Anestrus and Transition: Can We Start The Cycle?

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Mares are seasonally polyestrous long day breeders with anestrus typically occurring in the late fall and winter, transition occurring biannually in the early spring and early fall, and normal cyclicity occurring in the late spring and summer. With a gestation length of 11 months, this ensures that the majority of foals will be born in the spring or summer as the weather warms. While this may pose an evolutionary advantage to the wild horse, it can be problematic for the equine practitioner and mare owner. With the establishment of an industry imposed birth date of January 1 by several equine organizations, many mare owners are interested in breeding mares during what would be normally be anestrus or transition months. Anestrus and transition lengths can also be quite variable between mares, with some mares cycling year round and some mares returning to estrus late in the spring or early summer.

Seasonal reproductive activity is affected by several factors including nutrition, age, breed, ambient light, environmental changes, and housing. As the photoperiod lengthens, melatonin concentrations from the pituitary gland decrease. This decrease in melatonin releases the melatonin-induced inhibition of GnRH secretion. Thus as melatonin secretion decreases, GnRH production from the hypothalamus increases. GnRH stimulates FSH and LH secretion from the anterior pituitary gland. These hormones travel though the circulatory system to the ovaries where they stimulate follicular development and maturation. Once follicular development reaches 20-25 mm in diameter, the mare has moved from anestrus to transition. Therefore, anestrus is characterized by minimal follicular activity, low uterine tone, lack of uterine edema, and low serum estradiol and progesterone concentrations. During the transition period, mares may have multiple waves of follicular growth and regression. Estrogen production by follicles is low in early transition and higher in late transition prior to ovulation. As follicular development normalizes, estrogen concentrations rise and feed back to the pituitary gland causing an increase in LH production. Estrogens are also involved in the development of edema within the uterus, thus as estrogen levels rise, uterine edema increases. The LH surge that results from the increased estrogen levels causes the first ovulation and moves mares from transition to normal cyclicty. Therefore, transition is characterized by waves of follicular growth (20-30 mm), variable uterine tone and edema, variable serum estradiol concentrations, and low serum progesterone concentrations.

Because of the multitude of factors that affect transition, shortening these periods can be complicated and have variable results. Mares in a good body condition are more likely to cycle year round, and mares exposed to an increase plane of nutrition or fresh grass are more likely to start cycling sooner. Age also plays a role, as older mares tend to start cycling later than young mares. Ambient temperature is important as well and may be affected by housing conditions of the mare. Warmer weather induces earlier cycling and sudden or continued cold temperatures can cause mares to delay or stop progressing through transition. Keeping these factors in mind and adjusting as needed will improve results regardless of the techniques chosen.

Altering the photoperiod with artificial lighting is the most commonly used mechanism to alter the onset of cycling. Mares exposed to artificial lighting still pass through a normal length transition period and the average time from the onset of artificial light therapy to ovulation is 60-70 days, though some studies report longer periods prior to ovulation (90-100 days). The traditional artificial light
programs house mares indoors and ensure light exposure for up to 16 hours. However, by housing mares indoors, the environment is also altered which may affect results. If light therapy is applied in outdoor environments success rates may be different depending on the weather that year. Additionally, some studies have looked at 1-2 hour pulse light therapy.9-13 This light is applied 8-9.5 hours after onset of darkness and is thought to disrupt the production of melatonin at a critical time period.12 There are conflicting results regarding whether this protocol is as affective as the traditional 16 hour standard, but it does seem help hasten the onset of cyclicity.

A variety of medical protocols have been studied in the attempt to shorten anestrus or transition periods. Aspiration of >35 mm follicles during transition resulted in a rise in serum progesterone sooner than untreated controls.14 However, mares don't generally develop 35 mm follicles until late in gestation, so the time savings may be small (approximately 20 days in this study). Administration of GnRH or GnRH analogs has had variable results. The use of GnRH pumps or GnRH analog implants resulted in 30-88% of ponies or mare ovulating within 20 days.15-17 The variation in ovulation rate depended on the dose and product used. GnRH and its analogs are more successful if the mare is further along in the progression towards normal cyclicity. Deslorelin, a commercially available GnRH analog, has been used to successfully hasten the termination of later transition, but often multiple injections are needed and limited time savings is achieved.18 Progesterone or progesterone analogs have been used in various protocols.19-21 Again, mares in deep anestrus or early transition are less likely to respond to treatment, but progesterones can be effective in late transition. Mares with follicular sizes of at least 30 mm are more likely to respond than mares that have not yet developed follicles of this size. Daily sulpiride (dopamine antagonist) administration has also been shown to advance the first ovulation. This is thought to be due to increased prolactin secretion. These protocols were started in late January or early February and were continued until ovulation occurred. Ovulation occurred 21-33 day earlier than control mares, but long term (1-2 months) administration was required.22-23 By combining light therapy and sulpiride administration, one group was able to shorten the treatment period to less than 21 days with good results.24 Another group utilized alternate day estrogen injections prior to the starting sulpiride treatment to hasten the onset of ovulation.25 A third group successfully utilized a combination of estradiol and domperidone.26 The use of domamine antagonists in combination with estrogens shows promise, but more work is needed to develop an easy to use protocol that will allow for good compliance.

While many drug protocols have been evaluated, ambient light therapy remains the mainstay for hastening the onset of normal cyclicity in mares. Care should be taken to consider other controllable factors such has environmental conditions and nutrition when utilizing light or hormonal therapy as this will improve results. Drug therapy is likely to be more successful in late transition and can be useful in shortening this period, but is less effective during deep anestrus. Further work may yet develop a more consistent and useful drug protocol.

Suggested Readings:

References:


