

INDUCTION OF LACTATION & ADOPTION OF FOALS BY NONPARTURIENT MARES

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The induction of lactation without the need of a preceding pregnancy could offer several practical and economical advantages. Lactation has been induced in ruminants using steroids (progesterone and estrogen) as a short term treatment followed by a wide variety of drugs aimed at increasing prolactin secretion. These treatment protocols have resulted in lactation with a milk production between 25 and 82 % of a physiological, post-partum lactation. As a general observation, an induced lactation do not start with a production of colostrum. Several products (domperidone and sulpiride) have been used in recent years to increase endogenous prolactin secretion in mares either to advance the onset of reproductive activity in the early spring or to counter the ill-effects of fescue toxicosis in pregnant mares at term.

In the equine industry, there is an interest in systems that would allow us to produce colostrum independent of pregnancy. Also, the availability of foster mares for adoption of orphaned foals remains a critical issue. Motivated by these two demands, studies were undertaken by Pascale Chavatte-Palmer and Eric Palmer to determine if lactation can be induced in the mare and if this induced lactation is apt to generate colostrum. These studies were conducted in collaboration with the French National Stud and constitute likely the first successful attempt to induce lactation in the non-parturient mare (1-2). The initial treatment protocol consisted of a 2-week treatment in which progesterone, estrogen and a dopamine D2 antagonist (sulpiride or domperidone) were administered daily. Mares were milked within a few days after the start of sulpiride treatment and in some experiments milking was continued after the end of treatment. The results of these studies indicate that lactation can be induced in mares that have foaled in previous years but that the production of colostrum at the onset of lactation is minimal to non-existent. A comparison between sulpiride and domperidone indicated that both products are effective in inducing milk production. These data set in motion several studies aimed at (1) improving colostrum production and (2) improving the induction protocol.

In a subsequent study, we have examined the influence of season on milk production following induction of lactation. These studies were conducted in March and September using mares that had cyclic reproductive activity. No difference in mean milk production was detected between mares induced in spring and autumn. Although only a limited number of mares (n=5/group) were used, we suggest that lactation can be induced in cyclic mares regardless of the time of year. In the same year, we also examined the relative importance of ovarian steroids in the induction treatment (3). Intact, estrous mares and ovariectomized mares were induced using a dopamine-antagonist only. Whereas intact mares in estrus produced significant amounts of milk following one week of sulpiride treatment, ovariectomized and untreated, estrous mares did not produce milk. The results suggest that at least one of the ovarian steroids (progesterone or

estrogen) is necessary for the successful induction of lactation in mares that have had at least one foal in previous years.

In 2000, a mare with an induced lactation and that had produced several foals in previous years adopted a newborn foal. The mare continued to receive sulpiride for about 6 weeks after adoption. The mare demonstrated an apparently normal maternal behavior and nursed the foal until weaning age. The growth rate of this foal during the first month and the weight at weaning was similar to 6 contemporary control foals. This was the first indication to our knowledge that mares with an induced lactation are able to nurse a foal to weaning age.

In 2001, a more substantial study was conducted aimed at (1) improving the treatment protocol and (2) testing the hypothesis that mares with an induced lactation are able to adopt a foal, develop a normal maternal behavior and nurse the foal until weaning age.

In the first experiment, three induction protocols were compared using 24 non-pregnant, non-parturient Welsh pony mares that had previously delivered and nursed at least one foal in previous years (4). Treatment 1 was the reference treatment as it was used in most of the previous experiments. During Week 1 (Days 1-7), steroids were delivered using a vaginal sponge containing altrenogest and estradiol benzoate. During Week 2 (Days 8-14) of the treatment, the first vaginal sponge was replaced by a vaginal sponge containing altrenogest and estradiol benzoate and left in place from Day 8 to 14, estradiol benzoate and prostaglandin were administered by intramuscular injection on Day 8 and sulpiride was administered on Days 8-14. Milking was started on Day 9. Treatment 2 (n=6) was designed to increase the accumulation of colostrum prior to the first milking. In this treatment protocol the start of milking was postponed until the end of Week 2. Mares received the same treatment described in Treatment 1 except that prostaglandin was administered on Day 13 and milking was started on Day 14. Treatment 3 (n=6) was designed to offer a shorter alternative to the existing induction protocol. Mares received only the treatment described for Week 2 in Treatment 1. Mares were milked 5x/day between 8am and 10pm using a milking machine designed for goats and oxytocin was administered approximately 2 minutes before milking. IgG concentrations were estimated using a refractometer and results of specific analyses are pending. No significant differences in daily milk production between treatments were observed. In all mares, the IgG levels at first milking were below levels expected for colostrum. The results of this study suggest that neither the treatment during Week 1 nor the milking during Week 2 appears to influence daily milk production. Thus it appears that a treatment of one week combining progesterone, estrogen and sulpiride without concurrent milking effectively induces lactation in mares. Milking was continued following the end of hormonal treatment. In all mares, milk production remained relatively constant for at least one week when milking 5x/day was continued.

In order to determine if continued sulpiride administration further increases milk production after the end of the induction protocol, sulpiride treatment was re-initiated on Day 23 (=Week 4) in 9 mares randomly selected from the previous experiment. Milk production after 7 days of sulpiride treatment (Day 30) was significantly higher compared to 4 non-treated mares that had been milked for the same length of time. In the non-treated mares milk production on Day 30 had increased about 11% in contrast to 75% in mares treated with sulpiride. These results

suggest that continuation of sulpiride treatment beyond Day 14 (Day 14 as described in the previous experiment) might further increase daily milk production.

To determine the growth rate of foals adopted by mares with an induced lactation, 19 foals were adopted by mares with an induced lactation selected from the experiments described above. All adopting mares were administered sulpiride on the days before adoption and treatment was continued for 3 days after adoption. Fifteen foals were left with their natural mother and used as controls.

Adoption was realized using one of two methods. Mares in Group 1 were placed in an individual stall and confined behind a padded bar placed horizontally at chest height. A foster foal was removed from its natural mother at birth and introduced to the adoptive mare. The foal was held close to the mare's head while she received vaginal-cervical stimulation for 2 periods of 3-min., separated by a 10-min. interval. The foal remained in the stall with the mare and was observed until the foal was accepted at the udder for the first time. In Group 2, mares were treated in the same manner as those in the above group, but did not receive vaginal-cervical stimulation when the foster foal was introduced. Mares were punished if they responded aggressively to the foal. Seven mares that initially displayed high levels of aggression towards the foal received a tranquilliser once or twice (acepromazine). Pairs of parturient mares and their newborn foals served as a control group for the observations of maternal behavior. The control mares were not confined behind a bar during the observation period. Two days after introduction of the foster foal, each of the 16 adoptive mothers was tested for her responses to her adopted foal versus an unfamiliar stimulus foal of the same age. In addition, 8 control mares were tested with their biological offspring and an alien foal. During the 3-min. observation, the mare was free to move about the 8 x 10 m. test pen; the 2 foals were held on the opposite side of one of the 8-m fences, one at each end. Two observers recorded the mare's latency to approach each of the foals, and the length of time that she spent near them. All 16 non-parturient mares successfully adopted their foster foal (allowed it to suckle with no signs of aggression). However there were significant differences in the acceptance latencies across the 3 conditions. Acceptance took significantly longer for the non-parturient mares that did not receive vaginal-cervical stimulation, than for mares in the vaginal-cervical stimulation condition and the control mares.

All foals were weighed on the day of birth, Day 14, 30, 60 and 120 and at weaning. Adopted foals had a significant lower daily weight gain during the first 2 weeks after adoption but at weaning adopted and control foals had the same body weight. Taken together, the results of the above described studies indicate that lactation can be induced in mares that have foaled in previous years. These mares are able to adopt a foal and nurse it until weaning age. The initial difference in daily growth rate is likely the combined result of the lesser milk production at the onset of an induced lactation versus a postpartum lactation and the abrupt ending of the all hormonal treatment 3 days after adoption. Experimental data suggests that the prolonged treatment with sulpiride may help to overcome the initial insufficient milk production and this option is currently being examined.

References

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