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Embryo Transfer in Horses

For a number of years, the dairy industry has used embryo transfer in order to increase the number of calves from select producers. Now this technology is being applied to produce more high quality performance horses. At the University of Pennsylvania's School of Veterinary Medicine as well as at other institutions, researchers are helping horse breeders to increase the number of offspring from superior mares.

Dr. Patricia L. Sertich, a lecturer in reproduction at Penn, is affiliated with the Georgia and Philip Hofmann Center for Reproduction at the Vet School's New Bolton Center campus. "We are into our fourth year of performing embryo transfer in the horse," she said. "Currently, more breed associations are accepting embryo transfer foals into their registries. It is permitted by the registries for Arabians, Quarter Horses, American Saddlebreds, Trakehners, and other European warmblood horses. Each registry has specific criteria which must be met for acceptance. Embryo transfer is not permitted by the Thoroughbred and Standardbred registries."

The horses Dr. Sertich works with are performance horses, predominantly show jumpers and dressage horses. Many are actively in training and competing on the show circuit, even while participating in the transfer program.

"We like to group the mares for breeding to increase the efficiency of the program. Usually, we breed more than one mare to the stallion," Dr. Sertich said. "The procedure is very labor intensive and requires a lot of attention to detail. Embryo transfer allows a mare to produce more than one foal in a year." Usually, the 11-month gestation period of the horse allows for production of only one foal per year, and serving as a broodmare interferes with the mare's training and performance schedule.



Top: Dr. Patricia Sertich examining a mare by ultrasound for detection of ovulation.

Bottom: A successful transfer.



One of the donor mares in competition.

Dr. Sertich explained that the donor mare (mare which is bred) and the recipient mare (mare which carries the foal) must be synchronized so that they are at the same stage in their heat cycles. "When the horses arrive at the Hofmann Center, they are given hormones to prevent them from coming into heat. These hormones are discontinued after ten days and the mares come into heat six days later. Each mare is teased daily to determine her receptivity toward the stallion, and her reproductive tract is palpated to detect ovulation. Follicle development is also monitored by ultrasound so the precise time of ovulation can be determined." Mares are bred just prior to ovulation.

Breeding is accomplished by artificial insemination. "It is physically safer for the horses and lowers the likelihood of spreading infection," she said. "Also, more than one mare can be bred from one semen collection." Frequently, the stallion is actively competing at shows. He is brought in for breeding at the proper time and then returned to competition.

Seven days after ovulation, the donor mare's uterus is flushed. A special embryo medium is infused and then collected. After flushing, the embryo, no larger than a pin head, is located and transferred transcervically into the recipient mare. The Hofmann Center is one of the few places where nonsurgical equine embryo transfer is successfully being performed. Throughout the procedure both the donor and the recipient mares are awake and comfortable.

"Inserting the embryo into the recipient's uterus must be done carefully so the recipient cervix and uterus won't 'recognize' that something is happening," said Dr. Sertich. "We use an insemination pipette, thread it into the cervix, gently negotiate the cervix, and insert the embryo into the uterus."

Dr. Sertich explained that the timing of a flush is critical. "If you flush as early as five days after ovulation, the embryo is still in the oviduct, whereas if you wait until after the ninth day, the embryo is so big that it can be easily damaged." After transfer, the equine embryo travels all around the uterus, touching the entire endometrium during the first 16 days of pregnancy.

The condition of the recipient mare is important. "We prefer to use young mares that have not foaled and that have a healthy reproductive tract. Using reproductively sound maiden mares, we were able to achieve a 70 percent transfer success rate. If poor

quality recipients are used in an embryo transfer program, the success rate can be expected to be much lower."

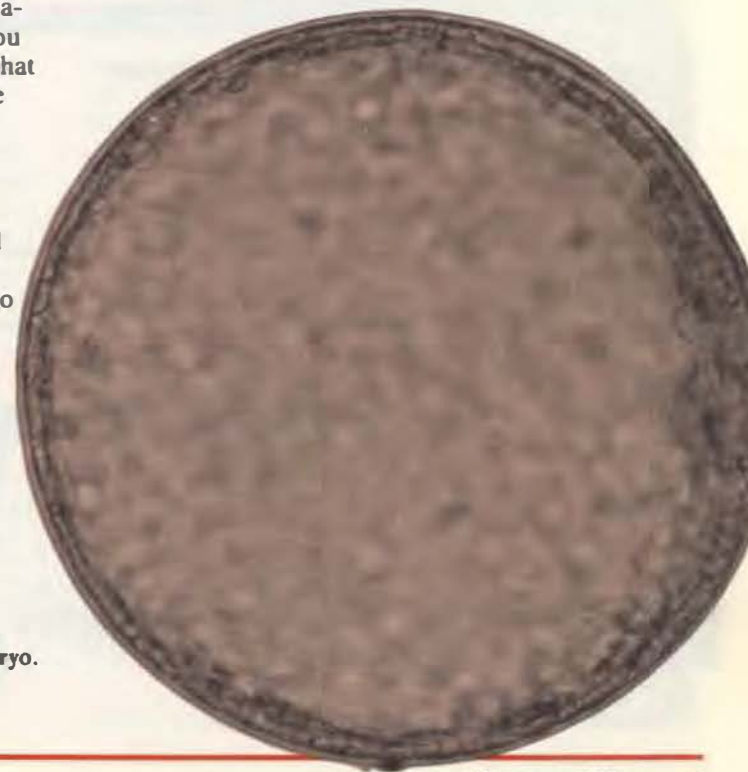
New Bolton Center does not provide the recipient mares. That is the responsibility of the donor mare's owner, who also must satisfy the requirements of the breed registry. If one elects to have the procedure performed, one must plan on the mares staying at least 28 days at the Hofmann Center. It is not an inexpensive procedure as it is very time consuming. "The mares are checked and palpated daily. It is very labor intensive. But the breeder may get more than one foal, and the donor mare is still available for competition."

After being flushed, the donor mare may simply return to competition or training. However, she can be brought to cycle again and rebred for a further flush. Of course, another recipient mare must be synchronized. In this way it is possible for one mare to produce two or even three foals during a single breeding season.

Although an embryo can remain viable for hours at room temperature, recovered embryos are usually transferred as soon as possible. Dr. Sertich has cooled embryos to 4° C for 24 hours before implanting them, achieving a 25 percent success rate. If this cooling technique can be perfected, embryos could be transferred throughout the nation or even the world.

"Embryo transfer provides us with an intensive breeding situation in a very controlled environment," said Dr. Sertich. "We are able to collect a great deal of data, and these studies provide an invaluable teaching and learning situation. We are performing research in a clinical setting. Thus, both students and horse breeders benefit."

Dr. Sertich graduated from the School in 1983; her primary research interest is in equine reproduction.



Seven-day equine embryo.