



Some recent scientific studies provide insights on starting foals on the right foot

## Early Advantages

### RECENT STUDY FINDS FOALS BORN EARLY IN YEAR FARE BETTER ON THE TRACK

By AMANDA DUCKWORTH

**FOR ALL OF** the pedigree research and effort put into bringing a foal into the world, the wild cards of genetics and unforeseen problems also come into play. Continuing research into both common practices, as well as rare issues, will help give future foals their best chances at success.

Even before foals are born, the decisions being made can vastly impact their viability as racehorses. One of these factors would be the timing of the mating. Because Northern Hemisphere Thoroughbreds celebrate their birthdays Jan. 1, a great effort is made to have foals born

earlier in foaling season rather than later. Whether this plays out as beneficial on the racetrack, however, remains a debated point in the industry.

In December 2022, *Veterinary Record Open* published “Date of birth and purchase price as foals or yearlings are associated with Thoroughbred flat race performance in the United Kingdom and Ireland.”

“Current industry convention is to maximize efforts to produce foals as early in the breeding season as possible, given the likelihood of such individuals to be physically precocious, which (might) be

advantageous both in the sales ring and on the racecourse,” explained researchers. “Thoroughbred breeders aim to have foals born early in the season, but scientific evidence on the advantages for race performance is scarce and contradictory.”

In order to perform this retrospective cohort study, Weatherbys and the British Horseracing Authority provided researchers the required data under non-disclosure agreements with both. The 2014 and 2015 Thoroughbred foal crops from the United Kingdom and Ireland, which totaled 28,282 foals, were included. The study measured race performance by the end of horses’ second and third years of life, leading to a data set of 9,456 horses that competed at least once in a flat race.

Researchers found that both prize money—and prize money per start—decreased with each additional day beyond Jan. 1 that a foal was born.

“Foals born early in the season had higher earnings by the end of their second and third years of life than foals born later,” researchers concluded. “Differences were more marked among males than females.”

“In general, total prize money and prize money earned per start by the end of the third year of life decreased by 2% for every seven days after Jan. 1 of the corresponding year of birth. However, the interaction observed between date-of-birth and sex for both these outcomes indicates that this association was different for males and females.”

As a secondary focus of the study, the report also determined that the most expensive horses sold as foals or yearlings ran fewer races but earned more prize money—and prize money per start—than less expensive horses. Results from this population-based study could inform strategies and management practices aiming to maximize horses’ racing performance potential and increase financial returns.

“A thorough economic analysis to esti-

mate the profitability of breeding horses for racing is needed, given that a notable proportion of horses did not earn any money by the end of their third year of life, and a low percentage of horses earned enough prize money to at least cover their purchase price.”

Many factors go into a foal's growing up to be a productive racehorse. One undeniably important influence is hoof health. In November 2022, *Animals (Basel)* examined this issue with “Hoof Matters: Developing an Athletic Thoroughbred Hoof.”

“Conformation of the hooves and distal limbs of foals and factors influencing their morphological development have not been reported in detail for the Thoroughbred breed,” researchers said. “In



Bred by St. Simon Place, this Audible-Sunday Driver, by Quality Road filly was born Jan. 15, 2022

A black and white photograph of a mare and her foal. The mare is on the left, wearing a halter, and the foal is on the right, also wearing a halter. They are nuzzling each other's faces.

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this paper we explore morphogenesis of the equine distal limb in Thoroughbred foals with emphasis on adaptations in response to weight bearing early in life that prepare the foal for an athletic career.”

Researchers conducted four independent studies that examined changes in hoof shape using a sampling of Thoroughbred fetuses and foals ranging from 38 days pre-partum to 503 days post-partum.

“The functional capacity of the hoof in the Thoroughbred racehorse begins with the development of the hoof capsule in utero,” explained researchers. “Post-partum changes due to growth and in response to loading influence the form and function of the mature hoof.”

The first study measured epidermal features and used 15 Thoroughbred cadaver fetuses and foals—aged 38 to 134 days—that had died naturally or were still born. They all presented with healthy limbs and hooves.

Another study examined skeletal conformational features and was based on 22 foals that were born at three geographically close stud farms that used the same farrier and veterinary practice. Of this group, none of the foals had obvious conformational faults or had been treated for lameness.

A third study, which measured growth and compression, used 28 Thoroughbred foals spread across two farms. All were selected for being healthy with no behavioral difficulties. Data were collected when acquired flexural deformities were reported. These same foals were used for the fourth study, which measured solar load distribution.

“Dorsal epidermal thickness increased from  $2.84 \pm 0.41$  mm in utero to  $4.04 \pm 1.10$  mm by 4 months of age,” researchers found. “The increase in thickness was accompanied by decreased tubular density, increased inter-tubular material, and an increase in number and size of tubules at the quarters, which provided a malleable hoof capsule to allow for skeletal growth. Between 4-6 months of age, the hoof wid-



From the start, hoof health is an important factor for a developing racehorse



### **THE FUNCTIONAL CAPACITY OF THE HOOF IN THE THOROUGHbred RACEHORSE BEGINS WITH THE DEVELOPMENT OF THE HOOF CAPSULE IN UTERO. POST-PARTUM CHANGES DUE TO GROWTH AND IN RESPONSE TO LOADING INFLUENCE THE FORM AND FUNCTION OF THE MATURE HOOF.”**

—RESEARCHERS IN THE NOVEMBER 2022 EDITION OF *ANIMALS (BASEL)*

ens, and higher loading on the medial side (60%) vs. the lateral side (40%) might be factors that influence mature asymmetric hoof shape. Shortly after 12 months of age, the dorsal hoof wall angle and dorsal parietal angle of the distal phalanx be-

come parallel, thus optimizing the functional capacity of the hoof capsule in the weanling Thoroughbred.”

Lameness in foals can result in varus deformities, which are inward deviations of a joint or limb and might require medical attention. In the September 2022 issue of *Veterinary Surgery*, researchers published “Single-incision drilling technique to achieve hemiepiphysiodesis of the distal metacarpus—complications and outcome in 207 foals with metacarpophalangeal varus deformities.”

For this retrospective case-control cohort study, researchers reviewed the medical records from 2017-2020 of 207 Thoroughbred foals. Of those, 171 were age- and sex-matched maternal siblings. They examined signalment (age and sex), limb(s) treated, location of the surgery, and any reported complications. Then follow-up radiographs obtained for the yearling sale were assessed for abnormalities. Using an online database, horses were matched to maternal siblings and their sales and racing performances compared.

The data showed that the average age at time of surgery was 97 days. The most common treated limb was actually both fronts in 119 cases. The left front was treated 52 times and the right front 31

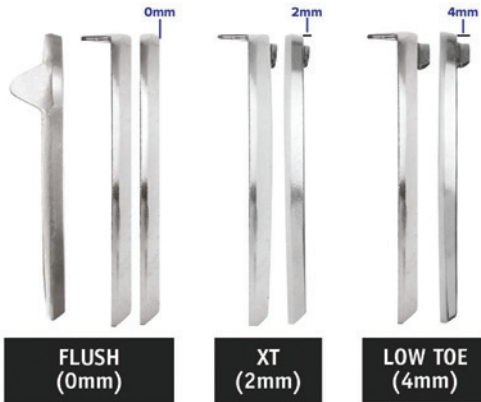
# Kerckhaert Offers Best Options for HISA Compliant Race Plates

The Horseracing Integrity and Safety Authority has put into place new rules for race plates allowed at Thoroughbred tracks in the U.S. These changes went into effect in 2022. The following Kerckhaert Race Plates are HISA compliant as of December 2022. HISA rules do not apply to Canadian Thoroughbred tracks. For the most up-to-date HISA compliant shoe styles, visit [www.farrier-products.com/hisa](http://www.farrier-products.com/hisa).

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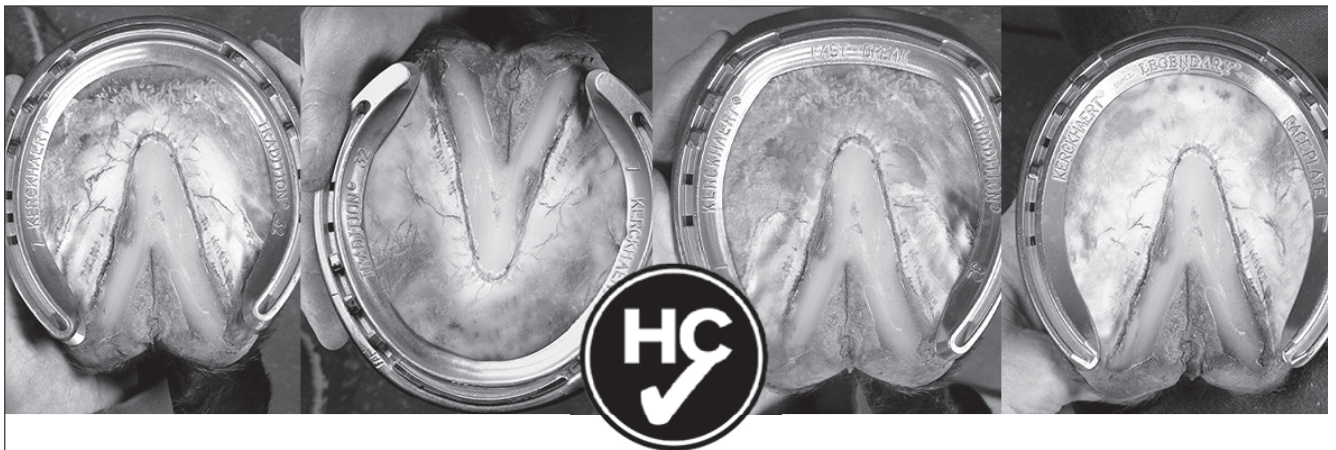
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A happy, healthy foal is the goal of each of thousands of matings every year

times. The affected limb was unknown in five cases.

“Three horses developed calcosinosis circumscripta lesions adjacent to the physis, which were removed successfully,” researchers found. “No radiographic abnormalities associated with the surgery site were detected on yearling pre-purchase radiographs. There were no differences in sales and racing performance data between treated horses and maternal controls.

“Hemiepiphyodesis is a safe and effective treatment for metacarpophalangeal varus deformities in foals. No negative effect on sales or racing performance was identified. This technique avoids risks, costs, and the need for second surgery associated with an orthopedic implant. The surgeon should be aware of the potential for development of a calcosinosis circumscripta lesion with this technique.”

In addition to being sound of hoof and limb, another key element of foal health involves seeing them safely through any potential bouts of diarrhea. In November 2022, the *Journal of Veterinary Internal Medicine* examined this issue in the study “*Enterococcus durans* infection and diarrhea in Thoroughbred foals.”

“Diarrhea remains an important cause

of morbidity and mortality in neonatal foals, and correct identification of etiologic agents is essential for effective disease management,” explained researchers. “Identification of pathogens that can cause diarrhea in foals is an important element for disease risk management at both animal and farm levels.”

Researchers performed a prospective observational study in order to examine the association between diarrhea and detection of *enterococcus durans* or other enteropathogens in 59 neonatal foals and their dams on a single Kentucky breeding farm from January-May of 2010. The selected farm was used because of an outbreak of foal diarrhea the previous year.

The horses involved were tested for *E. durans* and other enteropathogens during the 10 days after foaling, and researchers found seven of the foals developed diarrhea.

“The frequency of foals with *E. durans* infection was higher in foals with diarrhea 5/7 (71%), compared to foals without diarrhea 0/51 (0%),” researchers concluded. “Detection of *E. durans* in foals was associated with detection of *E. durans* in broodmares; in 2/7 (29%) foals with diarrhea, the two broodmares tested positive for *E. durans*, and, in 51/51 (100%)

foals without diarrhea, all broodmares tested negative to *E. durans*. Based on the spatial and temporal distribution of foals with diarrhea, five of six additional cases of diarrhea were attributed to lateral transmission of *E. durans* infection.

The first 35 foals in the study did not develop diarrhea. The first foal to present with diarrhea was diagnosed two days after foaling. Five additional cases were diagnosed in the same barn, all within three to 12 days later. The remaining case occurred in a different barn two days after foaling.

“This study provides new epidemiologic evidence that detection of *E. durans* is associated with diarrhea in foals,” concluded researchers. “A strength of this investigation is that both foals with and without diarrhea were targeted for detection of enteropathogens within 10 days of birth. In foals with diarrhea, fecal samples were collected and tested at the onset of clinical signs, as well as from their respective broodmares. The inclusion of foals without diarrhea as a comparison group offers epidemiologic evidence that *E. durans* was associated with diarrhea in study foals.

“The first case of diarrhea in foals tested negative to *E. durans*, but its broodmare tested positive to *E. durans*,” said researchers. “It is possible that this case had a false negative culture result of *E. durans*. It is also possible the source of infection was its broodmare, which tested positive to *E. durans*, or environmental contamination with that pathogen.”

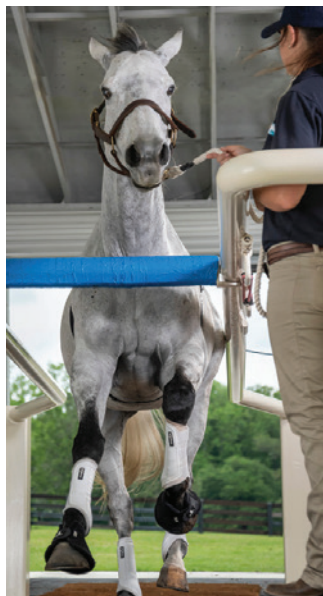
Genetics also plays a key role in a foal’s viability as a racehorse. In October 2022, the *Equine Veterinary Journal* published “Prevalence of the RAPGEF5 c.2624C>A and PLOD1 c.2032G>A variants associated with equine familial isolated hypoparathyroidism and fragile foal syndrome in the U.S. Thoroughbred population (1988-2019).”

“Equine familial isolated hypoparathyroidism and fragile foal syndrome are both fatal recessive conditions reported in Thoroughbred foals,” explained re-

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# HEALTH ZONE

## Foal Health

searchers. “The causal variants for EFIH and FFS were recently reported.”

A population allele frequency study was used to estimate the frequency of the EFIH and FFS variant alleles in the United States Thoroughbred population between 1988 and 2019 with the objective of determining whether these are recent mutations or are increasing in frequency because of current breeding practices.

Researchers genotyped genomic DNA from hair and serum samples for the EFIH and FFS. A total of 728 samples were from birth years 1988-2000 while 1,059 were from 2001-2019. Collectively, they spanned across seven geographical regions of the U.S. Data showed EFIH and FFS allele frequencies were not significantly different between the two time points.



Improved scientific understanding of horses' development can improve the lives of foals

“The EFIH and FFS variants are present at low frequency in the United States Thoroughbred population but are not recent mutations,” researchers concluded. “There is no evidence to support changes in allele frequency over time. However, given the closed studbook and breeding practices, continued monitoring of breed allele frequencies and genetic testing are

recommended to avoid the mating of carriers and production of affected foals.”

A happy, healthy foal is the ultimate goal of each of the thousands of matings planned every year. While making it to the races is never guaranteed, chances can be improved the more both common and uncommon issues are scientifically understood. **BH**

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