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Time of ovulation and reproductive performance over three parities after treatment of primiparous sows with PG600

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Abstract

Primiparous sows from a commercial pig farm in central Brazil were utilized to investigate the effect of post-weaning gonadotrophins (given during summer) on estrus, time of ovulation and reproductive performance over three parities. One group of sows (PG600) was treated with a combination of 400 IU equine chorionic gonadotrophin (eCG) + 200 IU human chorionic gonadotrophin (hCG) (PG600) 24 h after weaning ($n = 420$), whereas the control group received saline ($n = 408$). In a subset of sows ($n = 150$), estrus was detected and time of ovulation was determined by transcutaneous ultrasound. Treatment with PG600 increased the percentage of primiparous sows in estrus within 10 days after weaning (94.8% versus 79.7%) and reduced the first weaning-to-estrus interval (5.3 days versus 8.0 days) relative to control sows ($P < 0.05$). Although the duration of estrus was longer ($P < 0.05$) in sows given PG600 (65.7 h versus 61.0 h), the interval from estrus to ovulation was not different ($P > 0.05$) between PG600 and control sows (46.6 h versus 43.3 h). Treatment with PG600 did not affect ($P > 0.05$) rates of return-to-estrus and farrowing over three parities, but it increased the number of total piglets born ($P < 0.05$) in the second parity (11.2 versus 10.4), thereby minimizing the magnitude of second-litter syndrome. Culling rates from the first to the fourth parity were 26.7 and 24.5% ($P > 0.05$) for PG600 and control sows, respectively. In conclusion, PG600 given 24 h after the first weaning reduced the weaning-to-estrus interval and increased the size of the second litter.

Keywords: Gonadotrophins; PG600; Primiparous sows; Second-litter syndrome; Pigs

1. Introduction

Post-weaning anestrus is a major cause of reproductive failure. Several factors influence the ability of the female to return to estrus following weaning, including parity, season, genotype, lactation length, feed intake during lactation, litter size and boar exposure [1]. An extended weaning-to-estrus interval (WEI) in primiparous sows is also a common cause of increased non-productive days, which substantially increases costs [2]. The WEI is longer in primiparous sows and during summer and early fall [3,4]. Since primiparous sows have the highest risk of a prolonged WEI, they are good

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candidates to be treated with estrus-stimulating hormones, e.g. PG600 [5].

The duration and variability in the WEI are primary constraints to achieving breeding targets [6], leading to problems in the management of farrowing facilities. Gonadotrophins have been used to decrease the WEI and reduce the frequency of post-weaning anestrus [7], particularly in females predisposed to a longer WEI. Treatment with PG600, a combination of equine chorionic gonadotrophin (eCG) and human chorionic gonadotrophin (hCG), induced a fertile estrus in multiparous sows [8] or in primiparous sows, which are more susceptible to a prolonged WEI [2]. However, responsiveness to this combination can vary among herds and production systems [8]. Furthermore, there are limited studies regarding the duration of estrus, time of ovulation [9] and lifetime productivity in swine given PG600.

The reduction in the number of piglets in second litter compared to first litter, the second-litter syndrome, is another problem of primiparous sows [10]. The low second litter size is probably caused by a low ovulation rate or an increased embryonic mortality [5], which can be related to the high susceptibility of primiparous sows to weight loss during lactation [11]. There was a reduction of at least one piglet in the second litter size in 55 and 60% of sows in two herds from the central and south regions of Brazil, respectively [12,13].

The objective of this study was to investigate the effect of PG600 (given 24 h after weaning in primiparous sows) on WEI, duration of estrus and time of ovulation. Farrowing rate, litter size and culling rate were also evaluated (to Parity 4) to verify the effects of this treatment on lifetime productivity.

2. Materials and methods

2.1. Animals and facilities

This study was carried out in a commercial pig farm located in Mato Grosso State, in central Brazil. This farm had an inventory of 5800 Camborough 22® (Pig Improvement Company International Group, Fyfield, Oxon, England) females. The primiparous sows used in this study had an average lactation length of 18 days (range, 16–21 days) and a body condition score that ranged from 2 to 4 (scale of 1–5). Those with <7 piglets and with any apparently lesions were also excluded. The sows were kept in individual crates with a partly slatted floor until the last third of pregnancy when they were moved to collective pens with a space allowance of 2.0–2.5 m^2 per sow. Sows were transferred to farrowing rooms, approximately 1 week before the predicted farrowing date, where they were housed in individual farrowing crates.

Temperature was measured (with a mercury-in-glass thermometer) at approximately 10:00 each day inside the building where sows were weaned and submitted to the treatments. Minimum and maximum temperatures were also recorded.

2.2. Treatments

On the day of weaning, primiparous sows were ranked according to their lactation length, number of piglets born in the first parity and body condition score, to be uniformly distributed between treatments. They were then randomly assigned to one of two treatments. One group (PG600) of sows ($n = 420$) was treated (5 mL given SC) with a combination of 400 IU eCG + 200 IU hCG (PG600®; Intervet, Boxmeer, The Netherlands), 24 h after weaning. Sows in the control group ($n = 408$) were treated with 5 mL of saline solution.

2.3. Estrus and time of ovulation

Sows were placed in individual crates after weaning and detection of estrus (back pressure test) was performed twice daily (12-h intervals) with the aid of a sexually mature boar. The WEI was calculated as the interval between weaning and the onset of estrus. Duration of estrus and time of ovulation were determined in 150 females (PG600 = 75; control = 75). In these females, estrus detection was performed thrice daily (8-h intervals). The onset of estrus was calculated as the moment at which the sow first showed a standing response to the back pressure test, minus half the interval to the previous assessment. The end of estrus was calculated as the moment at which the female no longer showed a standing response to the back pressure test, minus half the interval to the previous assessment. To determine the time of ovulation, starting at the onset of standing estrus, sows were examined (by a single operator) with real-time transcutaneous ultrasonography [14,15] with a 5-MHz Aloka (Aloka Co. Ltd., Mure, Mitaka-shi, Tokyo, Japan) convex linear transducer. Sows were standing (not restrained) and the probe was placed horizontally on the right inguinal region just dorsal to the last pair of teats, cranial to the hind leg. Ovaries were located using the bladder as a reference. Ovulation was defined as complete when large follicle numbers were noticeably reduced from the previous observation and ≤ 4 large follicles remained [16]. The time of ovulation was considered as the first time that