# Breeding the next generation

Research has shown that the best horses come from young dams. But how can you combine breeding a talented mare while developing her athletic career? Likewise, young stallions face the challenge of combining breeding with young horse classes and the stallion selection tests.

**The natural cycle**

Many breeders tend to breed a young mare once or twice before her sporting career takes off. Under natural herd conditions a filly will start her cycle the spring after she was born. Although not even a year old at this point, she can then be covered by a stallion and conceive. This pregnancy may be lost, but over 50% will carry their pregnancy to term and deliver a foal. In two- and three-year-old mares, it might take a day before the milk production to start up after the foal is born and maternal behaviour could be delayed. Another downside is that the mare will not grow to the size she would have reached if she had not been in foal and the foal itself usually becomes a smaller adult as well. Most breeders will therefore consider breeding their mare as a three-year-old.

**Aged mares**

Breeding an older mare for the first time brings its own challenges as well. These mares can show symptoms of the 'aged maiden mare syndrome'. For example the mare's cervix may show failure to relax during estrus, predisposing the mare to retaining fluid in the uterus after breeding. This leads to an inflammation of the inner lining of the uterus (endometritis) as the uterus is unable to clear foreign contaminations. As the mare ages (middle teen years and beyond) the quality of her eggs (oocytes) declines, resulting in a higher chance of loss of pregnancy and it may also lead to genetic deficiencies in the foal. A mare can stop cycling all together when she reaches her mid 20's. Considering these factors, the optimal age to breed a mare for the first time is between three- and ten-years-old.

**The next generation**

Over the years many studbooks switched to artificial insemination instead of natural breeding. This not only decreases the chances of transmission of infectious diseases (like CEM, Contagious Equine Metritis) but also the chance of the stallion or mare getting injured. Another advantage is that the stallion or mare has to travel less and the semen can be used to serve multiple mares. As the stallion no longer meets the mare it is up to the owner to find the optimal time to breed the mare. A mare's cycle is approximately 22 days long, but this can vary. She is in season (estrus) for three to seven days during this cycle. The ovulation (release of the egg) usually takes place 24-48 hours before the end of the estrus. At this stage, the mare will be interested in a teaser stallion (or even a gelding), urinate and wink (opening of the vulva) frequently and squirt. A veterinarian can use rectal ultrasound examination to decide on the optimal moment to inseminate the mare.

**Nature vs nurture**

But what if your mare is very successful at competitions? After four months of pregnancy mares are not allowed to participate in FEI competitions anymore, and raising the foal further increases the period that the mare cannot compete. During the pregnancy and birth, there is also the risk that the mare becomes injured. Embryo transfer is a widely used technique to let another mare carry, deliver and nurse the foal. The donor mare is covered as usual, but after seven or eight days the embryo is flushed from her uterus and transferred to the receptor mare. This mare also has to be exactly at the right state of her cycle to be able to receive the embryo and gestate. This can be achieved by monitoring her closely and via the administration of hormones. The other option is to have multiple receptor mares and choose a mare whose stage of her own cycle is acceptable. After the transfer the mare conceives and gives birth/nurses the foal as her own. In the past small (trotter and pony) mares were used, but as their uterus is smaller the fetus receives less nutrition. This will result in a smaller foal. Even after they reach maturity they will still tend to be smaller than if the foal were born from its biological mother. In addition, character is not only dependent on genetics. The recipient mare's behaviour will influence how she raises the foal, influencing the development of its own character.

**Modern techniques**

Over the past years ICSI and OPU have become more popular. ICSI stands for Intracytoplasmic Sperm Injection and OPU means Ovium Pick-Up. These techniques have been developed over 20 years ago, but are being used in horses more and more. With OPU oocytes (eggs) are being harvested from the mare's ovaries. This can be done all year round, but especially during winter (when the mare is in anestrus; not cycling) this technique is successful. Two to 30 eggs may be harvested at any time. To fertilize the egg, one sperm cell is injected into the oocyte (ICSI). The embryo can be placed in a recipient mare when she is in the fourth day of her cycle. It can also be frozen and stored, making it possible to transfer the embryo to the recipient mare at a convenient time. Therefore the recipient mare's cycle does not have synchronized with that of the donor mare.

**The sporting connection**

The OPU technique is more invasive than ET as the oocytes are aspirated through a needle that is placed through the wall of the vagina. It is suitable for mares that have good oocytes, but have changes to the uterus that prevent them from getting pregnant. When ET is used, mares may compete less successful during the short period of inseminations and flushing. ICSI/OPU influences the mare's behaviour less and can be used at a moment that fits the competition schedule (year round). Even shortly after euthanasia, the oocytes may be harvested. ICSI can also be helpful when a stallion's semen is rare or very expensive, as only a very small quantity is used. At the moment, about 70% of OPU/ICSI procedures results in one or more embryos. On average a successful procedure results in 2,5 embryos. After transferring an embryo to the recipient mare, 80% of the time this results in a pregnancy.

**Disadvantages**

These techniques offer opportunities for the breeder to breed a foal from a valuable dam, but they also have their disadvantages. Compared to covering a mare and having her carry and deliver her own foal, the success rate is lower and the procedure is more invasive and expensive. If used on a larger scale it could lead to a decrease in fertility within our horse population as we include individuals that would otherwise not be capable to reproduce. Their offspring will (on average) also be less fertile. It would also lead to a narrowing of the genetic pool as more foals would come from just a handful of excellent mares and stallions. Inbreeding can decrease fertility within the population even further. As these mares and stallions are usually valuable, since they are very successful in competition, this implies that often they are also relatively old (as it takes time to train a horse to be able to compete at elite level). This results an increase in the generation interval (the time between each generation) and as a consequence the genetic progress will slow down.

**Choose your options carefully**

All in all, there are many ways to breed a foal from a sport horse, both during or before/after their athletic career. Which way or technique is most suitable depends on many circumstances. By carefully evaluating and discussing options with your veterinarian, the optimal path may be chosen to successfully breed the next generation of sport horses. ■


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**ABOUT SMDC**

Sporthorse Medical Diagnostic Centre (SMDC), based in the Netherlands, is a multidisciplinary centre of excellence where all orthopedic diagnostic and treatment modalities can be utilized in combination with experience, extensive knowledge and individual attention. Dr. Bergman, Dr. van Toor, Dr. Cokelaere, Dr. Hoogelander and Dr. van Veggel dedicate their time to optimize sporthorse performance while considering all factors which might influence it. Their caseload contains horses showing lameness but also includes horses with spine related problems, pre-purchases examinations as well as preventative sporthorse care. www.sporthorsemdc.com