INDUCTION OF LABOUR IN DOMESTIC ANIMALS

W. C. Wagner

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One component of increased management and production efficiency is improved labor efficiency. In animal production this has resulted in considerable research on the question of controlled estrus or ovulation and more recently, controlled parturition. An interest in induction of parturition has also resulted from a desire to reduce calving problems by early parturition when there are fetus-dam size disparities as in crossbreeding of different beef breeds. For an excellent review on this topic in cattle see the paper by Carroll in J. Anim. Sci., Vol. 38, Suppl. 1, 1974.

The drugs that have so far been reported as successful in inducing parturition in domestic animals include glucocorticoids and prostaglandins. Within the glucocorticoid group some distinction in results must be made between the « short » action corticoids such as dexamethasone (DXMS, 9α-fluoro-16α-methyl-prednisolone) or flumethasone (FMS, 6,9α-difluoro-16α-methyl prednisolone) and the « long » action preparations such as dexamethasone-trimethyl-acetate (DXMS-TMA) or dexamethasone-phenylpropionate (DXMS-PP). The difference is that parturition occurs about 48 hours post-injection with the short action compounds but about 7-10 days post-injection with the long action preparations. To the present time, studies on prostaglandin (PG) usage have been confined to the use of PGF₂α or related compounds in domestic mammals.

The first report on the use of DXMS for parturition induction in cattle was made by ADAMS in 1969. In this report he indicated that responding cows exhibited signs of imminent parturition including swelling of the vulva, relaxation of the perineal region, udder filling and dilation of the cervix within 24 hours post-injection. No particular problems with the parturition process including actual labor were reported. However several other observations were made that have since been repeatedly confirmed by other workers.

The response was best in cows during the last 2-3 weeks of gestation. Cows less than 255 days post-conception responded poorly or not at all suggesting an increased sensitivity to the treatment as the normal parturition time approached. Retention of the fetal membranes was and still is one of the major problems of glucocorticoid induced parturition in cattle. ADAMS (1969) and ADAMS and
Wagner (1970) reported an incidence of 50 p. 100 or more of retained membranes. In the latter paper, data were presented to indicate that placental retention decreases as induction time approaches normal parturition time. These retained membranes are nearly impossible to remove manually. Wagner et al. (1974) reported good success by treating such animals with systemic antibiotic therapy. Certainly uterine manipulation and attempted placenta removal are contraindicated.

Lactation and calf survival seems to be unaffected by the induction process. There has been some variation in calf survival data with most authors reporting no effect or improved calf survival. Exceptions to this have occurred where the calves are born 3 wks or more prior to the expected date resulting in very immature calves that do not suckle well and are more susceptible to neonatal calf diseases such as enteritis and/or pneumonia.

Subsequent fertility has generally been reported to be normal. Wagner et al. (1974) reported that induced cows conceived as early as 40 days post partum and no difference in total pregnancies was observed between cows with and without placental retention.

Studies on lactation performance in dairy cows have been reported by Beardsley et al. (1973) in the U.S. and by Bailey et al. (1973) in Australia. In general it appears that milk production was not depressed following induced parturition. Occasional animals seem to show some initial transient decrease in milk secretion but production data over time seem to show no significant differences.

Up to this point, the data cited have been primarily based on studies in cattle using the short action corticoids available in the US. Extensive research as well as clinical usage of a long action glucocorticoid (DXMS-TMA) in New Zealand and Australia has demonstrated certain significant differences when these preparations are used. Much work has been done on this question by R. A. Welch at the Ruakura Station in New Zealand.

Injections of corticoids such as DXMS-TMA result in parturition up to 7-10 days or more later. In general Welch has reported a low (normal) incidence of placental retention using this drug but with a rather higher perinatal calf mortality of 20-25 p. 100. Other studies have not reported such high calf mortality (Bailey et al., 1973). However, little or no steroid hormone data are available from such studies to compare with the data from use of short action glucocorticoids which could provide some clues on these questions.

Hormonal changes (progesterone, estrogens, corticoids and prostaglandins) have been reported for induced parturition animals. Edquist and Coworkers (1972) have reported a significant increase in plasma estrone following DXMS injection. There was also a decrease in plasma progesterone which began after the estrone rise was initiated.

In contrast Evans and Wagner (1976) have reported only a slight increase in plasma estrone from injection of DXMS to parturition, an interval of 48 hours. However, they observed an immediate decrease in plasma progesterone, with near basal levels occurring about 24-36 hours post-DXMS injection. The decrease was most noticeable in blood collected from the utero-ovarian vein, indicating a rapid and complete luteolysis resulted from the DXMS injection. In most reports, DXMS injections result in suppression of endogenous corticoid secretion. Data
from sheep by Liggins have indicated an increase in prostaglandins in uterine tissues and cotyledons following corticoid administration.

Corticoid induction of parturition in sheep has been extensively studied by Bosc 1972. Generally the response appears similar to that seen in cattle although the period of sensitivity appears restricted to animals more than 138 days of gestation. Retained fetal membranes are not reported as a common sequela in sheep as they are in cattle.

Glucocorticoids such as DXMS have also been tried for parturition induction in the mare and sow. These two species appear much more resistant to DXMS for parturition induction than the cow and sheep. Research at Wisconsin (N. I., First et al.) has shown that 75-100 mg DXMS per day for 3-4 days are needed to induce parturition in the pig and mare. Furthermore, the pig is only responsive with some chance of piglet survival about day 109 or later.

Prostaglandins such as PGF<sub>2α</sub> have been tried in several species. At the present time they seem to offer little advantage over corticoids in cattle. Placental retention was a major sequella to PG-induced parturition in the cow. Interval from injection to labor was similar to that seen with DXMS. It is assumed that PG can act both to cause death of the CL (as in the cow and pig) and also to stimulate myometrial activity as reported in other species, e.g., human.

PG treatment of late pregnant sows does induce parturition but the response time was sufficiently variable that it seems to offer no significant advantage over natural parturition at present. Not only has the response interval been variable but, in some studies, only 70 p. 100 of the animals responded with early parturition.

The primary potential for induced parturition seems to be in cattle at the present time. It has proven useful in reducing calf birth weights and improving calf survival in certain crossbred animals. This procedure is not a panacea for calving problems but rather requires capable management for it to be successful. Prostaglandins do not appear to offer any advantage over corticoids in cattle.

Parturition induction in other domestic species (pig, sheep, horse) is less applicable at present. The response and timing is erratic in sows treated with PG and the sow requires uneconomic amounts of glucocorticoid. Obviously we require more information about natural parturition events before we can hope to solve all of the questions related to induced parturition.

REFERENCES


*Fin des rapports présentés au XXe Congrès mondial vétérinaire.*

*End of reports presented at the XX th world veterinary Congress.*