



## Director's Note

As we spring into the next quarter of 2023, the UC Davis Veterinary Genetics Laboratory (VGL) is pleased to share some of the exciting things we have been doing and discovering over the last several months.

Our [case of the quarter](#) describes a rare equine reproduction event that has been verified by VGL's parentage testing. Parentage testing was the first genetic test offered by the VGL. Parentage testing, first in cattle and then horses, is how the UC Davis VGL got started in the 1960's; although, at the time, we were known as the UC Davis Serology Laboratory and parentage testing was based on blood group markers, not DNA.

Parentage testing was established as a way to preserve the integrity of breeds by ensuring the accuracy of pedigree records. During the 1990's the technology for parentage testing switched from using blood proteins and markers to utilizing variation in the DNA at specific sites, known as [short tandem repeats](#), or STRs for short, to detect differences between individuals. This genetic variation is passed down from one generation to the next. By reviewing that genetic variation at specific sites in the offspring and possible parents, DNA testing allows us to qualify the correct parents of an animal.

With the movement of animals around the globe and the advancement of reproductive technologies, these tests became increasingly important for animal identification and parentage. In fact, many animal organizations have rules for registration based on parentage testing results. While not the only type of testing we provide today, parentage testing across species is still a big part

of what we do.

Our case of the quarter highlights the importance of this powerful tool and how utilization of this test is still contributing to the understanding of novel mechanisms of reproductive biology. We hope that you find this case as interesting as we do.

In addition to parentage testing, we also do genetic diagnostic testing for traits of interest and disease. Thanks to advances in technology, causal genetic variants are being discovered at an accelerated pace, and several of the "[what ifs](#)" of genetic testing are now a reality to advance the health of animals. For sure, it is an exciting time to be an animal geneticist.

I hope that through this newsletter you enjoy learning about some of our recent activities.

Thank you for your continued trust in our services,

A handwritten signature in black ink that reads "Rebecca Bellone". The script is cursive and fluid.

Rebecca Bellone, PhD  
Director, Veterinary Genetics Laboratory

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**Explore the hundreds of genetic tests  
available from the VGL for 20+ species**

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**Case of the Quarter**



Image description: A Quarter horse mare and foal grazing.

Delayed embryo development is a rare occurrence in horses. In collaboration with researchers at Colorado State University, results from UC Davis VGL parentage testing verified this rare finding in a donor Quarter Horse mare.

An American Quarter Horse mare was inseminated by a stallion and an embryo retrieved at day 6. The mare returned to estrus 5 days later, and a different stallion was used for insemination. This time, two embryos of different sizes were collected 8 days after ovulation, and both embryos were transferred into recipient mares. Parentage testing based on 30 [microsatellite markers](#) confirmed the first stallion as the sire of one of the foals with zero exclusions, thus suggesting that either embryonic development was markedly delayed or the first stallion's sperm survived quite a bit longer than expected in the donor mare to fertilize an egg from the second ovulation cycle.

“This fascinating case points out the fact that events in nature cannot always be predicted”, says Dr. Patrick McCue from Colorado State University lead author of this study. “Nature has a way of humbling us when we take common things for granted.”

To read more about this case, please see our [news story](#).

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## Communications and Outreach

### American Quarter Horse Association (AQHA) Convention

VGL was invited to participate in this year's [AQHA convention](#) held in Fort Worth, Texas from February 24 to 27. **Drs. Rebecca Bellone** and **Liza Gershony** attended the convention and spoke to AQHA members about the use of genetic testing to promote health, breed integrity and wellbeing of American Quarter Horses. Together they developed an activity to explain how coat color genetics works in the horse using Dr. Bellone's great analogy: "it's as simple as a cup of coffee!" Attendees were excited about the activity and the "aha" moment it provided as they connected that knowledge to past breeding experiences they had with their horses.



Photo caption: Dr. Gershony, VGL's Community Engagement and Outreach Coordinator, showing how the base coat color of a horse can be diluted

## New Tests

The VGL has launched two new tests this quarter:

### Primary Open-Angle Glaucoma (POAG) in the Petit Basset Griffon Vendeen



Image description: A Petit Basset Griffon Vendeen sitting on a couch.

POAG is a type of glaucoma that progresses gradually without obvious signs of pain. [POAG in the Petit Basset Griffon Vendeen](#) is characterized by elevated pressure inside the eye and partial dislocation of the lens, and can lead to enlarged eyes and vision loss at a later stage of the disease. Genetic testing can determine the genetic status of dogs and help inform breeding decisions.

### Cerebellar ataxia (CA) in the Italian Spinone

CA is a progressive neurodegenerative disease that

by a modifier gene.

### **Western State Livestock Rural Enforcement Association**

In the beginning of March, VGL Forensics Scientist, **Teri Kun**, spoke at the [Western State Livestock Rural Enforcement Association](#) in Reno, NV. The talk covered an introduction to what DNA is, how samples are handled in the lab, and examples of best practices for evidence collection based on sample type. Teri also presented case work examples involving livestock as well as other cases highlighting the use of animal DNA.

### **International Buckskin Horse Association (IBHA) Convention**

**Dr. Bellone** was invited to give a talk about the use of genetic testing to assist in registration decisions. The IBHA's mission is to preserve the pedigree and promote the activity of Buckskin, Dun, Red Dun, and Grulla Horses, and is the world's largest registry for horses with these coat colors. As part of her presentation, Dr. Bellone described the genetics behind these coat colors and presented the study the VGL will be doing in partnership with the IBHA to evaluate the use of our genetic tests to help guide registration decisions and breed standards. To participate in that study [contact the IBHA](#).

starts to manifest as a gait abnormality at approximately 4 months of age in affected dogs. [CA in the Italian Spinone](#) progresses to a point where the dog is no longer able to walk and is euthanized. The condition is autosomal recessive and genetic testing can help diagnose and inform breeding decisions to avoid producing affected puppies.



## **Research Highlights**

VGL staff and researchers have contributed with two new publications in the first quarter of 2023. The first publication described two very rare case reports of [delayed embryo development](#) in two donor mares: one Quarter Horse and one Arabian. VGL's parentage testing confirmed this rare event in one of the horses in the study. Read more about this fascinating case in our ["Case of the Quarter"](#).



The [second publication](#) is the result of the Functional Annotation of the Animal Genomes (FAANG) project, a large international collaboration in

## UC Davis Education

During the winter term, Dr. Bellone taught Equine Genetics, a 3-credit course for [UC Davis Animal Science](#) students. One of top students in the course, **Stephanie**

**J'Usrey**, accepted an intern position and will be contributing to several of our equine research projects. Dr. Bellone was also invited to be a guest lecturer for two other UC Davis Animal Science Undergraduate courses this winter (Horse Husbandry - ANS15 - and Animals and Human Society - ANS10) and spoke to over 150 students about coat color genetics and how this topic has helped us to better understand horses.

## SAVA and Wildflower Charter School Visits

VGL hosted two groups of students this past quarter: a group of seniors from the Sacramento Academic and Vocational Academy (SAVA) visited the VGL on March 13 and a group of 7th and 8th grade students from Wildflower Charter School, Chico, visited on April 3rd.

which the VGL is involved. The aim of the project is to develop a tissue-specific atlas of gene expression and gene regulation for the horse following similar methodologies created by the human Encyclopedia of DNA Elements (ENCODE) project. This study identified a total of 39,625 novel transcripts in the horse and over 84,000 candidate regulatory elements. The tissue-specific atlas from 9 tissues created from this work is now publicly available and will undoubtedly assist in the study of complex traits by the equine research community. The lead author on this study was Dr. Sichong Peng, a recipient of the UC Davis VGL Ann Bowling Fellowship who was mentored by [Dr. Carrie Finno](#), Gregory L. Ferraro Endowed Director of the UC Davis [Center for Equine Health \(CEH\)](#),



## Upcoming Events

### 109th UC Davis Picnic Day

One of the most anticipated events of the year, Picnic Day is the University's annual Open House for families, students, alumni, staff, faculty, and regional communities. Every year thousands of visitors enjoy the activities offered by UC Davis departments and student organizations. This year the event will take place on **Saturday**,



Photo caption: Dr. Bellone, VGL's director, shows SAVA students the first steps we do in analyzing the data to ensure it passes our quality controls.

Students were given a tour of the VGL and had great questions about genetic testing and its applications. At the end of the tour, SAVA students got a chance to extract DNA from their own cheek cells, whereas the Wildflower students got to test their knowledge of genetics and inheritance by solving a parentage testing exercise. The Wildflower school has been visiting the VGL for many years, and we recently learned about a student from Wildflower who after learning about genetic testing in animals from us went on to study genetics. We love the opportunity to ignite a passion for genetics!



Photo caption: VGL research associate,

**April 15.** Visit the [Picnic Day website](#) for more information and schedule of activities. Don't forget to stop by our booth at Hutchinson Field!

### **Take Our Children to Work Day**

UC Davis' equivalent to a career day, [Take Our Children to Work Day](#) is a day when employees bring their children to campus to learn a bit about the work that we do. Several departments on campus participate every year and VGL is proud to be one of them! This year the event will take place on April 27. We look forward to having all the kids here.

Mona Christiansen, explains polymerase chain reaction (PCR) to Wildflower students.

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