During the month of March we focused on equine reproduction at Woodside's Facebook page. There are many fascinating topics to cover more in depth, including the advanced reproductive techniques of embryo transfer, oocyte transfer, in vitro fertilization using ICSI (intra-cytoplasmic sperm injection), as well as genetic preservation techniques such as embryo vitrification, semen freezing, and cloning. Discussion of all of these topics requires an understanding of the mare’s estrous cycle and the hormones involved as the final goal is to have a foal born from the combination of the mare and stallion’s genetic material. The purpose for this new foal will most likely be to compete as some type of performance horse. Because there are so many more performance horses compared to breeding horses and roughly half of those performance horses are mares, the most common reproductive question we answer is "How can I keep my mare out of heat?" So this article will address the basics of the mare's cycle and the different techniques that have been employed to stop mares from cycling.

Mares are seasonally polyestrous long day breeding animals. This means that they have multiple cycles during the long days of spring and summer. When mares are cycling normally they will ovulate every 3 weeks. They will be in heat ( estrus) for 5-7 days. During this time estrogen is the dominant hormone produced by the ovary. Estrogen is the hormone that causes mares to be receptive to the stallion for breeding. Ovulation occurs at the very end of estrus.
After ovulation the dominant hormone produced by the ovary is progesterone. This phase of the cycle is called diestrus. If the mare is not pregnant, diestrus will last 14-16 days and then she will come back into heat. If the mare is pregnant, progesterone production will continue and the mare will not come back in heat until after she foals. Most mares in our geographic region will stop cycling during the late fall and winter months. This is called winter anestrous. They will go through a transition stage in early spring as the hormones gear up for the breeding season and another transition stage in late fall as they begin to shut down for the winter. During the transition stages the estrous cycle can be unpredictable with prolonged estrus or very short diestrus phases. With the rise and fall in estrogen and progesterone levels, mares are often not as steady in their behavior or temperament as geldings or even stallions. However a mare’s behavior can be incorrectly blamed on her estrous cycle when she is actually showing submissive behavior. Submissive behavior can include leaning away from possible threats, swishing the tail, and actively squirting urine. Whereas a mare in heat will lean towards a stallion or other stimulus, have a relaxed lifted tail, and passive urination. Other causes of suspected estrus signs could include infection or inflammation of the urinary or reproductive tract or hormone producing tumors. Therefore it is important to establish that the problem behavior is due to the mare’s cycle. This can first be established by keeping a calendar to see if her behavioral issues are on a consistent three week cycle. If the behavior in question is constant or very erratic, it is much less likely to be the result of her cycling. The next step is to have a reproductive examination done by your veterinarian to rule out some of the non-estrous cycle issues and to establish that the mare is actually in heat when the problem behavior occurs. If it is determined that the behavior is due to the mare’s estrous cycle, then it would be appropriate to look at methods for estrus suppression. There are numerous techniques and hormone preparations that have been or are currently used to prevent mares from cycling. Some of them are tried and true and others have been proven not to prevent estrus, to only work for a short period of time, or to have quite variable results between mares. As progesterone is the hormone of diestrus and pregnancy, placing mares on some type of progesterone hormone is one of the most common methods used. Keep in mind that progesterone has a calming effect that can be seen even if the mare continues to cycle. Frequently it is this effect that trainers and owners are looking for. It is also important to note that mares are the only domestic animal...
that can show mild signs of estrus in the absence of estrogen produced by the ovary. This can occur due to hormone secretion from the adrenal gland. This has important implications with some forms of estrus suppression. All of the methods listed below have advantages and disadvantages related to how well they work, how long they work, expense, required veterinary intervention, and side effects.

**Pregnancy:** This is the most natural method for preventing mares from continuing to show signs of estrus behavior and maintaining elevated progesterone levels. Many owners notice that their mares are calmer and quieter when they are in foal. The disadvantage to this method is obvious in that the mare will become larger in late gestation and then will have to deliver and nurse the foal until it is weaned; not an ideal situation for a performance horse.

**Natural Progesterone:** This had been the most widely used method and was first used in the 1960’s. It is a proven effective method to prevent estrus, however the compounded formulations need to be given by IM injections either daily or every 10 days depending on the formulation. The injections have a significant potential to cause localized muscle soreness.

**Synthetic Progestins:** *Altrenogest* (Regumate or Altresyn) is a synthetic progestin that given daily by oral administration has been proven to suppress estrus in mares. It is an FDA approved product for estrus suppression and is considered the gold standard method. However the expense and daily dosing as well as human handling precautions are all considered drawbacks to this method. An injectable compounded long acting form of altrenogest is available that can be given IM every 12, 15, or 30 days depending on the formulation and has been shown to suppress estrus as well. Expense is still a concern but less frequent administration is required. *Medroxyprogesterone* is a long acting progestin that is also frequently used. It is given by IM injection every 2-4 weeks at varying doses. A well run study at Colorado State University established that medroxyprogesterone, even at very high doses will not suppress estrus in the mare. However the quieting or calming effect of progesterone from this drug may give some owners or trainers the desired effect they are looking for.

**Intra-uterine Marbles:** Placement of a 25-35mm glass marble into the uterus soon after ovulation has shown to prolong diestrus in the mare. However the results are extremely variable. In the initial study only 39% of mares showed estrus suppression for an average time of 90 days. The unreliable results and shorter duration of suppression as well as the need for veterinary involvement in the timing,
placement of the marble, and the need to remove the marble to prevent complications make this a less attractive method.

**Oxytocin Injections:** This method utilizes a series of timed IM injections of the hormone oxytocin given once a day on days 7-14 post ovulation to prevent the mare from returning to estrus. Approximately 70% of treated mares will not return to estrus for approximately 2 months. This is an inexpensive method but requires accurate timing related to the day of ovulation and the need for multiple injections.

**Intra-uterine Infusion of Plant Oils:** A more recent study showed that infusion of a small amount of fractionated coconut or peanut oil into the uterus on the 10th day after ovulation prolonged diestrus in 92% of the mares treated. This shows promise but more studies need to be done to develop a practical protocol for this method.

**Ovariectomy:** This is the surgical removal of the mare's ovaries. It is a permanent resolution to the mare's ability to cycle and should not be considered if the mare has future breeding potential. It will reliably result in a more consistent behavior, but as described above, some mares can continue to show low grade signs of estrus in certain situations. Look out for Dr. Hirsch's article to be posted on our website more details on this procedure.

While many owners, trainers, and veterinarians simply start mares on some form of estrus suppression method without an evaluation, it is in the best interest of the mare and the owner to get to the root of the cause first. The cause and treatment can in some cases be much cheaper and more lasting than having to maintain mares on long term hormone treatments. These long term treatments can have negative effects on the mare's reproductive ability if she were ever to be bred at a future time. Even if your mare does require a longer term hormone treatment for estrus suppression, if you work with your vet and utilize the mare's natural cycle and winter anestrous, you can save a significant amount of money and improve her uterine health by not maintaining her on hormonal treatments year round. If you would like to discuss your mare's situation please give us a call at the clinic.

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**Blog: Diaries of a Veterinary Intern**

**Equine Urolithiasis** By: Dr. Courtney Bowers

A recent hospital case inspired me to research and share information about equine urinary stones, also termed
urolithiasis. Lower urinary tract (urethral) stones are more of a problem in humans, whereas in horses we typically see upper urinary tract (bladder) stones. Male horses, geldings specifically, make up ¾ of all cases and have been attributed to their longer, less distensible urethra preventing stone clearance. Bladder stones are most commonly seen in adult horses, but can occur at any age. Stones form similarly to how an oyster forms a pearl when urinary crystals precipitate (solidify out of solution) and build upon a nidus (cluster) of epithelial cells which have shed from the bladder wall. Factors which are thought to contribute to stone formation include prolonged urine retention, increased excretion of calcium, uric acid or oxalates in urine. Horses normally excrete a large amount of calcium carbonate crystals in their urine and have an alkaline (high) pH which favors crystallization but there are also are factors found in horse urine, including mucous and proteins which prevent stone formation...(Read more)

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Sincerely,

Woodside & Woodside North Equine Clinic