

How do you think cloning and genetic preservation benefit the livestock industry?

Historically, the livestock industry has bred desirable male and female animals and awaited their offspring. More recently cloning has been used to make genetically identical copies of animals with desirable characteristics. This safe, highly predictable process provides an opportunity to multiply successes quickly, effectively and at a reasonable cost. It enables the livestock industry to do in record time what breeders have been doing throughout history, selecting for genetic combinations that produce the most desirable offspring. Cloning has many potential benefits including trait selection, genetic preservation and the expansion of biodiversity. Consumers, especially those without access to an adequate food supply, will also benefit from this technology.

Cloning and genetic preservation benefits the livestock industry by expanding the accessible gene pool of highly desirable traits at a reduced cost. Some of these traits include better feed utilization, resistance to diseases -- thus a reduction of drug and antibiotic use, meat tenderness, more muscle, and increased productivity of milk, eggs or wool.

The benefits of cloning can clearly be seen in the show cattle business. Due to the high level of success in the show ring by offspring of the original bull, Heatwave, thousands of people wanted access to his semen to use with their cows. The demand for Heatwave semen rose quickly and far surpassed what one bull could produce in its

lifetime. Because demand far exceeded supply, the price for Heatwave semen became very high. Heatwave's owners quickly responded to this high demand with cloning. Heatwave has been cloned numerous times over the years and those clones have continued Heatwave's winning tradition. Additionally, because of the increased supply of Heatwave-identical semen, his high quality genetics are available to the public at a price significantly less than if he had not been cloned.

While the benefits of cloning are most visible within the show ring, it is also being used as a tool for genetic preservation outside the show industry. Many domestic species are approaching extinction. Cloning and other genetic preservation techniques, such as embryo transfer, may be the key to preventing extinction in some of these species. An example of this is the preservation of the last surviving cow of the Enderby Island cattle breed. Cloning this female provides a second chance to resurrect a breed that otherwise would have disappeared and also helps maintain bovine biodiversity.

Embryo transfer involves transferring multiple live embryos from a "donor" female with desirable characteristics to a number of less valuable recipient females. It allows specific combinations of characteristics to be spread through a population at a much higher rate than relying solely on natural pregnancy. It is not uncommon for a cow to produce fifteen calves a year when embryo transfer is used compared to one with natural pregnancy. This increased spread of desired maternal genes, along with cloning which multiplies the rate that desired traits of both sires and dams can enter a population, can help insure that the species will never be lost. These genetic preservation techniques are useful in food animal production by maintaining high quality

purebred lines that can be cross bred to produce offspring of increased health, performance and efficiency.

Genetic preservation techniques such as cloning, embryo transfer, artificial insemination and the freezing of semen and embryos, will become increasingly important in the production aspect of the livestock industry. Like Heatwave, popular sires are being cloned to produce more semen which in turn will increase the number of animals with elite genetic DNA for high efficiency in market and dairy animals. These elite animals will foster the growth of even more efficient and productive animals at rates faster than we have ever witnessed. Being able to easily select for desired traits is also valuable to provide adaptability to changing environments and production needs.

Increased productivity and efficiency will be important in the effort by farmers to feed the world as its population continues its exponential growth. With the use of non-traditional methods to produce uncommon results, questions have been raised as to the safety of meat from cloned animals. The genetics of the cloned animal are the same as its parent and are not altered during the cloning process. The FDA and USDA have concluded that the meat is safe for human consumption. Because of pushback by many people to potentially having meat from cloned animals on their dinner plate, the agencies have allowed animals sired by clones to be used for human consumption, but not the actual cloned animals. This restriction is not a major concern, however. Animals being cloned are typically ones that have proven their worth as genetic donors. Current economics dictate that this rather costly process is used mainly for preservation of species or to increase the productivity of a herd.

Consumers, especially those with limited access to food or with specific health concerns, will benefit greatly from cloning. Dairy cows are being bred to produce significantly more milk. Many cows are also being bred for other traits such as higher milk protein, lower lactose levels, and higher milk fat. Cattle and hogs are being bred to yield more meat with that meat being leaner, more tender and having lower cholesterol levels. This technology may also provide consumers new food and health products that are just dreams today.

There are many benefits of using genetic preservation techniques, such as cloning and embryo transfer. Some of the benefits include increasing productivity and efficiency throughout a herd, the prevention of some species from extinction and the expansion of biodiversity all while moving forward in the effort to provide low cost, high quality meat and dairy products. The use of cloning and embryo transfer will also allow livestock producers to obtain high quality genetics at reasonable prices. Consumers also benefit greatly by having access to more economical and nutritious food. Cloning is truly an opportunity for farmers, ranchers and consumers to multiply successes.