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Notas Científicas

Intravaginal progestagen for estrus and parturition control in sows

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Abstract – The objective of this work was to evaluate the use of intravaginal devices (IVD) for the control of reproductive events in swine. Sows at 112 days of pregnancy received an injection of PGF2α (control, n = 15) or PGF2α plus an IVD containing medroxyprogesterone acetate (IVD group, n = 14) for 48 hours. Sows initiated labor 27.7±1.6 and 82.3±3.8 h after PGF2α aplicaction, in control and treated groups, respectively. Regarding control of estrus cycle, ten sows received IVD for 12 days starting immediately after weaning, and estrus was confirmed 17.25±0.17 days after weaning, in comparison to 4.00±0.25 days for the control group. Intravaginal devices with progestagen can be applied for the control of reproduction in swine.

Index terms: gestagens, intravaginal device, labor, swine reproduction.

Progestágeno intravaginal para controle do estro e do parto em fêmeas suínas

Resumo – O objetivo deste trabalho foi avaliar a utilização de dispositivos intravaginais (DIV) para o controle da reprodução em suínos. Porcas aos 112 dias de gestação receberam injeção de PGF2α (controle, n = 15) ou PGF2α com inserção de DIV contendo acetato de medroxiprogesterona (grupo DIV, n = 14) por 48 horas. As fêmeas iniciaram o parto 27,7±1,6 e 82,3±3,8 horas após aplicação de PGF2α nos grupos controle e tratado, respectivamente. Quanto ao controle do estro, dez porcas receberam DIV por 12 dias, iniciando imediatamente após o desmame, e o estro foi confirmado aos 17,25±0,17 dias após o desmame, em comparação a 4±0,25 dias no grupo controle. Dispositivos intravaginais com progestágeno podem ser utilizados no controle da reprodução em suínos.

Termos para indexação: gestágenos, dispositivo intravaginal, parto, reprodução de suínos.

The current swine production systems require tight control of reproductive functions as they are directly related to most of the production indexes. Also, as these production systems become more intense, greater demands are placed on the reproductive system. To overcome this situation, producers can use various hormonal treatments in different protocols, which can facilitate management practices while maintaining high reproductive efficiency (Cowart, 2007; Knox & Wilson, 2007).

In ruminants, some devices for slow release of gestagens are available and, nowadays, are extensively used for estrus induction and synchronization. However, devices to promote slow release of gestagens are still not available for swine (Knox & Wilson, 2007). Exogenous administration and control of gestagens plasma levels allow for applications of assisted reproductive technologies as estrus synchronization in gilts (Wood et al., 1992) and weaned sows (Fernández et al., 2005; Patterson et al., 2008) and also for control of parturition (Guthrie et al., 1987; Vanderhaeghe et al., 2010).

An available method for estrus synchronization in swine is to daily feed progestagen during 14 to 18 days. Studies demonstrate that altrenogest, supplied in the food at a rate of 15 to 20 mg per day, for 14 to 18 days, is effective for estrus synchronization of cyclic gilts, without affecting litter size (Wood et al., 1992). However, this progestagen is expensive and its use is not allowed in some countries. Also, oral drugs must be provided daily for several days with doses varying according to each animal and purposes (Estill et al., 2000). The plasma levels of altrenogest depend on food intake and absorption of the active principle by the gastrointestinal tract.

A large percentage of piglet losses, during the first hours of life, can be reduced through the supervision of labor and assistance to sow and piglets. In the traditional management systems, it is necessary to maintain employees in the maternity 24 hours a day, seven days a week. An alternative to reduce labor and simplify parturition supervision is the use of drugs to concentrate the labor on weekdays, preventing its occurrence in weekends and holidays (First & Bosc, 1979; Cowart, 2007).

Oral progestagen has been used to control the time of parturition in sows (Guthrie et al., 1987). Pregnant sows from 108 to 113 days of pregnancy, which were orally supplemented with natural progesterone delivered at 115.6±0.3 days (Wilson et al., 1989). Oral supplementation of altrenogest has delayed deliveries but has not induced a good synchronization of parturition (Guthrie et al., 1987). For the use of medroxyprogesterone acetate (MPA), there is only one report in which this steroid was orally administered (twice daily) to sows and efficiently delayed parturition by one day (Whitely et al., 1990).

The objective of this work was to evaluate the use of an intravaginal device (IVD) to promote the slow release of progestagen in swine. This is the first report of successful use of an IVD for slow release of exogenous progestagen to control the time of parturition and estrus manifestation in sows.

All experimental procedures using animals were reviewed and approved by the Animal Care and Use Committee from Universidade Federal de Santa Maria. In order to evaluate whether IVD applications for slow release of progestagen are capable to maintain the gestation, sows were subjected to parturition induction with PGF2α. Twenty-nine crossbred sows (Landrace x Large White), at 112 days of pregnancy, received treatments as follows: the control group (n = 15), an intramuscular injection of PGF2α with 250 µg sodium cloprostenol (Schering-Plough Animal Health, São Paulo, SP, Brazil); and the IVD group (n = 14), PGF2α plus an intravaginal polyurethane device (4x4x5 cm, 33 kg m^{-3} density) containing 800 mg of MPA (Genix-Purifarma, Anápolis, GO, Brazil). The two groups were balanced for sow parity, and the devices were removed 48 hours after PGF2α treatment. Time between PGF2α administration and parturition, number of born piglets and piglets born alive were recorded and compared by analysis of variance using the JMP software (JMP, 2010). Continuous dependent variables were tested for normal distribution using Shapiro-Wilk test and were normalized when necessary. The alive/total born ratio was analyzed using ANOVA with fitted exponential distribution of arcsine-transformed data.

To test the hypothesis that progestagen intra-vaginal devices are suitable for control of estrus cycle, ten crossbred cull sows (Landrace x Large White) received IVD containing 200 mg MPA for 12 days, starting immediately after weaning, which occurred 26 days after farrowing. In five sows, devices were replaced for new ones at day 6 after insertion, and other five sows received only one intravaginal device from day 0 to 12. Estrus detection was performed twice daily, in the presence of a mature boar, for 20 days starting on the day of device insertion. Time (days) between weaning and estrus manifestation was recorded, and data were subjected to ANOVA after normalization.

Control sows initiated labor 27.7±1.6 hours after PGF2α treatment. In IVD group, sows parturition was significantly delayed ($p<0.05$) and occurred at 82.3±3.8 hours after PGF2α treatment, nearly 34 hours after IVD removal. There was no significant difference in the average number of born piglets – 14.53±0.63 and 13.07±1.05 –, and piglets born alive – 13.73±0.56 and 11.74±0.88 – for control and IVD group, respectively. The alive/total born piglets ratio also did not differ between control and treated groups.

None of the sows manifested estrus during vaginal progestagen supplementation. However, estrus was detected in all sows 5.26±0.17 days after device removal, which corresponds to 17.25±0.17 days after weaning. Control sows, which were weaned concomitantly (26 days after farrowing), manifested estrus 4.00±0.25 days after weaning. These results indicate that progestagen IVD applications are suitable to control the time of parturition and estrus cycle in sows. This is the first report on intravaginal progestagen supplementation in swine for control of reproductive events.

The number of days (5.26±0.17) between the IVD removal and estrus (corresponding to 17.25±0.17 days after weaning) was similar to that observed in weaned sows daily fed altrenogest for 10 days (Wood et al., 1992). The fact that control sows manifested estrus 4.00±0.25 days after weaning confirms the efficiency of progestagen IVD in preventing estrus manifestation.

All sows were detected in estrus 5 days after device removal. The delay in the post-weaning estrus using oral progestagen (altrenogest) is associated to increased sow reproductive performance comparable to the "skip-a-heat" strategy (Patterson et al., 2008). No differences (p>0.05) were observed between sows which received one (for 12 days) or two IVD (for 6 days each). Thus, one IVD containing 200 mg MPA is sufficient to prevent estrus manifestation. This is a clear advantage, since oral supplementation of progestagen has to be provided every day.

Regarding the control of parturition in sows, intravaginal devices containing 800 mg MPA delayed parturition even in the absence of functional corpora lutea (after PGF2α administration). Thus, the efficiency of this implant in delaying parturition is unquestionable. This may represent an alternative to obtain a more precise control of the time of parturition, which is currently based on the use of luteolytic drugs. Moreover, progestagens have a potential role in preventing early parturition in sows (before 114 days) and in decreasing reproductive losses, as recently proposed by Vanderhaeghe et al. (2010). Based on our results, IVD could be used to prevent early parturition and avoid deliveries in weekends and holydays.

In both experiments, IVD were applied to animals individually housed in pens, and none of the animals lost the device during the entire period of treatment. As a source of progestagen for sows, the main advantages of using intravaginal devices over oral progestagen are less labor, lower cost and better standardization of dose administration. The only progestagen (altrenogest) available in Brazil is more expensive and it is indicated for daily oral supplementation. Thus, the present results show that IVD can be a valuable tool for different purposes in swine. Further studies are being performed to evaluate different conditions, as doses and periods of progestagen supplementation, to obtain an improved protocol for parturition control in swine. Also, since only cull sows were used in the second experiment, parameters like estrus response, ovulation rate and number of viable piglets will be further investigated in sows subjected to estrus synchronization using progestagen IVD and mated/inseminated after estrus detection. Further studies are also being performed to evaluate additional parameters to certify that IVD containing different doses of medroxyprogesterone acetate are suitable and safe for controlling the time of delivery and inducing and synchronizing estrus.

Progestagen IVD can be successfully applied for the control of reproduction in sows. Given its low cost and simple use, IVD applications are anticipated to have a huge impact in modern swine production systems.

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