

Equine Cloning
An Investigation of Legality and Prospects
By Charlotte Yates

INTRODUCTION

In equestrian sports, the horses' abilities will largely determine the outcome of any match or competition. In the competitive equestrian world, the ideal horse is not only the best playing animal, but is also a model specimen of its breed. Investing in a horse that carries good genes ensures a return on investment because the genes can be passed to many progeny through well-crafted breeding programs. Thus breeding competitive horses has evolved into a highly studied and regulated industry.

A world-renowned polo player, Adolfo Cambiaso, together with Crestview Genetics, has popularized cloning in the world of breeding competitive horses. [1] Historically, equine breeders strove to produce the best competition horse, by selecting two talented horses to breed. Technological advances, like artificial insemination allowed for horses in different locations to be bred. Now, cloning allows the genetic material of a talented horse to be identically copied in creating one, or multiple offspring. Currently, it is unclear what the impact cloning will have on equine sports both legally and athletically.

I. Historical Overview of Equine Breeding Technologies

A. *Traditional Techniques*

For a traditional breeding, the male and female horse have to be in the same location while the mare is in the most fertile period of her estrus cycle. Typically a mare comes into estrus every three weeks in the summer. The mare's cycle is naturally induced by the increase in daylight hours during the summer months. Many breeders have developed techniques to trick a mare's body into beginning estrus in the earliest parts of the calendar year, for example by using artificial lights. [2] This practice is advantageous for ensuring that foals are born at the ideal time of the year for making racehorse age group cutoffs, known as "breed birthdays". For example, The Kentucky Derby, allows only three year old Thoroughbred¹ horses to compete. [3] Thoroughbreds are considered one year older on January 1st in the Northern Hemisphere and on August 1st in the Southern Hemisphere. [4] Therefore, a racehorse that is born in January will race in the same class as a horse born in June. On race day, the older horse will have had six months more to grow and gain muscle, which theoretically would make the older horse a better athlete. Thus a Thoroughbred owner can increase the likelihood of a win simply by controlling the time of year that the competing horse is born.

¹ Thoroughbred is a registered breed of horse used mainly for racing and for polo.

B. Artificial Insemination

In the second half of the twentieth century, using artificial insemination technology in breeding horses became popular. [5] This technology allows for mares to be inseminated by stallions that are located anywhere in the world, expanding potential breeding opportunities. Breeders who desired using specific stallions no longer needed to ship their mares to the stallion's location across country or abroad. Because of the popularity of artificial insemination, many countries, including the United States, have strict statutory importation regulations for the artificially collected semen. [6] Foals conceived through artificial insemination are allowed to participate in almost all types of competition, with the main exception being the most lucrative competition, horse racing. Official jockey clubs, such as the United States Jockey Club, which regulates all Thoroughbred racing in the US, forbid foals conceived via artificial insemination from competing because it believes this breeding technique could jeopardize the integrity of the breed and sport. [7] However, the strict regulations on Thoroughbred breeding may in fact be harming the industry. A recent theory proposed that the Thoroughbred's ability to sprint has been physiologically maximized through traditional breeding practices, meaning that the horses competing in races today are not running any faster than their predecessors in the 1970's despite the use of carefully selective breeding practices. [8]

C. Cloning

According to Alan Meeker, a polo playing enthusiast and founding member of Crestview Genetics “it would take him personally fifty years in breeding practices and an estimated \$100 million dollars to create the perfect stable of horses using traditional breeding practices.” [9] In order to expedite this process, Meeker teamed up with Cambiaso, often referred to as the greatest polo player to ever exist, to create Crestview Genetics to pursue polo pony cloning using Cambiaso’s best horses. Meeker acquired the rights to all patents involving animal Somatic Cell Nuclear Transfer (henceforth SCNT) for cloning, the process that was famously used to make Dolly the Sheep. [10]² Meeker therefore monopolized all SCNT cloning for polo purposes worldwide as well as for all mammals in Argentina, which is the main country producing polo ponies. Not all countries recognize international patents, with Argentina being one of them, thus it is necessary to hold a patent in that country as well as an international patent. To circumvent this problem, Meeker brought in a third partner Ernesto Guitierrez, an Argentine businessman whom holds his own patents for bovine and mammal cloning protocols in Argentina. [11] Crestview Genetics has an office in Argentina which owns the Argentinian

² In order to clone a horse using SCNT, Crestview Genetics acquires the ovaries of slaughtered mares. They strip the eggs of genetic material contained in the nucleus leaving behind a shell that is then filled with the DNA of the animal that they wish to clone. This clone-filled embryonic cell is then transplanted into the uterus of a surrogate mare to develop in the same way as a naturally inseminated embryonic cell.

patents for SCNT cloning. [12] Crestview Genetics began testing the process of cloning the world's best polo ponies with Cambiaso's star polo pony Cuartetera.

Crestview Genetics is one of two laboratories actively involved in polo pony cloning in Argentina. [13] The other Argentinian lab uses a different type of cloning than Crestview Genetics. [14] Success rates are reportedly much higher at Crestview Genetics and many clones have been created for high level play as well as breeding. [15] The company follows strict protocols to ensure that the animals are raised as similarly to the originals as possible through training, diet, habitat, etc. [16] According to Meeker "around 85% of clones produced are as good or better than the originals." [17] This past year Cambiaso has ridden several clones in major polo tournaments, proving that the animals are capable of play at the highest level of the sport. [18]

The success of Cambiaso's venture in the past five years has led to excitement about cloning in the sport of polo. [19] Crestview Genetics' patents expire in 2016, meaning that the cloning technology will fall into the public domain. [20] However, the company is actively involved in the creation of new patents which advance their cloning technology. For example, Crestview has a pending patent on a way of taking epithelial from sperm and cloning from that sample. [21] Crestview hopes to identify genes that would allow for increasing a horse's heart and lung capacity, which could increase the horse's athletic potential. The company is also working outside the equine world with Harvard University on human technology. Despite this string of successes for Crestview

Genetics, the future applicability to the polo world and legal uncertainty that has arisen in other animal registrations (like dogs) may prevent their technology from becoming a new standard breeding technique.

II. The Economic Impacts of Clones

Thoroughbred Racing and Polo are perhaps the most interconnected and comparable of the equine sports. The Thoroughbred is a very popular choice of mount for polo because of the breed's extreme athletic ability, which compliments the game of polo. Many lower level polo ponies are horses that failed or were not competitive on the racetrack. Additionally, the process through which a horse is valued in these disciplines is very similar. A race stallion's fee can range from a few thousand dollars to half a million dollars depending on his own pedigree and race record or progeny's race record, with pedigree having a large influence on the resulting foals worth. [22] Young racehorses have been sold for millions despite being untested on the racetrack because of their breeding potential. [23]

Similarly, many of the top polo players own large breeding farms where they produce horses for the paying masses through breeding and training techniques. A horse bred and trained (or more colloquially known as "made" in polo circles) by Cambiaso can sell for hundreds of thousands of dollars. [24] The biggest difference between the breeding practices of polo and racing is that polo does not restrict itself to purebreds has no official restrictions on the

breeding technologies such as artificial insemination, embryo transfer and now cloning. Meeker believes that cloning will “increase the value of mares,” which are traditionally favored for playing polo, and that will have a positive trickle down effect with “the best horses flooding the market making them more accessible to the lower levels.” [25]

III. Legality of Clones in Competition and Registration

A. The Domestic Animal

Most domesticated animals are ruled by official clubs based on breed or style of work. The breed-based competitions, such as the Westminster dog show, encourage breeding styles that propagate the “official breed standards” and protect the integrity of pure-breeding practices. [26] Animals can generally be registered with the clubs so long as they come from two registered parents. These clubs host major events, which increase the value of the successfully competing pure-bred animals. Alternatively, there are clubs such as the International Federation for Equestrian Sports that have no restriction on the breed of animals competing. [27] Instead, the animals competing in the club event gain value simply by being the best competitor in the division. Despite the appearance of fairness for all competing individuals, most of the top competition animals are from registered stock that have been carefully bred to emphasize characteristics that will enable future offspring to be as successful.

Legalities involving domestic animal cloning are vague due to the novelty of the technology.

The American Kennel Club, which stands as the overseeing club for dog registration, has banned clones from registration. The complementary club for cat registration in the USA, the Cat Fanciers Association, has not taken a stance because no one has tried to register a cloned cat. Horses, which have much wider selection of breed and competition club registries, have not settled on a singular ruling.

B. The Equine Divide

International equestrian groups such as the International Federation for Equestrian Sports (FEI) have embraced technological advances in equine breeding tactics. The FEI ruled officially in 2012 that clones would be allowed to compete in all future events, including the 2016 Olympic Games. [28] The FEI reasoned that clones are not direct copies of their originators because each horse is shaped by its training and upbringing. [29] This decision to allow clones may be a way of enhancing the breeding practices that benefit this type of competition.

For example, stallions are notorious for being distractible which can inhibit their best performances in competitions. To avoid this problem many competitors geld, or castrate, the stallion so that they may compete the animal without worrying about hormonal imbalances. This practice prevents many of the top competing horses from ever reproducing. Famously, a gelding called

Gem Twist, which won the American Grand Prix Association Horse of the Year three times, and is regarded as one of the greatest show jumpers to ever live, was cloned in 2006. [30] Both of his clones are intended to be used for breeding purposes. Cloning allows for horses to be bred after allowing it to compete in its best state and prove its worth.

By contrast, in 2012, in a lawsuit involving the American Quarter Horse Association (AQHA), the Court ruled that prohibiting Quarter Horse³ clones from registration was a violation of section one of the Sherman Act regarding anti-monopoly laws. [31] The complainants argued that by not allowing clones to compete, the AQHA was effectively controlling the “elite” horse market by creating a monopoly for the registerable horses. [32] However, this decision was later overturned in 2015. The appellate court ruled that the AQHA did not have a direct interest in the “elite” Quarter Horse market and thus there could be no monopoly. [33] The clones in this competitive and breeding arena are still ineligible for registration and banned from competitions. [34]

As mentioned previously, clones are expressly prohibited from competing in horse racing. This is particularly important because DNA verification has existed in the American Jockey Club since 2000 to prove parentage. [35] Additionally each foal that is registered with a tattoo indicating

³ Quarter Horse is a registered breed of horse typically associated with western style events.

its registration number so that it can be checked at the racetrack. [36] This is to prevent unregistered horses from competing in official races.

IV. Pedigrees and Valuation

Cloning has called into question how we look at animals and in particular, the hotly debated nature versus nurture theory. On the one hand, some official associations have taken the view that a clone is merely a twin of the original and that it is the upbringing of the animal that makes it unique, therefore clones should have the same rights as the original. [37] On the other hand, many associations have postulated that the allowance of clones into registries and competitions would impact the genetics of the breed as a whole and create an unfair advantage to those who are able to afford to clone the best animals. [38]

In addition to polo ponies, Meeker has cloned the famous racehorse stallion Storm Cat, who during his peak stood at stud for a record \$500,000.⁴ [39] Most polo players could not justify paying such a stud fee for a polo horse. Now, clones may have lower breeding fees compared to their genetic predecessors. This opens the possibility that polo ponies could have the legendary stallion Storm Cat in their pedigrees.

⁴ Stallions standing at stud receive a fee for each breeding, regardless of the ultimate value of the resulting foal.

Another intriguing problem also arises from the existence of clones. Though cloning is strictly forbidden in the US Jockey Club, and clones are forbidden from competing, the Club cannot test for clones as they are indistinguishable from their predecessors. Moral ambiguities aside, because Thoroughbreds must be bred naturally by club rules, a popular stallion's owner could relatively easily clone a stallion to increase the stallion's breeding ability. [40] For example, a stallion might be restricted by biology to breed only 500 times in a season, but an owner could clone the stallion and use the clones for breeding purposes as well since the genetics are identical.

One of the cloned "Cuarteteras," the first horse that Adolfo cloned from his string, sold for \$800,000 as a three-month-old foal to his future partner Guitierrez. [41] Her value was ostensibly encoded in her genetics as the clone of a celebrated playing mare. In a landmark decision in 2014, the Federal Court of Appeals ruled that cloned individuals were a non-patentable subject matter and the creators of Dolly the sheep could not patent her. [42] In order for something to be considered eligible for patent the subject cannot come from natural laws, natural phenomena or abstract ideas. [43] The court in the case of Dolly's patent eligibility ruled that because she was genetically identical to the donor, which was a naturally occurring individual, Dolly is natural, just a twin in time.⁵ [44] Crestview Genetics, the main cloning company for horses

⁵ A "twin in time" refers to the concept that the cloned individual is identical to the original though they are separated by time of birth.

in the world, realizing that the value of their product (the genes) could diminish if sold the clones themselves, now intend to focus on selling the foals of the clones instead so as to protect their interest in the superior horse's genetic code. [45]

Horses began as beasts of burden before becoming animals of pleasure, and legally have only ever been viewed as real property. As the technology of cloning evolves and we begin to modify the animals, it does not make legal sense that the clones themselves are only the real property of the creators instead of the intellectual property. It seems that this goes against other current agricultural patent examples. The process and genes involved in the in creation of clones should be considered similar to that of another major agricultural movement: Genetically Modified Organisms. For companies such as Monsanto, the value in their products is not in the actual produce, but in the modified genes that are found in them for which the company holds the patent. [46] As cloning in horses advances and individual genetics become more understood it will be possible to "modify" the horses, which should make them truly patentable as individuals. If a breeder could find a way through cloning and genetic modification to make a Thoroughbred capable of sprinting faster, is that not better for the breed that many consider evolutionarily maxed out? In essence, the cloning of equestrian athletes is becoming more like the creation of machines than of animals. People should be able to protect their creations.

V. Recommendations

The process of cloning must be researched further before regulations can effectively be put into place. Cloning offers a new way of enhancing a breed, but it also calls into question many traditional practices that were designed to create fair competition.

One reason cloning could benefit the equine industry in particular is because while a successful stallion might be able to produce thousands of offspring, an equally successful mare is very limited in the amount of offspring that she can produce. For example, the legendarily undefeated mare Black Caviar, whose career spanned longer than many of the most iconic stallions, would be able through cloning to make a strong impact on the breed as a whole. Black Caviar went undefeated in twenty-five races; comparatively a stallion called Danzig, recognized as one of the most important studs of the twentieth century, retired to stud after winning his first three races.⁶ [47] Cloning allows for a previously grossly underrepresented sex to influence the genetic code of horses equally in the future. It could also allow for horses to prove themselves in competition before becoming breeding stock as in the case of the gelding Gem Twist mentioned previously. However, the problem with this representation is that it can also go the other way as well. It may be that

⁶ Successful stallions may retire from their competitive career to stand at stud full-time. These stallions will be kept for purely reproductive use.

because it is only desirable to clone and breed the most successful animals, instead of improving the genetics of a breed we artificially create a bottleneck effect which occurs when there is not enough genetic variation for a species to survive. Without introduction of new blood or mutations, the breeders could actually destroy the breed.

A happy medium to pursue until further long-term scientific studies are done may be to allow the equine clones to compete, but not allow the stallions to be used for breeding. This would allow for cloned animals to compete on an individual level and be judged for their personal achievements. Additionally this would enable mares, traditionally limited by the small amount of offspring they can produce, to impact the breed as much as a stallion.⁷

CONCLUSION

Cloning has changed the way that we view the uniqueness of life and genetics. In the equine world, cloning has the potential to change all equestrian sports as well as the way horses are bred. This unusual technology has been embraced mainly by the sport of polo in which it has gained worldwide recognition as an acceptable practice. Despite that, the reality of cloning has not been adequately explored in the wider context of equine disciplines or in that of other animals.

⁷ Mares typically can produce one offspring per year during their adult life, which limits most mares to fewer than 20 foals

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<http://www.bloodhorse.com/horse-racing/articles/31576/leading-sire-danzig-dead-at-29>.

A mule named Idaho Gem is the first equine to join the cloned menagerie, according to a report published today in the journal Science. Born on May 4, this foal is also the first sterile animal to be cloned. Starting with Dolly the sheep, scientists have successfully duplicated pigs, cows, cats, rabbits and rodents. The cloning of horses and other equids eluded them, however, despite numerous attempts. Equine cloning is now in use as a clinical technique. It is available commercially, and its efficiency seems to be increasing. The foals produced by cloning may differ in some phenotypic and behavioral traits from the original animal but should produce offspring that reflect those that the original donor animal would have produced. Equine Cloning Concerns. Will cloned foals be healthy and normal? The cattle and sheep industries see huge abnormalities with clones, said Hinrichs—such as abnormally large offspring, fluid swelling, abnormal placentae, and heart and lung abnormalities.Â Much research is being done on what constitutes —reprogramming—™ and what affects its efficiency.â€ What about premature aging? Many people are worried about premature aging in equine clones after widespread media discussion of Dolly the sheep—™s supposed premature aging.