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The Cloning Company

Cloning Equids

A clone is an identical genetic copy, and in the equine world horses and mules have been cloned

Overview

Cloning is defined as the process of creating a genetically identical copy of another cell or organism (i.e., bacteria, plant, or animal) through non-sexual means. In the equine world, cloning refers to the production of a foal that has the exact same genetic material (DNA) as the donor horse, be it mare, stallion, or gelding.

Cloned foals are not considered genetically engineered, but rather conventional animals. That is, cloning is an advanced assisted reproduction technique (like embryo transfer, which is commonly performed in horses) that does not manipulate or alter the animal's DNA.

While scientists have been attempting to clone animals for more than 50 years, cloning wasn't widely considered a success until the production of Dolly the Sheep. Dolly was cloned in 1996 by Ian Wilmut and colleagues at the Roslyn Institute in Edinburgh, Scotland. Since Dolly, advances in cloning have progressed at a remarkable pace.

Successfully cloned animals now include the rhesus monkey, the gaur and banteng (endangered bovine species), cattle, cats, mules, water buffalo, and horse.

How Animals Are Cloned

There are multiple techniques utilized for cloning animals, some of which employ embryonic cells (i.e., those cells in the early stage of development prior to birth). The process currently used to commercially clone a horse in the United States is a nuclear transfer technique that uses DNA from adult cells rather than embryonic cells.

Specifically, a tissue sample from the donor animal is obtained (e.g., from the neck or under the tail). The collected cells are cultured in the laboratory, then they are cryogenically frozen in a gene bank. To produce a clone of the donor horse, some of the frozen cells are thawed, and the genetic material from those cells is transferred into an unfertilized equine oocyte (egg) harvested from a donor mare. The donor oocyte has been stripped of its own DNA, and the DNA from the donor horse is subsequently inserted into the "empty" oocyte.

ANNE LAMBERT/VIAGEN

National cutting horse champion Royal Blue Boon (right) and her clone Royal Blue Boon Too, which was born Feb. 19, 2006. The mare is being held by owner Elaine Hall.

The oocyte containing the donor horse's DNA is then stimulated to begin dividing to form an early stage embryo. The embryo is then transferred into a recipient mare, just like what occurs during embryo transfer. After a normal gestation period, the cloned foal is delivered that is genetically identical to the selected horse.

Since both the donor horse and the foal have the same DNA, cloned foals are often referred to as a "later-born identical twin" to the donor horse. Just like human identical twins, however, the donor and cloned horses will not be exact replicas of each other. This is because environmental factors can impact the chemical structure of the DNA and gene expression.

As a result, certain physical characteristics, such as markings and behavior, will differ between the parent (donor) horse and its clone.

Cloning Horses: Progress to Date

The first horse was cloned in Italy in May 2003 to produce a Haflinger filly named Prometea. The first North American horse to be cloned was in 2005. The resultant cloned foal, Paris Texas, is an exact copy of the European jumping stallion Quidam de Revel. In March 2008 Prometea gave birth to a colt, Pegaso, and in 2009 the cloned foal of Scamper, a 10-time world champion barrel horse, began his career as the world's first cloned stallion to stand stud for commercial breeding.

Equine cloning is now commercially available in the United States. The cost to "gene bank" your horse is about $1,500. Cloning costs approximately $150,000. Success rates remain highly variable.

The DNA from the donor horse is transferred into many oocysts in the laboratory. Only a small number of the oocytes containing the desired donor DNA will begin to develop into an early stage embryo; an even smaller number of oocytes will remain viable once transferred to a recipient mare. Even oocytes that have been

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successfully transferred and prove viable (live) on follow-up ultrasound examinations are not guaranteed to produce a live foal.

For example, to produce the first cloned horse (Prometea in 2003), investigators experimented with 841 reconstructed embryos. Of the 14 viable embryos, four were implanted into surrogate mothers, and only one live foal was produced.

Commercial success rates today are said to be approaching 25%.

Why Clone?

Cloning in general has been used for a variety of purposes, such as producing strong, healthy, reproductively viable animals and to help protect endangered species.

In the equine industry, horses are usually commercially cloned:

- To produce one or more foals from a superior horse that cannot reproduce (e.g., a gelding or infertile/subfertile stallion or mare due to health or age);
- To preserve the genetics of animals that either died prematurely or died prior to recognition of the valuable genes.

Registration and Equine Cloning

While cloning is exciting from a scientific standpoint and for an owner to potentially immortalize a favorite horse, cloning remains a heatedly debated subject, particularly in certain athletic sectors of the industry.

Commercially cloned horses are currently permitted to compete in endurance horse racing, show jumping, polo, carriage horse competitions, cutting, rodeo events, and dressage. Check with your breed registry to see if clones are allowed.

In March 2009 the American Quarter Horse Association (AQHA), which banned the registration of cloned foals in 2004, voted to appoint a task force to evaluate the impact of cloning horses. The AQHA has agreed to reconvene in 2010 to re-evaluate their stand on registering foals produced by cloning.

The Jockey Club (which registers Thoroughbreds) has rules that state foals produced by artificial insemination, embryo transfer or transplant, cloning, or any form of genetic manipulation are not eligible for registration and therefore cannot race in the United States.

FAST FACTS

- Cloning refers to the production of a foal that has the exact same genetic material (DNA) as the donor mare, stallion, or gelding.
- Cloning is an advanced assisted reproduction technique (like embryo transfer) that does not manipulate or alter the animal's DNA.
- The first animal clone was a sheep in 1996. The first equid clones were mules in 2003. The first horse clones were born in 2003 in Italy and 2005 in the United States.
- In the United States commercially cloned horses are produced using a nuclear transfer technique. The DNA is harvested from adult cells, not embryonic cells.
- While cloned horses are able to participate in many athletic events, the American Quarter Horse Association and The Jockey Club (Thoroughbred registry) continue to ban the registration of cloned foals.
- Clones often do not look identical.