

Effect of short (10- or 12-day) or standard (14- or 18-day) periods of estrus suppression with allyl trenbolone on estrus synchronization and fertility in pubertal gilts

F. De Rensis, DVM, PhD; C. Mazzoni, DVM; R. Saleri, DVM, PhD; M. Techakumphu, DVM, PhD; R. N. Kirkwood, DVM, PhD, Diplomate ECAR

Summary

Allyl trenbolone was fed at 20 mg per day for 10, 12, 14, or 18 days, with two 75- μ g injections of D-cloprostenol at last feeding at 10 or 12 days to synchronize estrus in gilts. There were no treatment effects on farrowing rate or subsequent litter sizes.

Keywords: swine, allyl trenbolone, D-cloprostenol, estrus synchronization, fertility

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Resumen - Efecto de los periodos corto (10 ó 12 días) o estándar (14 ó 18 días) de supresión del estro con allyl trembolona en la sincronización del estro y fertilidad en hembras púberes

Se administró allyl trembolona en el alimento a 20 mg por día por 10, 12, 14, ó 18 días, con dos inyecciones de 75 μ g de D-cloprostenol en el último alimento a los 10 ó 12 días para sincronizar el estro en hembras primerizas. No hubo efecto del tratamiento en el porcentaje de fertilidad o en el tamaño de camada subsiguientes.

Résumé - Effet d'une période courte (10 ou 12 jours) ou standard (14 ou 18 jours) de suppression d'œstrus avec de l'allyle de trenbolone sur la synchronisation de l'œstrus et la fertilité chez les cochettes pubères

L'allyle de trenbolone a été administré par la nourriture à une dose de 20 mg par jour pour 10, 12, 14, ou 18 jours avec deux injections de 75 μ g de D-cloprosténol au moment du dernier repas à 10 ou 12 jours afin de synchroniser l'œstrus chez les cochettes. Aucun effet de traitement ne fut noté sur les taux de mises bas ou la tailles des portées subséquentes.

Gilt pools frequently house large groups of randomly cycling gilts to ensure that sufficient service-ready gilts are available to meet weekly breeding targets. The need for large numbers of gilts can be reduced if estrus synchronization is employed. Some degree of synchronization of estrus in gilts can be attained by appropriate use of the boar effect or administration of exogenous gonadotrophins, although these practices are effective only for prepubertal gilts.¹ For cyclic gilts, a relatively precise and predictable synchronization of estrus can be achieved by feeding the orally active progestogen allyl trenbolone (AT). Depending on the country, the standard treatment protocols are to feed AT at 15 or 20 mg per day for either 14 or 18 days.²⁻⁴ After AT withdrawal, 93% of gilts were in

estrus by days 5 to 7, with improved farrowing rates to insemination at this estrus.⁴ Interestingly, in the mare,⁵ cow,⁶⁻⁸ and ewe,⁹ long-term progesterone administration compromised luteinizing hormone (LH) secretion, follicular development, oocyte quality, uterine environment, and fertility, and there are recent data showing that a shorter (5-day) compared to a standard (9-day) duration of a progesterone-based treatment of dairy cows improved fertility.¹⁰ It is not known if a similar situation can occur in gilts. However, when AT administration occurs at random stages of the estrous cycle, some animals at the beginning of treatment will be in their late luteal phase. Consequently, the duration of endogenous, followed by exogenous, progestagenic activity on ovarian activity could be more than

30 days and fertility may be compromised. In contrast, it is possible that a shorter period of AT feeding may result in improved fertility. The aim of the present study was to evaluate the effect of a shorter period of AT feeding on fertility of pubertal gilts.

Material and methods

The experiment was performed in compliance with the requirements of the University of Parma Animal Care Committee and applicable Italian and EU law. As the experiment was performed in a farm outside the university and involved no special treatment outside of normal commercial practice, the Parma Animal Care Committee was informed of the study but approval was not required.

Animals

The experiment was conducted on a commercial 650-sow farm with in-house multiplication located in Parma province, Italy, between February 2011 and January 2012. Starting at approximately 110 kg body weight and 200 days of age, gilts (PIC Camborough-22) were subject to contact with a mature boar to facilitate estrus detection. At detection of estrus, gilts were transferred to gestation stalls and were fed a commercial dry-sow ration formulated to supply 3.1 kcal per kg and 0.62% total lysine at 2.0 kg per day. Water was available ad libitum.

FDR, CM, RS: Department of Veterinary Medicine, University of Parma, Italy.

MT: Department of Obstetrics, Gynaecology and Reproduction, Faculty of Veterinary Science, Chulalongkorn University, Bangkok, Thailand.

RNK: School of Animal and Veterinary Sciences, University of Adelaide, Australia.

Corresponding author: Dr R. N. Kirkwood, School of Animal and Veterinary Sciences, University of Adelaide, Roseworthy, SA 5371, Australia; Tel: +61 8 8313 7617; E-mail: roy.kirkwood@adelaide.edu.au.

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Experimental protocol

A total of 501 pubertal gilts between day 1 and 19 of their estrous cycles were distributed among four experimental groups involving the feeding of 20 mg per day of the orally active progestogen, altrenogest (AT) (Altresyn; CEVA, Agrate Brianza, Italy), mixed in a small amount of feed for periods of 10, 12, 14, or 18 days, and two intravulvar injections of 75 µg of the prostaglandin F2α analog, D-cloprostenol (Dalmazin; Fatro, Bologna, Italy) 6 hours apart on the day of last altrenogest feeding for the 10-day and 12-day altrenogest treatments (Table 1). The day of first feeding of AT was designated as day 0 of the study. D-cloprostenol has a potency 10-fold greater than that of the racemic DL-cloprostenol¹¹ and was administered to minimize the risk of residual luteal activity at the end of the shorter feeding periods.

Beginning at AT withdrawal, gilts were exposed to 10 minutes of fence-line boar contact twice daily for estrus detection and, at estrus detection and 24 hours later, gilts were inseminated with 2.6×10^9 sperm in 90 mL M-RA extender (Hermitage Italia, Castellazzo, Reggio Emilia, Italy). All semen was used by 3 days after collection. Mean and standard deviation (SD) gilt age and weight at breeding were 232 ± 3.8 days and 138 ± 8.6 kg, respectively. At their post-treatment estrus, estrus intensity was subjectively scored by one person on a scale of 1 (very weak estrus signs) to 5 (very strong estrus signs),¹² and the duration of estrus and the interval between the end of treatment and estrus were recorded. Farrowing rate was the percent of inseminated gilts that farrowed. Total and liveborn litter sizes were recorded.

Statistical analysis

Treatment effects on proportion of gilts returning to estrus and farrowing rates were examined using Fisher's exact test. Treatment effects on litter sizes were examined using the Wilcoxon-Mann-Whitney test, and effects on interval between the end of treatment and estrus were examined using Student's *t* test. For all comparisons, $P < .05$ was considered significant.

Results

Overall, the average rate of gilts in estrus after treatment was 95%, the mean interval between the end of treatment and estrus was 5.5 ± 0.8 days, the mean estrus score was 4.3 ± 0.6 , and the farrowing rate was 84%, with no differences attributable to treatment (Table 2; means \pm SD reported). There was no significant effect of treatment on mean numbers of piglets born or born alive ($P > .05$; Table 2).

Discussion

In this study, 93% to 96% of gilts were in estrus approximately 5 to 6 days after AT withdrawal. These results are similar to those of previously reported studies in which the administration of AT for 14 or 18 days synchronized estrus within 5 to 7 days in 84% to 96% of treated gilts.^{4,13} Our working hypothesis that a different duration of progestagen treatment can influence fertility in pubertal gilts has been rejected. Indeed, in our study, estrus synchronization, farrowing rate, and piglets born after a short (10 or 12 days) or a standard (14 or 18 days) administration of AT were not different. This is in contrast to limited data from gilts where an 18-day AT feeding period yielded superior fertility results compared to a 14-day feeding period¹⁴ or data from mares,⁵ cows,⁶⁻⁸ and ewes,⁹ in which the duration of

a progestagen treatment can influence LH secretion, follicular development, oocyte quality, uterine environment, and fertility, with the longer treatments having negative effects.⁵⁻¹⁰ The differences between species might be related to the patterns of follicular development, follicular waves, and follicular dominance.

A practical implication of the present study is that the efficacy of a 10- or 12-day AT administration for estrus synchronization, when followed by prostaglandin-induced luteolysis, does not compromise fertility, compared to a treatment for 14 or 18 days. These data provide information that will allow producers to further fine-tune gilt availability for service and so ease the attainment of breeding targets.

Implication

A shorter period of progestagen-induced estrus suppression (10 to 12 days) followed by exogenous prostaglandin-induced luteolysis results in fertility comparable to that of gilts suppressed for 14 or 18 days.

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Conflict of interest

None reported

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Table 1: Treatments administered to 501 pubertal gilts between day 1 and 19 of their estrous cycles

Group (n)	Altrenogest fed* (days)	D-cloprostenol injections†
AT18 (196)	18	None
AT14 (135)	14	None
AT12 (97)	12	Day 12
AT10 (73)	10	Day 10

* Altrenogest (Altresyn; CEVA, Agrate Brianza, Milan, Italy; 20 mg/day) was mixed with a small amount of feed for 10, 12, 14, or 18 consecutive days.

† Two intravulvar injections of 75 µg of the prostaglandin F2α analogue, D-cloprostenol (Dalmazin; Fatro, Bologna, Italy), were administered 6 hours apart on the day of final AT feeding.

Table 2: Performance of gilts treated with 20 mg/day allyl trenbolone (AT) for 18, 14, 12, or 10 days*

	AT18	AT14	AT12	AT10
Gilts treated	196	135	97	73
No. of gilts in estrus (%)	188 (96)	129 (95)	91 (93)	69 (94)
Estrus score†	4.3 ± 0.2	4.4 ± 0.3	4.0 ± 0.5	4.1 ± 0.7
AT to estrus (days)‡	5.2 ± 0.7	5.4 ± 1.5	5.6 ± 2.2	5.9 ± 2.7
Duration of estrus (hours)‡	54 ± 6.2	48 ± 8.1	56 ± 12.2	54 ± 11.4
No. of gilts farrowing (%)	156 (82)	104 (80)	77 (84)	60 (82)
Litter size (total)‡	13.3 ± 3.4	13.4 ± 2.5	12.8 ± 2.8	13.3 ± 2.5
Litter size (alive)‡	12.2 ± 4.2	11.5 ± 4.2	10.8 ± 3.8	12.2 ± 4.3

* Gilts treated for 10 or 12 days were administered two 75- μ g intravulvar injections of D-cloprostenol at the time of last AT feeding. Treatment effects on proportion of gilts returning to estrus and farrowing rates were examined using Fisher's exact test. Treatment effects on litter sizes were examined using the Wilcoxon-Mann-Whitney test. Effects on interval between the end of treatment and estrus were examined using Student's *t* test. No significant differences ($P > .05$) between the four treatments were detected.

† Intensity of the post-treatment estrus was subjectively scored on a scale of 1 (very weak estrus signs) to 5 (very strong estrus signs).¹² Mean \pm standard deviation reported.

‡ Mean \pm standard deviation reported.

the rules and regulations governing research or the practice of veterinary medicine in their country or region.

References

- Kirkwood RN. Pharmacological intervention in swine reproduction. *Swine Health Prod.* 1999;7:29–35.
- Kraeling RR, Dziuk PJ, Pursel VG, Rampacek B, Webel SK. Synchronization of estrus in swine with allyl trenbolone (RU-2267). *J Anim Sci.* 1981;52:831–835.
- Rhodes MT, Davis DL, Stevenson JS. Flushing and altrenogest affect litter traits in gilts. *J Anim Sci.* 1991;69:34–40.
- Martinat-Botte F, Bariteau F, Forgerit Y, Macar C, Poirier P, Terqui M. Synchronization of estrus in gilts with altrenogest: effects on ovulation rate and foetal survival. *Anim Reprod Sci.* 1995;39:267–274.
- Lofstedt RM, Patel JH. Evaluation of the ability of altrenogest to control the equine estrous cycle. *JAVMA.* 1989;194:361–364.
- Sirois J, Fortune JE. Lengthening the bovine estrous cycle with low levels of exogenous progesterone: A model for studying ovarian follicular dominance. *Endocrinology.* 1990;127:916–925.
- Stock AE, Fortune JE. Ovarian follicular dominance in cattle: relationship between prolonged growth of the ovulatory follicle and endocrine parameters. *Endocrinology.* 1993;132:1108–1114.
- Kinder JE, Kojima FN, Bergfeld EG, Wehrman ME, Fike KE. Progesterin and estrogen regulation of pulsatile LH release and development of persistent ovarian follicles in cattle. *J Anim Sci.* 1996;74:1424–1440.
- Flynn JD, Duffy P, Boland MP, Evans ACO. Progestagen synchronization in the absence of a corpus luteum results in the ovulation of a persistent follicle in cyclic ewe lambs. *Anim Reprod Sci.* 2000;62:285–296.
- Garcia-Ispuerto I, Roselló MA, De Rensis F, López-Gatius F. A five-day progesterone plus eCG-based fixed-time AI protocol improves fertility over spontaneous estrus in high-producing dairy cows under heat stress. *J Reprod Dev.* 2013;59:544–548.
- Re G, Badino P, Novelli A, Vallisneri A, Girardi C. Specific binding of DL-cloprostenol and D-cloprostenol to PGF₂ α receptors in bovine corpus luteum and myometrial membranes. *J Vet Pharmacol Ther.* 1994;17:455–458.
- Knauer MT, Cassady JP, Newcom DW, See MT. Estimates of variance components for genetic correlations among swine estrus traits. *J Anim Sci.* 2010;88:2913–2919.
- Stevenson JS, Davis DL. Estrous synchronization and fertility in gilts after 14- or 18-day feeding of altrenogest beginning at estrus or diestrus. *J Anim Sci.* 1982;55:119–123.
- Estienne MJ, Harper AF. Case study: Synchronization of estrus and fertility in gilts administered P.G. 600 after treatment with Regumate for 14 or 18 days. *Prof Anim Scientist.* 2002;18:158–161.

