

Top Equine Reproduction Studies of 2012 (AAEP 2012)

By [Nancy S. Loving, DVM](#)

Updated: Thursday, March 14, 2013 9:00 AM
Posted: Thursday, March 14, 2013 8:00 AM

Originally published on [TheHorse.com](#)

Veterinary researchers publish scores of scientific papers annually, but if practitioners are out examining and treating patients they don't necessarily have time to brush up on every study's take-home message. The annual Kester News Hour presentation at the American Association of Equine Practitioners' convention gives practitioners a chance to sit down with a coffee and hear veterinary specialists summarize of time to studies. Pat McCue, DVM, PhD, Dipl. ACT, gave a rundown on a number of the year's practical equine reproductive studies during the 2012 convention, which was held Dec. 1-5 in Anaheim, Calif.

Stallion/Semen/Sperm

McCue, a professor of equine theriogenology at Colorado State University's Equine Reproduction Laboratory, first described a paper by Terry Blanchard, DVM, MS, Dipl. ACT reviewing issues in older stallions with testicular dysfunction. Owners and veterinarians' goal for these horses is to maintain them in a successful breeding program, be it using natural cover or artificial insemination (AI).

McCue described the natural progression in decreased testicular function: decreased sperm production; decreased first-cycle pregnancy rates; then spermatozoa changes such as declines in morphologically normal and progressively motile sperm. He also noted that toward the end of a stallion's career, due to testicular degeneration, the testes decrease in size with accompanying endocrinological changes. Hormone levels (e.g. estradiol, inhibin, and testosterone) decrease, leading to reduced signals that would normally affect gonadotropins (protein hormones) such as follicular stimulating and luteinizing hormones.

To manage older stallions' flagging fertility, study authors recommended breeders decrease stallion book size to maximize sufficient sperm counts for insemination; time the mare's ovulation to coincide with the time of live cover or AI to minimize unnecessary inseminations; manipulate damaged spermatozoa using centrifuge to help improve semen quality; and implement deep-horn insemination near the uterotubular junction to gain closer proximity to the fallopian tubes. "With enhanced management of mare and stallion, it is possible to keep the stallions in reproductive service for longer," McCue concluded.

The next topic McCue reported on was a study by Brian Carroll, DVM, on how to evaluate stallions during a prebreeding soundness examination. In his study Carroll evaluated daily sperm output and semen quality and calculated the amount of sperm a stallion should be able to produce (based on testicular size, since stallions produce certain numbers of spermatozoa per gram of testicular tissue). Then he processed the semen via centrifugation techniques, timed breeding close to ovulation, and applied low-dose insemination techniques. With these diligent efforts, Carroll was able to increase pregnancy rate (in subfertile stallions) from 50% to more than 90% in a season.

McCue then discussed ways to save a stallion's genetic material (i.e., in the face of a life-threatening injury). Billions of spermatozoa live in the tail of the epididymis and ductus deferens (the ducts that store and transport sperm) and are available for future use if collected in a timely fashion. McCue described a study out of Brazil in which researchers compared testes stored at room temperature and refrigerated (5°C, or 41°F) from 48 stallions that were electively castrated. They evaluated sperm at castration and six, 12, 18, 24, and 30 hours later. The epididymis from each testis yielded an average of 16 billion sperm, which were evaluated for motility, velocity, and viability at all temperatures. Sperm from the refrigerated epididymis yielded the best results. McCue said it is notable that degradation changes occurred within six to 12 hours at room temperature. In summary he recommended breeders cool each epididymus as early as possible, and certainly within six hours, to ensure preservation of recoverable semen for future use.

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Nonpregnant Mare

McCue next turned his attention to studies on reproductive strategies for managing the non-pregnant mare's uterus and preparing it for pregnancy. He initially reviewed a paper by Sara Lyle, DVM, PhD, Dipl. ACT, on adjunctive therapies for treating mares with residual and recurrent infections that haven't responded to traditional treatments such as antibiotics and lavage. He cited, for example, a uterine flush with the mucolytic agent acetylcysteine to decrease mucus production so that antimicrobials can work. He mentioned another adjunctive treatment, flushing with the buffered chelating agent Tricide Solution, which alters bacterial cell wall integrity to facilitate antimicrobial action. Other intrauterine or systemic therapies, such as dimethyl sulfoxide (DMSO), plasma, and glucocorticoids provide additional opportunities to improve treatment outcomes. McCue stipulated that by incorporating other therapies into traditional uterine therapies, veterinarians can improve a mare's reproductive success.

Then McCue discussed modulating the immune response to uterine inflammation in mares with endometritis. He cited one study in which giving intravenous (IV) glucocorticoid (dexamethasone) 24 hours prior to uterine infusion of *E. coli* did improve the uterus' anti-inflammatory capacity to levels similar to resistant mares'. The researchers also evaluated mycobacterial cell wall extract administered as an intrauterine infusion. Both treatments helped rid the mare of uterine fluid and helped clear the bacteria.

In another study, researchers evaluated the effect of the antibiotic enrofloxacin as a potential uterine infusion treatment because few bacteria seem to be resistant to it. However, all the mares treated with intrauterine enrofloxacin developed severe endometritis. McCue suggested that enrofloxacin is not suitable for this use.

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Hormonal Therapy

McCue reported on the new FDA-approved drug deslorelin acetate (SucroMate) that is used to induce mare ovulation. In the past, a veterinarian could administer hCG (human chorionic gonadotropin) to induce ovulation for ideal timing of insemination. A study by Ryan Ferris, DVM, MS, Dipl. ACT, looked at deslorelin as an alternative to hCG that might be more effective in inducing ovulation. The researchers administered intramuscular (IM) deslorelin to 21 mares and then examined them every six hours to identify their time of ovulation. The results were encouraging, with 95% ovulating within 48 hours following deslorelin treatment as compared to 83% ovulating within 48 hours after hCG treatment.

The next study McCue described concerned oxytocin administration during the latter half of diestrus once or twice daily performed by Dirk Vanderwall, DVM, PhD, Dipl. ACT. The goal is to induce formation of a persistent corpora lutea--this structure helps maintain progesterone elevations that are important for maintaining pregnancy. When veterinarians gave 60 units of oxytocin IM on Days 7 to 14 following ovulation, 71% of mares dosed twice daily with 60 units per dose had a persistent corpora luteum; 63% of mares dosed once daily maintained a persistent corpora luteum. This study demonstrated that dosing once or twice daily with oxytocin on Days 7-14 following ovulation could effectively maintain a corpora luteum with persistent progesterone elevation as long as 75-80 days.

Veterinarians use a medication called domperidone to manage late-term pregnant mares and, more specifically, prevent complications caused by fescue toxicosis. Mares started this preventive treatment 30 days prior to their expected due dates. The investigators found that this achieved successful outcomes, meaning there were live foals, shorter gestations, and lactation.

They also tried a rescue therapy with domperidone gel to treat mares whose pregnancies were extending 10-15 days past their anticipated due date--the objective was to "rescue" the mares and foals from the effects of fescue toxicosis. While the rescue treatment resolved clinical signs in the mares, the foals did not do well in these circumstances. McCue stressed, "Prevention is much more preferable to rescue strategies."

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Pregnant, Foaling, and Postpartum Mare

McCue focused initially on a study out of Kentucky in which researchers examined survival rates and postoperative complications following cesarean section in 95 mares. Elapsed time from chorioallantois rupture (when a mare's water breaks) to cesarean procedure was critical to the outcome in these mares: Mares with dystocia (difficulty giving birth) whose foals were delivered via cesarean in less than 90 minutes had fewer complications and higher foaling rates in subsequent years as compared to mares with dystocia lasting longer than 90 minutes prior to cesarean section. In general, 84% of mares survived following cesarean surgery whereas only 35% of foals delivered by cesarean survived. Overall foaling rates in years following cesarean section were lower in mares older than 16 years of age.

A look at parturition, dystocia, and foal survival in another study showed that dystocia occurs in about 10% of all equine births. Researchers found the highest incidence among Thoroughbreds (14%), whereas 8% of Quarter Horses developed this condition. Most dystocias are due to abnormal foal postures, with front limb retention being the most common (30%) followed by retained fetal head (4%), premature placental separation or red bag (1.6%), hip lock (0.8%), and mare uterine arterial hemorrhage (0.8%).

McCue reported that the length of labor in the normal mare averaged 17 minutes. Delay in Stage 2 labor for longer than 40 minutes is associated with an increase in foal mortality, he noted. This study data correlated well with another study in which scientists noted that foal survival declined by 10% in mares taking longer than 30 minutes to deliver.

The final paper McCue presented involved determining fetal sex using cell-free fetal DNA via a blood sample from a pregnant mare in the last three months of gestation. In eight of 11 pregnancies, researchers were able to correctly identify male fetuses; they correctly identified all nine female fetuses. He noted that this is the first report of fetal DNA detection in a pregnant mare. Prior to the DNA test, veterinarians determined fetal sex using diagnostic ultrasound.

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Disclaimer: Seek the advice of a qualified veterinarian before proceeding with any diagnosis, treatment, or therapy.