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BY LES SELLNOW AND CHRISTY WEST

Estimating Future Stallion Fertility

When a racing or performance stallion is retired to stud, many owners choose to purchase first-season subfertility insurance, also called congenital infertility insurance, against the possibility that he might be infertile. Veterinary examination of the prospective breeding stallion is required and, generally based solely on the size of his testes, the veterinarian is asked to judge whether the stallion might have acceptable fertility and how many covers he should handle per day.

Terry Blanchard, DVM, MS, Dipl. ACT, professor of veterinary medicine at Texas A&M University, discussed calculations a veterinarian can use to estimate a stallion's fertility and capabilities. All of the calculations are based on testis size as measured by calipers or ultrasound (Blanchard's preferred method).

A practitioner might collect the follow-

ing measurements from a stallion:

- Total scrotal width (across both testes);
- Left and right testicle widths, heights, and lengths;

These measurements can be compared with published reference values.

From these measurements, the practitioner can calculate or estimate:

- Testicular volume = $(0.05233 \times \text{length} \times \text{width} \times \text{height})$;
- Daily sperm output, billions per day = $(0.024 \times \text{total testicular volume in mL}) - (0.76 \text{ to } 1.26)$;
- Number of covers per day (from calculated daily sperm output divided by 1.5 billion sperm per cover);
- Maximum book size (using a table based on covers per day required for different book sizes, or how many breedings per season).

Caveats "Typically, semen collection and

evaluation are not permitted to determine if libido, erection, mating ability, ejaculatory function, sperm output, or semen quality are normal," commented Blanchard. Thus, the veterinarian and insurance company must be aware that estimates of fertility and book size are only valid if significant fertility factors, such as libido, semen quality, etc., fall within normal parameters.

Another caveat is that testis size can be temporarily reduced by hard training, anabolic steroid usage, stress, past illness, and other testicular insults. If there is reason to suspect one of these events has reduced testis size, re-examination at a later date is recommended.

"It is possible that semen collection and evaluation may one day become an integral part of the veterinary examination required to obtain first-season subfertility insurance," Blanchard commented. "Un-



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You can use testicular measurements and math to help you determine if a new stallion will be fertile before he covers his first mare. There are caveats that could make measurements inaccurate, such as previous injury, illness, hard training, or steroid use.

til that time, however, the veterinarian will have to make a recommendation on whether or not a stallion should qualify for first-year subfertility insurance and whether or not the stallion can be expected to handle a certain book size or mating frequency based strictly on physical examination and measurement of testicular size.”

New Tool for Counting Sperm

Equine practitioners now have a new, accurate tool for measuring stallion fertility—the NucleoCounter SP-100 fluorescence-based instrument. While it is more expensive than some instruments currently used for counting sperm, it is accurate and easy to use, according to a study presented at convention.

Measuring a stallion's sperm concentration accurately is important for assessing sperm quality and calculating breeding doses for artificial insemination. The “gold standard” equipment options for counting sperm in stallion semen currently are the hemacytometer (a microscope-based system in which a person counts the sperm) and flow cytometer (an expensive laser-based counting system).

Kathryn Comerford, BS, a graduate student in reproductive biology at Texas A&M University, presented the results of several experiments comparing the NucleoCounter's performance to that of a hemacytometer and a flow cytometer. The NucleoCounter provided acceptable agreement with both the flow cytometer and the hemacytometer, and it had excellent within-sample repeatability of 3.17% (this refers to the precision of the instrument, for example, how close each sample measurement is to the others; in general, acceptable repeatability is considered to be anything below 10%). In addition, she noted that it is “far less laborious to use” than the hemacytometer and flow cytometer, and it can accurately measure sperm concentrations in raw ejaculate that's contaminated with urine and red/white blood cells.

“This is the only automated instrument currently available that can measure sperm in opaque extender,” Comerford noted. “It has application for sending/receiving extended semen, semen freezing, and low-dose artificial insemination. However, it's expensive (about \$15,000) compared to hemacytometer and photometric systems (with hemacytometers ranging from \$200-300, and photometric

systems, \$2,000-3,000). Each operation must decide for themselves if the cost of the instrument is less than that of open mares resulting from inaccurate sperm concentration measurements.”

Processing Dilute Semen for Artificial Insemination

Since artificial insemination is currently practiced in most equine breeds (except Thoroughbreds), processing semen for cooling and transport is a common task in most equine reproductive centers. However, processing a dilute ejaculate—one with a relatively low concentration of sperm—requires modified procedures to get enough viable sperm in each breeding dose. At convention procedures and calculations for this modified technique were presented by Dirk Vanderwall, DVM, PhD, Dipl. ACT, an academic faculty member at the University of Idaho.

Vanderwall reported that ejaculates with less than 100 million sperm per milliliter are considered dilute and require the modified technique. Normal ejaculates with 100 million or more sperm/mL are

typically mixed with extender in a 3:1 ratio to achieve a final concentration of approximately 25-50 million sperm/mL. However, with a dilute ejaculate, this dilution ratio would give you too few sperm for successful breeding. He explained that you can't just use less extender for a dilute sample because seminal plasma (fluid in semen) needs to be diluted to 25% or less of its original concentration to maximize sperm viability during cooling/storage.

Processing a dilute sample requires mixing the semen with extender, centrifuging the sample at 300-400 Gs (300-400 times the force of gravity) for 10-12 minutes to concentrate the sperm into a soft “pellet” at the bottom of the tube, drawing off some of the liquid (half seminal plasma and half extender), and resuspending the sperm pellet with some additional extender. With this procedure, at least 75% of the sperm are kept, seminal plasma concentration is reduced to a viable concentration for cooling/shipping, and adequate breeding doses can be achieved.

“The objective is to produce a final concentration of spermatozoa between 25 and



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50 million/mL in a mixture of extender and seminal plasma containing 5-20% seminal plasma," Vanderwall summarized. It is helpful, especially for very dilute ejaculates, to use the sperm concentration of the raw semen to calculate the amounts of extender needed to achieve this target.

An additional assist is a "cushion," or a dense liquid that prevents excessive compaction of the sperm during centrifugation (Vanderwall likened it to a trampoline). With a cushion, sperm can be safely centrifuged for longer periods at higher G forces to concentrate them further, allowing recovery of nearly 100% of sperm without excessive damage.

"If dilute semen is routinely encountered, and/or the total number of spermatozoa in an ejaculate are extremely limited, the use of a centrifugation cushion might be particularly beneficial to optimize recovery of the spermatozoa," he noted.

Reducing Castration Herniation

Although herniation (protrusion of tissues through the body wall) following castrations is relatively uncommon, Canadian veterinarians reported on a way to further minimize this complication. James Carmalt, MA, VetMB, MVetSc, Dipl. ABVP, ACVS, associate professor of large animal surgery at the Western College of Veterinary Medicine in Saskatoon, Canada, presented a study of the technique.

The key to this technique modification involves ligating (suturing) the opening in the common vaginal tunic, the sac that enclosed both testes prior to castration, with a strong, pre-tied, 4S-modified Roeder knot. Carmalt and his colleagues used this technique in closed castrations under field conditions on 131 draft horse colts. The results were positive, with only one colt herniating tissues during recovery—this yielded a 0.76% herniation rate, compared to 7.6% in a previous study on the same breeds and bloodlines of horses (pregnant mare urine industry foals). Eight other colts experienced swelling or bleeding at the castration site, and only one colt sustained an infection after the one-week checkup. This infection rate of only 0.76% reduces the concern that ligating the vaginal tunic will increase infection (previous work reported a 3.44% infection rate).

"These findings support the ligation of the common vaginal tunic in field castrations (where the incisions are to remain open), especially in those breeds that are

prone to post-surgical herniation," concluded Carmalt. "It's simple, cheap, and doesn't potentiate infection."

Increasing Pregnancy Rates with Multiple Matings

If at first you don't succeed, try, try again. This old statement sums up the practice of breeding an older stallion with declining pregnancy rates in his mares to the same mare twice or even three times to improve his chances of getting her in foal. At the convention, a study on the value of this practice was presented by Terry Blanchard, DVM, MS, Dipl. ACT, professor of veterinary medicine at Texas A&M University.

(respectively), with two matings, and to 43% with three matings for Stallion 1.

"The two most likely possibilities for why this works is that we're increasing the total number of normal sperm accessing the oviducts, and/or we're ensuring that short-lived sperm are more likely to be available at the time of ovulation," Blanchard explained.

Planning multiple matings does introduce a degree of difficulty in that the stallion's book size (how many mares he breeds in a season) likely will need to be reduced so he can handle the double/triple covers per mare. The stallion must be physically healthy and able to handle the

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DR. TERRY BLANCHARD

Candidates for this strategy include aging, previously fertile stallions with declining pregnancy rates, he said. There are two options for the schedule—breeding a mare twice at 24-hour intervals in late estrus or breeding her three times at 12-hour intervals. Mares are carefully managed, with estrus induced using deslorelin acetate (such as Ovuplant) injections at appropriate points in their cycles and matings scheduled from the injection timing.

For the study, Blanchard, et al., evaluated two 24-year-old Thoroughbred stallions standing at two different studs in Central Kentucky. Both stallions had acceptable pregnancy rates in earlier seasons with the typical one-cover-per-mare strategy, but their pregnancy rates had declined in the previous one or two breeding seasons. He also noted that both stallions had low percentages of progressively motile sperm (25% and 20%, compared to the 60% or higher considered acceptable) and high percentages of morphologically (structurally) abnormal sperm (61% and 65%, compared to the 40% or lower considered acceptable).

When multiple matings were employed, pregnancy rates increased from 0% (for Stallion 1) and 47% (for Stallion 2) with one mating per mare to 18% and 64%

additional covers, and the mare owner/manager must plan for additional mare exams and transportation costs (if the mares aren't housed at the stud farm). Lastly, older mares that tend to accumulate uterine fluid after breeding might not be ideal for this strategy (they'll likely accumulate enough fluid with the frequent covers to further reduce pregnancy rates).

"The extra expense and management for each mare could be justified by an increased chance of obtaining a pregnancy from such a valuable older stallion that otherwise might be considered to be at the end of his breeding career," Blanchard summarized.

Partial Phallectomy Technique

Although it's a painful option to consider (especially for the males in the profession), for some horse health problems the best treatment is partial phallectomy, or amputation of part of the penis. Such conditions might include penile injury, chronic paraphimosis (inability to retract the penis into the sheath), neoplasia (tumors), and stenosis (narrowing) of the urethra that compromises the horse's ability to urinate.

Carolyn Arnold, DVM, Dipl. ACVS, clinical assistant professor of veterinary medi-

cine at Texas A&M University, discussed eight horses (four geldings/four stallions) that underwent a modified Vinsot's technique for partial phallectomy. She reported success with the standing band tourniquet/amputation procedure in all horses, with minor complications (urine scalding) in only two cases. The bands fall off after three to four weeks, leaving dime-sized wounds that heal quickly, Arnold reported.

Six horses only required local anesthesia for the procedure, and two required additional sedation. Stallions were castrated after the phallectomy procedure. Following the procedure, the horses underwent 24 hours of stall rest followed by 30 days of small paddock turnout (geldings) or 30 days with 20 minutes of forced exercise twice a day (recently castrated stallions).

"The modified Vinsot's technique of partial phallectomy may be useful for horses that are unsuitable for general anesthesia (because of generalized poor health) or for those whose owner has imposed a financial limitation that does not allow the horse to be anesthetized," said Arnold.

The logical question is how the stallion urinates following phallectomy with a tourniquet in place. Arnold discussed two possible locations for the new urethral opening: on the ventral (lower) surface of the penis proximal to (above) the tourniquet, and 3 cm below the rectum (subischial location). She prefers the subischial location because it is safer for the practitioner and allows amputation of more of the penis, although it will result in urine scalding if the horse does not learn to lift his tail to urinate.

In conclusion, she noted that the procedure was humane, effective, well-tolerated, inexpensive (\$200 or less compared to up to \$2,000 for phallectomy under general anesthesia), easy to perform, and practical (requiring only one veterinary visit).

Breeding The Problem Mare With AI

Achieving pregnancy via artificial insemination (AI) of a problem mare can be a challenging endeavor, said Juan Samper, DVM, MSc, PhD, Dipl. ACT, of Langley, British Columbia. However, he added, if the proper diagnostic and treatment approaches are taken, the chances for success can be improved.

The solution for a problem mare is rarely natural cover either by hand breeding or pasture breeding, he said. "In my opinion, a mare that fails to become pregnant by

AI with good semen quality and does so by natural cover without human intervention is an example of poor or inadequate breeding management by the personnel performing the AI," said Samper.

Proper breeding management involves three basic fundamentals:

- 1) Diagnostic procedures to determine the soundness of both male and female.
- 2) Necessary therapies both before and after breeding.
- 3) Determination of the optimal time of insemination.

Often overlooked when breeding a problem mare by AI, Samper said, is the stallion. Mare owners often study pedigree and performance in depth when selecting a stallion, but they often pay little or no attention to the horse's semen quality. Research has shown there is a great range in the fertility of stallions with cooled or frozen semen. In addition, he added, AI breeding should be approached under the assumption that one is dealing with semen that is of mediocre or poor quality. It is highly important that insemination of

the problem mare be performed only once and as close to ovulation as possible.

In discussing what constitutes a problem breeder, Samper said that age can often be a factor. "Mares in their midteen years start to have a reduction in their fertility potential and, therefore, must be considered potential candidates for repeat breeding," he noted.

Here is how Samper describes a problem breeder: "I consider a mare a problem breeder when she has been bred in two consecutive cycles with good-quality semen and at the appropriate time. Signs that a mare is a candidate for potential problems could include one or all of the following: 1) irregular interovulatory intervals (too long or too short); 2) presence of free fluid (in the uterus) before and/or after insemination; 3) a significant increase in the amount of uterine edema (fluid swelling) after insemination; or 4) presence or persistence of marked endometrial edema post-ovulation."

Samper then went into detail concerning the approaches that are available

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to veterinarians for treating the above conditions. A recurring theme was that there must be a thorough analysis of the problem mare's breeding history and an in-depth examination of her overall reproductive health. In the wake of that approach, Samper said, both veterinarian and owner must dedicate themselves to proper treatment and close observation. Knowledge of physiology, pathology, and

versus frozen-thawed semen. Additionally, factors affecting the fertility of barren mares bred with frozen-thawed semen generally have not been examined."

To rectify the lack of information problem, Barbacini and colleagues launched a study to determine the fertility of barren mares inseminated with either fresh or frozen-thawed semen. Researchers investigated the effects of mare age and uterine fluid, and they worked to determine the number of inseminations with frozen-thawed semen required per pregnancy.

Involved in the study were 285 mares of various breeds that were bred with frozen-thawed semen during breeding seasons from 1998 through 2007. The mares ranged in age from 3 to 21.

The frozen-thawed semen came from various laboratories. Forty-six stallions were used. The 285 mares inseminated with frozen-thawed semen were inseminated for a total of 544 cycles.

Following is the scorecard, in part:

- There were 202 pregnancies.
- The overall pregnancy rate computed to 71%.
- The per-cycle pregnancy rate for mares 10-16 years of age was 41% (41% of mares in this age group conceived on the first insemination attempt).
- The per-cycle pregnancy rate for mares 3-9 years was 38%.
- The per-cycle pregnancy rate for mares older than 16 was 23%.
- Overall pregnancy rates were 71% for mares 3-9 years; 76% for mares 10-16 years; and 48% for mares older than 16.

Fluid accumulation in the uterus, when it occurred, was treated with oxytocin (which causes the uterus to contract and clear the fluid) and/or lavage.

Barbacini's take-home message: "Pregnancy rates of barren mares inseminated with frozen semen are reasonable and similar to artificial insemination with fresh semen as long as mares are under 16 years of age. Treatment with oxytocin and/or uterine lavage seemed to improve fertility."

Neonatology: Immunostimulants for Foals

A product that could stimulate the immune systems of newborn foals to better fight infection of *Rhodococcus equi* would

be very beneficial, said Steeve Giguère, DVM, PhD, of the University of Florida.

Pneumonia caused by *R. equi* is endemic on many farms, he said. Studies have shown that immunostimulants decrease the incidence of respiratory disease, but there is no data looking specifically at *R. equi*-caused respiratory disease.

The researchers, Giguère said, hypothesized that immunostimulants can enhance immune system cells' ability to kill *R. equi*.

Seventeen foals were involved in the study, and they received Zylexis (a commercial immunomodulator offered specifically as an aid for reducing upper respiratory disease caused by equine herpesvirus-1, or EHV-1, and EHV-4), EqStim (a commercial immunostimulant), or saline. Blood and bronchial lavage (BAL) cells were collected on Days 7 (pre-treatment), 19, 31, and 43. The cells of the foals were infected *in vitro* with *R. equi*.

The researchers reported: "Neutrophils from foals treated with inactivated parapoxvirus ovis (Zylexis) had significantly greater ability to phagocytize (engulf) *R. equi* and undergo oxidative burst on Days 19 and 31 compared to baseline values. On Day 31 foals treated with inactivated parapoxvirus ovis had significantly greater phagocytosis and oxidative burst than foals treated with inactivated *Propionibacterium acnes* (EqStim). In contrast, treatment with EqStim resulted in significantly less intracellular proliferation of *R. equi* within blood-derived macrophages (*R. equi* multiplied less within types of white blood cells that ingest foreign material) compared to control foals, but not compared to foals treated with Zylexis."

Hormone Therapy in the Mare

The discussion in the table topic session on hormone therapy in the mare during the convention, followed a systematic progression through three broad areas: 1) hastening the onset of (ovarian) follicular activity and ovulation in winter anestrus (noncycling) mares; 2) synchronizing ovulation in cycling mares; and 3) blocking estrous behavior (i.e., heat) in mares.

During the discussion of methods that are used to hasten the onset of ovulatory activity, there was complete consensus on the value of an artificial lighting program for expediting the onset of follicular activity and ovulation in the spring. Then facilitators and attendees discussed hormonal methods that can be used to augment the

VIDEO: MARE FERTILITY

Your mare didn't take. What now? Dr. Michelle LeBlanc gives us some approaches to help increase our mares chances of pregnancy (TheHorse.com/Video.aspx?VID=188).



pharmacology are imperative in order to diagnose problems, implement appropriate therapies, and monitor the response to treatment.

He concluded with this comment: "Mare owners and veterinarians must realize that breeding a problem mare is a challenging procedure that requires dedication and knowledge of several areas of veterinary medicine and strict adherence to basic and sound medical principles. The constant and persistent use of sound techniques and clinical practices will result in the establishment of pregnancy in many of these difficult mares. However, poor practices or not enough dedication will result in frustration for both owners and veterinarians."

Frozen Semen Use in Barren Mares

More and more breeders are employing the use of frozen semen and success rates are increasing, reported Sandro Barbacini, DVM, of Select Breeders Services in Italy. Included among the reasons for increased usage, Barbacini said, is that many major registries are now allowing artificial insemination with frozen-thawed semen.

Techniques for freezing and thawing semen have improved, and conception rates using frozen semen have gone up. "It has generally been stated that frozen semen should not be used for insemination of barren mares," Barbacini said. "However, limited data are available on comparison of fertility of barren mares bred with fresh

use of artificial lights, such as:

- Treatment with progesterone
- Treatment with gonadotropin-releasing hormone (GnRH) or its agonists; and
- Treatment with dopamine antagonists such as sulperide.

The discussion then turned to methods of synchronizing estrus and ovulation in mares. Again, there was a general consensus that the most reliable method was daily administration of a short-acting combination of estrogen and progesterone for approximately 10 days. Some of the participants described the use of long-acting preparations of estrogen and progesterone that have the advantage of requiring only a single treatment compared to daily treatment; however, the degree of synchrony of ovulation among treated mares might not be as "tight" compared to what is achieved with daily administration of the short-acting formulation.

The session concluded with a discussion of methods for blocking heat behavior in mares. Like the two previous topics, there was a consensus that administration of progesterone, such as the orally active synthetic progestin Regu-Mate, is the most reliable means of blocking heat behavior. Additional methods discussed were three protocols for prolonging function of the corpus luteum (the source of progesterone in mares): 1) placement of a sterile glass marble into the uterine lumen; 2) hormonal induction of a "diestrus" (the quiescent period between one estrus period and the next) ovulation; and 3) administration of oxytocin. Advantages and disadvantages of each method were discussed.

The table topic session was attended by approximately 50 participants, which created an atmosphere for lively discussion.

This Table Topic was facilitated by Karen Wolfsdorf, DVM, Dipl. ACT, of Hagyard Equine Medical Institute in Lexington, Ky., and Dirk Vanderwall, DVM, PhD, Dipl. ACT, of the University of Idaho. Vanderwall wrote this article.

Diazepam Levels in Foals

The combination of ketamine and diazepam (Valium) commonly comprise anesthesia agents in horses, said Lori Bidwell, DVM, of Rood & Riddle Equine Hospital in Lexington, Ky. However, she added, many surgeons steer away from the combination when anesthetizing mares that are suffering from dystocia (difficult birth).

The reason for not using that combina-

tion, she said, stems from human reports that diazepam builds in the placenta after the mother receives the drug prior to delivery, resulting in respiratory depression in the baby at birth. However, she said, there have been no published reports that diazepam levels were present in foals after their dams received the combination of ketamine and diazepam.

The purpose of the study conducted at Rood & Riddle, she said, was to determine whether diazepam levels were, indeed, present in foals at birth if the agent had been used to anesthetize on the dam.

Investigators on the study randomly selected 15 mare/foal combinations from the 57 total cases that arrived at the hospital in 2007 for dystocia treatment. All of them were handled in the same manner. On presentation for dystocia in the hospital, the 15 mares were first given xylazine for sedation. Next they gave the combination of ketamine and diazepam to induce anesthesia, followed by maintaining it with inhalant anesthesia while the surgeon manipulated the foal's position in the uterus to allow delivery. If the foal was not successfully delivered within 20 minutes of presentation to the hospital, the mare was moved into surgery to deliver the foal by Caesarean section.

Two of the 15 foals were delivered by Caesarean section and the other 13 were delivered by controlled vaginal delivery (physical manipulation of the foal in the uterus). The average anesthetic time for controlled vaginal delivery was 13.85 minutes and the average anesthetic time for Caesarean section at the point where the foal was delivered was 37 minutes.

Immediately after delivery blood was drawn from foals and mares and later analyzed. Diazepam was detected in the blood of most mares and foals, but it was almost twice as high in the mares as in the foals.

Thirteen of the foals survived to discharge. One of the nonsurvivors was euthanized because of uncorrectable leg deformities and the other died from hemorrhage associated with fractured ribs (a relatively common occurrence during dystocia birth due to manipulation of the foal through the birth canal).

The average hospital stay for the surviving foals was 5.3 days.

Bidwell said, "The goal in management of dystocia birth is a healthy mare and foal. Induction of anesthesia for controlled vaginal delivery or Caesarean section

should be quick, safe, and effective. The combination of ketamine and diazepam for induction has been used for many procedures in horses, but until now, no studies have researched this combination for dystocia anesthesia. The current study found detectable levels of diazepam in mares and foals after dystocia birth, and average foal levels were 50% of mare values. Although it is difficult to determine whether diazepam levels were associated with ventilatory depression, the diazepam levels in neonates did not seem to negatively affect the outcome of these cases."

DNA Testing for Twins

Twin foals derived from the fertilization of one egg by one sperm (the scientific term is monozygotic twins) after embryo transfer have been reported in the past, said Semira S. Mancill, DVM, a resident in Large Animal Medicine & Surgery at Texas A&M University. But veterinarians had never performed DNA testing to confirm such a circumstance.

That all changed at Texas A&M. It started with a 9-year-old Thoroughbred mare giving birth to stillborn foals 10.5 months into her pregnancy. Both foals were bay fillies. The mare had received a single embryo via embryo transfer.

Tissues from both the recipient and donor mare, as well as from the two stillborn foals, were submitted for microsatellite analysis. The analysis verified that the foals had identical genotypes and resulted from the transferred embryo.

Parentage testing revealed that the embryo donor qualified as a possible dam and that the foals could not have resulted from conception of an ovum from the recipient mare.

"To our knowledge," Mancill told the group, "this is the first report of monozygotic twin pregnancy after embryo transfer verified by genetic analysis."

Hypocalcemia and Retained Placentas

Belgian draft mares and Friesian mares have high incidences of retained placentas. Jan Govaere, DVM, ECAR (European College of Animal Reproduction), of Ghent University in Belgium, explained that in Friesian horses the condition is frequently associated with low calcium levels (hypocalcemia) in the bloodstream.

Govaere and colleagues wanted to find out if the same association existed in Bel-

gian draft mares. They launched a study involving 29 Belgian mares and 16 Warmblood mares. All mares had foaled without complication between March 1 and May 1. They also sought to determine if age, parity (number of foals a mare has had), and placental weight were associated with the occurrence of retained placentas.

Seventeen of the Belgian mares in the study (58.6%) retained placentas—mares that were declared to have retained placentas were those that did not expel all or a part of the fetal membranes within three hours of foaling. None of the Warmbloods retained placentas. Blood samples were drawn within one hour of foaling and later analyzed.

“In the Belgain draft horse group,” Govaere reported, “no statically significant differences were found for serum-ionized calcium concentrations between Belgian draft horse mares with retained placentas and Belgian draft horse mares without retained placentas. The presence of retained placentas was not associated with increas-

ing age or increasing parity. Also, placental weight did not significantly differ in mares with retained placentas and mares without retained placentas.”

Therefore, other causes (i.e., inbreeding) might be more important in the pathogenesis of retained placenta in Belgian draft horses.

Uterine Inflammation

The reproductive tract is similar to the respiratory tract in that both have mucosal immune systems. In both areas, the mucosal immune system is capable of producing excessive quantities of mucus when persistently irritated. Robert C. Causey, DVM, PhD, an associate professor in Animal and Veterinary Sciences at the University of Maine, discussed the pathologic effects of clinical uterine inflammation on the equine endometrial mucosa.

Such excessive mucus can interfere with penetration of uterine antibiotics, sperm motility, and migration of an embryo before it becomes fixed in the uterus for

further development. These disruptions can result in subfertility. Causey said previous studies indicated that mucus secretion increases during experimental uterine inflammation and also increases in mares with delayed uterine clearance (of contaminants after breeding).

To determine what was occurring in mares with endometritis (infection of the uterine lining) compared with healthy mares, Causey and colleagues conducted a study of 34 mares. Of that number 10 were listed as being reproductively normal and 24 were listed as having been diagnosed with endometritis. Uterine biopsies were taken of all mares involved in the study.

The results revealed that persistent inflammation did stimulate disruption of the lining of the uterus and excessive mucus production. Veterinarians might recommend mucolytic agents (which dissolve mucus), steroids, or prolonged sexual rest for the mare to restore endometrial function. 🐾

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