

Advances in Equine Reproduction

Technological advances in equine reproduction have enabled the industry to achieve greater pregnancy rates and have given breeders the option to choose genetics from a larger pool of stallions all over the world. Improved diagnostics, imaging modalities, and hormone protocols ensure that mares are ready to breed at the proper time and are free of uterine infection and inflammation. Embryo transfer and oocyte aspiration may provide multiple pregnancies in one season and exempt the donor mare from having to carry to term. Semen processing following stallion collection has improved giving the breeder many more breeding options. These advances in reproduction have enabled more pregnancies from difficult breeders and better semen from sub-fertile stallions. They have also given more avenues for achieving a pregnancy and a more diverse pool of genetics. Pasture breeding to the stallion on a nearby farm is still an option, even though it may be easier it is not nearly as fun or safe. Of course the stallion may think otherwise, but fortunately he is not given a voice in the matter.

With all of these new technological advances in mind, the pre-breeding exam should not be overlooked. A pre-breeding exam may vary depending on the age of the mare and the reproductive history. A thorough physical exam is a good place to start. Special attention should be placed on the recto-vaginal conformation, body condition score, and the mare's physical ability to maintain and deliver a viable fetus. The cervix, uterus, and ovaries should be palpated and visualized with an ultrasound.

Advanced diagnostics may include a uterine culture and cytology to determine if the uterine environment is conducive for maintaining a pregnancy. A small volume uterine lavage is a new technique used to obtain a representative sample of the uterine environment. The fluid from the lavage is analyzed for both bacteria and inflammatory cells. If determined necessary, a small sample of the tissue from the inside of the uterus (endometrium) may be taken and submitted for analysis. On some occasions the cervix and uterus may be visualized on a monitor with an endoscope revealing any cystic structures or adhesions.

Following the reproductive exam it should be determined where the mare is in her estrous cycle. From the middle of spring to late fall most mares cycle over a 21-23 day period. If breeding is desired for the first part of the year mares should be placed under lights for at least sixteen hours two months prior to the desired time of breeding. Hormone therapy may enable estrous synchronization and certainly helps to determine the timing of ovulation. Breeding at the incorrect time yields excessive uterine inflammation with no pregnancy. Unfortunately not all mares are blatantly obvious when they are in heat. High resolution imaging as well as follicular, uterine, and cervical palpation indicate where the mare is in her cycle. Manipulation of the cycle with adjunctive hormone therapy enables breeding at the most effective time with the most effective dose.

Embryo transfer and oocyte aspiration are alternative methods used to achieve a pregnancy. Embryo transfer is a non surgical technique where the embryo is harvested from the donor mare 7-8 days post breeding. The embryo is either frozen or placed in a recipient mare. The donor may be bred again during the next cycle or returned to her previous level of activity.

The newest advancement in equine reproduction is the collection of oocytes from the mare's ovary prior to ovulation. Following the collection procedure the oocyte is placed in the reproductive tract of the recipient mare that was previously bred with the desired semen. An alternative is to fertilize the oocyte in a laboratory by a method called intra-cytoplasmic sperm injection (ICSI). The fertilized oocyte matures in an incubator into a mature embryo then is transferred into the recipient mare.

Both techniques, embryo transfer and oocyte aspiration, allow for a different mare to carry the pregnancy. Embryo transfer requires the breeding of the donor mare with the desired semen. With oocyte aspiration the donor mare is never bred. Semen is either placed in the recipient mare or the oocyte is fertilized in the laboratory. Oocyte aspiration allows for more control over the fertilization process.

The opportunity of the sperm following ejaculation is more diverse than ever before. It can be placed in a mare, shipped across the country, frozen in liquid nitrogen, or microscopically injected into an unfertilized oocyte. What's more, the instruments and media with which the semen is handled have greatly improved. Advanced handling techniques yield a friendlier environment for the sperm cells allowing for greater longevity and less bacterial contamination. More options exist for subfertile stallions. The ejaculate may be processed with media that selects for the most viable sperm cells. The viable cells have the best chance to attain a pregnancy. Artificial insemination techniques have improved which allow for the mare to be bred with smaller doses of semen closer to the sight of fertilization. The term for this technique is called deep horn insemination. Insemination deep within the uterine horn will shorten the time period taken for the sperm to find the egg. A decreased insemination dose reduces the amount of foreign material placed in the uterus and subsequently reduces the inflammatory response. A uterus that is quiet and clean is one that is ready to maintain a pregnancy.

Pre-breeding and post breeding treatments of the mare are sometimes needed to prepare the uterus for the semen and eventually the embryo. Immunostimulants boost the mare's immune response to combat common intra-uterine bacteria and inflammatory products. Old maiden mares often have a tight long cervix that does not soften and open when she is in heat. This leads to pooling of fluid within the uterus not conducive for a pregnancy.

Older mares with poor conformation may have a large sagging uterus. With gravity working against her, fluid may pool within her uterus as well. Detailed attention must be given to these mares to maximize the chance for attaining a pregnancy. Advanced techniques may be needed to soften the cervix and increase uterine tone. A surgical technique has recently been developed that elevates the uterus preventing fluid from pooling at the most dependent portion of the uterus. Essentially the mare can clean herself up on her own.

Equine reproduction is constantly evolving. Difficult and older mares are able to get pregnant and reproductively challenged stallions are reproducing. A more diverse pool of stallion genetics are more attainable than ever before. The horse industry relies on the few that choose to breed to sustain it. The breeders are the backbone of the industry. This is where it all begins!