

# Improved **HORSE** Breeding



Mark Arns

University of Arizona Equine Center in Tucson

## *Equine reproduction, research and education*

*By Joanne Littlefield*

**H**orses are often prized by their owners for their agility and speed on the trail or in the show ring, and for their sturdiness, sleek coats or other desirable characteristics. Breeding efforts focus on preserving such traits. Yet stallions have not necessarily been selected based on how well their sperm actually holds its fertility when frozen. This is a critical consideration when artificial insemination (AI) is used and a stallion's sperm needs to be stored and later transported to a breeding mare.

Although artificial insemination for horse breeding has been around for awhile, with fairly good success in shipping semen across country, the practice hasn't been readily adaptable for small herd owners. Because the American Quarter Horse Association recently approved the use of refrigerated and cryopreserved semen and lifted restrictions on its use, more horse owners are considering the advantages of long-term preservation. Being able to deep freeze the semen so it can be saved for a longer period of time and shipped a greater distance cuts down on transportation costs while making the genetic pool available to a larger group of brood mares.

To assist in this effort, researchers in the University of Arizona College of Agriculture and Life Sciences are examining how cryopreservation increases both the level of fertility and the sur-

vival rate of sperm for use in artificial insemination. Associate equine specialist Mark Arns, in the Department of Animal Sciences, whose background is in sperm physiology, has been looking at how changes in the horse's diet, as well as in the cryopreservation medium, can increase reproductive success. He is also studying how that sperm can be frozen more effectively.

Using research information gleaned from both swine and human reproductive physiology, Arns has been investigating whether dietary supplementation of an oil-based fatty acid makes a difference in the fertility rate.

"We fed stallions omega-3 fatty acids in the diet for 90 days," he says, "and then looked at changes in sperm characteristics and the makeup of the sperm plasma membrane, as well as the spermatozoal response following both short and long-term preservation."

Preliminary results show a 50 percent increase in sperm production in the treated stallions. This practice has the potential of increasing the number of inseminations—or the number of mares that can be bred—simply by altering the horse's diet.

The second study in which Arns is compiling data deals with improving the viability of spermatozoa after freezing. Adding cholesterol to the media in which the semen is held after harvesting strengthens the membrane of spermatozoa.

"We know that if we increase the amount of cholesterol in the membrane we can stabilize the membrane and for some stallions improve upon their sperm's ability to survive a cooling/warming or freezing/thawing cycle," Arns says. Additionally, this study looked at removing the cholesterol from sperm plasma membrane prior to insemination.

"For some stallions' semen, too much cholesterol is thought to actually have a negative effect, preventing fertilization," he says.

To bring this new technology to horse breeders in Arizona, Arns created a workshop series to provide producers with applied instruction using artificial insemination practices. The objective is for producers to be able to enhance reproductive efficiency in their breeding herd by incorporating basic reproductive technologies. Program participants range from first-time horse owners to skilled professionals.

The equine industry in Arizona includes private and commercial pleasure riding; participant and spectator events such as polo, rodeo, racing, shows or roping; and breeding. The Arizona equine industry adds \$1 - 1.3 billion annually to the state's economy, according to an economic survey funded by the Arizona Horseman's Association.

Four two-day workshops have been conducted each year since 2000, including the first workshop for Arizona tribal leaders, primarily from the Navajo Nation. The long-term goals of the program are to increase the number of foals born, to increase the number of client mares (thereby increasing income for horse breeders), and to decrease costs associated with breeding horse by decreasing the number of cycles per pregnancy and by incorporating the use of biotechnology through artificial insemination.


"Because the technology is relatively new in the horse industry, there are not a lot of places where owners can go to get some instruction in these different biotechnologies," Arns says.

"Most of our producers either have mares, or they have stallions they raised or purchased, and they're looking at trying to lower the cost of their production program by learning how to do it themselves instead of hiring it out."

The equine reproductive management workshop consists of a review of the reproductive physiology and management of the mare and stallion, followed by instruction in basic artificial insemination skills; hygiene; how to collect or harvest an ejaculate; and how to prepare it for either immediate insemination on the farm or for short-term preservation through refrigerated semen.

Depending on the number of horses they own, stallion owners in attendance said the workshop would result in annual savings of between \$4700 and \$6300. The participants who owned mares reported that the workshop would result in an annual savings of around \$3000.

"Even though artificial insemination is fairly simple, we didn't have a lot of people trained in it and so some of the initial trials weren't successful," Arns says. Now that it's been around for a while and more people have been educated in both stallion and mare reproductive physiology, the success rate is increasing.

"We have stallions in the industry that sell literally for millions of dollars," Arns says. "Now all of a sudden, they don't have as much risk. You can go ahead and harvest spermatozoa, put those in a cryobank and have a little bit of insurance if that stallion should become infertile or die. You still have sperm cells or genetic material available for use." 

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## The UA Equine Center

The UA equine center, located adjacent to the College of Agriculture and Life Sciences Campus Agricultural Center in Tucson, was created in 1978 under the direction of CALS equine specialist Bill Schurg. It currently has about 50 head of horses with an active Thoroughbred breeding herd for students to work with in several CALS classes. In addition there are several riding horses used in horsemanship classes. Research efforts have primarily been in the stallion fertility area with several stallions housed at the equine center. In addition to the equine breeding education program, the equine center is home to other public education workshops:

### Nutritional Management

To provide horse owners with an in-depth study of equine nutritional management, a series of three weekly 2-to-3 hours educational sessions focus on applied aspects of feeding horses, helping participants with their current feeding program. Participants who bring a hay sample receive an analysis to determine how to balance diets for each of the different classes of horses being fed. Computer assisted analysis is conducted and software is available for participant use.

### Hoof Function and Care

Horse owners who are interested in learning more about proper hoof function and care can learn through a workshop broken up into two modules. The first module is for owners interested in just the basics of hoof care and covers safety in handling horses and the anatomy of the leg and hoof. The second module is for those interested in gaining hands-on training in the proper trimming of horses and includes information on the how to detect physiological unsoundness found in legs and hooves and identification of various trimming/shoeing methods. In addition there are laboratories associated with the second module that focus on proper application of hoof care tools and evaluation of hoof form to function.

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