to describe the horse using the base color plus the dilute: brown with cream, for example.

And while roan is a pattern of white and not a dilution gene, the situation is the same.

"There's no name for brown roan," Kasmir continued. "They look more like a blue roan than a bay roan."

Until terminology catches up with technology, the best you can do is register the foal as brown and request that the dilution gene be mentioned in the remarks, providing genetic testing results to prove your case.

Finding seal brown

The research leading to the discovery of the seal brown allele received a major boost from three Paint Horse owners—Carolyn Shepard, Joycelyn Kasmir and

Keyhole Buffy (below, left) has both seal brown and dun genes. California Champagne (below) possesses both the seal brown and champagne genes, called a sable champagne.

COURTESY CAROLYN SHEPARD

Julia Lord. Their efforts led Michal Prochazka, MD, a molecular geneticist and founder of Pet DNA Services of AZ®, to become interested in seal brown genetics and begin his research in 2005.

Previously, geneticists from the INRA Centre de Recherche de Jouy, outside Paris, France, published a study in 2001 showing their discovery of the recessive *a* allele at the *Agouti* locus.

"There were seal brown horses in the study," recalled Prochazka, "but they didn't find anything in the *Agouti* gene that caused seal brown."

Prochazka realized the French were on the right track, but he took the research a step further.

"They investigated a functionally most critical part of the gene, but there are additional parts that we investigated," he said. "They are called regulatory parts of the gene that control whether the gene is turned on or off, and in which areas of the body, and that's where we found the difference."

Collecting samples was relatively easy, as breeders were very interested in the research, says Prochazka, who financed the study himself.

"It took about two years to get some data that looked like positive evidence for the brown allele," he recalled. "We did it by looking at the gene in seal brown, bay and black horses. We used standard laboratory procedures involving PCR (polymerase chain reaction) where you can amplify the DNA and compare the same parts between different colors.

"First, we were looking for any evidence for any change in the DNA that would correlate with the color," Prochazka recalled. "For example, there could be a change in the DNA which could be causing the difference in color. That would be the true mutation that causes the color. Or it could be something nearby that flags the mutation, like a marker. First, we found a marker, but based on our evidence it wasn't likely to cause the color."

In 2007, Pet DNA Services initially offered a test using the DNA marker, while continuing the research.

"Eventually, we discovered a change in the gene which by all evidence appears to be causing the difference in color," said Prochazka. "We tested this brown mutation in many different breeds—Thoroughbreds, Quarter Horses, Arabians, Miniature Horses, Appaloosas, Paint Horses, Mustangs, etc. In every breed where we found it, it correlated with the seal brown color. It's more common than people think.

"The *Agouti* gene only has an effect on the body distribution of black-pigmented hair, and of course, in a chestnut- [or sorrel-] based horse, you don't see it because it doesn't have black hair. However, they can carry it too, depending on what they inherit from their parents."

Since the study began, more than 300 horses have been tested for the seal brown mutation. Prochazka estimates

COURTESY CALLIE HERNANDEZ

Gambling Man (right) is one of the breed's most well-known brown stallions. Of his 253 offspring, more than 40 are registered as brown.

MONTGOMERY PHOTOGRAPHICS

Some descendents of Sacred Indian (below, left) illustrate a seal brown family line. Sacred Seven (left) is a seal brown son of "Hatter," and the brown stallion Premenitions Tramp (far left) is Hatter's grandson.

COURTESY KAREN BANISTER

that in 2009 approximately 50 horses were tested.

Yet the seal brown controversy continues to simmer.

"Some people say that unless we publish [a scientific paper], they won't believe me," said Prochazka. "I'm working on it. It's just a question of time and resources as to how soon it will get published."

He has ideas for further research in the area of seal brown genetics and the equine *Agouti* gene in general, but lack of funding has put additional studies on hold at this point.

All in the family

Because many brown Paints are often mistaken for blacks or dark bays, you might be surprised to learn the true color of some of the breed's most famous representatives.

Gambling Man was perhaps the most well-known among them. The APHA Supreme Champion's image is often used as an example of the splashed white pattern. His coat is so dark in some photos that he appears black, not the brown overo he truly is. A sire of multiple world champions, of his 253 foals, 43 were registered brown, although it's likely there were more true browns that slipped under the radar.

The most prolific brown sire on record is Will Spot Ya, a 1995 tobiano with 386 registered offspring to date. Of those, 111 foals—nearly one-third—are registered brown. A multiple world champion sire, Will Spot Ya currently ranks in the top five leading sires of performance class winners and of point-earning performance horses. Leading the pack of his talented brown offspring is Willionaire, a 10-year-old brown tobiano gelding with 1,144 points.

Even if it is difficult to distinguish them from dark bays or blacks from the rail, like Willionaire, other talented brown Paints have proved their merit in competition. Among the registered browns with the most APHA points, there are two "Sacred" horses in the top five. In the top spot is Sacred Seven, a 1991 brown tobiano gelding, who amassed nearly 5,000 points, 10 world and 11 reserve world championships during his competitive career. Ranked fourth is Sacred Elegance, a 1995 brown tovero mare, with 1,655 points and four reserve world championships. Both, of course, were sired by Sacred Indian.

For those who remember that distinctive tovero stallion, a question comes to mind—was he or wasn't he seal brown? Although he was registered bay, it's very possible that he was not. Sacred Indian only had a war bonnet, so it would have been hard to tell his genetic color without testing. But the top of his head and his ears were virtually black.

"Sacred Indian was a brown," said owner Karen Banister, who purchased him as a yearling. "He was also homozygous black."

Sacred Indian could have inherited his seal brown allele from his sire's side, as browns are common among Thoroughbreds. Over the years, he sired 335 registered offspring, of which 98 were classified as brown. And Sacred Indian's brown legacy carries on today. He was the grandsire of Premenitions Tramp, a 1997 brown tobiano stallion, by Mr Tramp and out of Sacred Premenition.

Owned by Cyndee Bognar and Callie Hernandez, Premenitions Tramp is thought to be black by most people.

"I have to tell people that he's not black—he's a brown horse," said Hernandez, who stands Premenitions Tramp in Skull Valley, Arizona. "He looks black, but along his stifle, the insides of his forearms, gaskins, legs and ears, he's a lighter brown. Most people don't

APHA FILE PHOTO

ABIGAIL WILDER BOATWRIGHT

Although Miss Ali Tramp (above) is registered bay, breeder Callie Hernandez suspects she's actually seal brown like her sire, Premenitions Tramp. Another Premenitions Tramp offspring, Simply Decadent (right) is registered brown.

APHA FILE PHOTO

understand that brown is a color. They just think it's a dark version of bay."

Premenitions Tramp has sired 123 registered foals to date, 15 of which are brown. Just recently, one of his brown offspring had her moment in the limelight. Miss Ali Tramp was the 2009 world champion Weanling Tobiano Mare and Breeders' Futurity Platinum reserve champion Tobiano Weanling Mare. Owned by Manuel Mora Rojas of Jalisco, Mexico, and registered bay, Hernandez says the mare is definitely seal brown.

"She's the same color as her dad," said Hernandez. "She looks black but with the brown undertones."

Brown denial

"Many people just don't understand how a horse could be brown," said Prochazka. "They think horses should be bay or black."

The misconception is so widespread that equine color enthusiasts call it "brown denial." Some even suspect that brown denial is not entirely innocent.

"Brown has been around for a long time," said Kasmir. "But it's more profitable to register a horse as black. There's more profit in calling it a buckskin rather than a smoky brown."

Part of the problem stems from the fact that the standard *Agouti* test doesn't screen for the seal brown gene at all.

"If you get the regular *Agouti* test, they are actually testing for true black—*a*," explained Kasmir. "If they find something other than *a*, by default, they assume it is *A* (bay). If I sent my horse's hair to UC-Davis, he would come back as *Aa*, when he's actually *Ata*.

"People are making financial decisions based on the regular *Agouti* test, when it is an incomplete test," Kasmir said. "For example, if you were going to breed or buy a cremello stallion that was *Aa*, you would assume you could get a buckskin if you crossed with a black mare. But if he is actually *Ata*, you would never get a buckskin if you crossed with a black or brown mare. You could only get a smoky brown or smoky black."

Those colors are less marketable as they are virtually indistinguishable from a non-dilute brown or black.

Do you believe?

Even today, relatively few breeders know that seal brown is a separate color and a genetic test exists to identify *At* carriers and differentiate them from black and bay horses.

The situation is gradually changing, as more people learn to recognize the color and realize the added value that complete testing brings to their breeding programs.

"I see a lot of brown horses that are mis-registered as either bay or black," said Hernandez, "and I am excited to know that the public is going to be better informed and can actually test for the color."

The next time you can't decide if a horse is dark bay, liver chestnut or faded black, don't assume, don't guess. Let science decide, and test for seal brown. You'll believe the results. PHJ

To comment on this article, e-mail feedback@apha.com.

Is your horse a brown carrier?

Currently, only one laboratory in the world offers a genetic test for seal brown—Pet DNA Services of AZ®, a licensed and independent research facility. Analyzing hair samples with root bulbs attached, the test costs $40. Results—which show if the horse is a carrier of one or two doses of *At* (seal brown)—are available in 7–10 business days. Together with the original *Agouti* test developed by French scientists (specific for *'a'*), the combined results of both tests will tell you if your horse is *AA*, *Aa*, *aa*, *AAt*, *Ata*, or *AtAt*. For more information, go to *petdnaservicesaz.com*.