A study on reproductive efficiency of artificial inseminations in swine with PRIMX cell and NBSE diluted boar semen with natural and synchronized estrus

N Vamshikrishna Reddy, K Muralimohan, K Ramchandra Reddy and C Latha

Abstract

The two main objectives of the present study were a) To compare fertility results of artificial insemination performed with liquid boar semen diluted in PRIMXcell and NBSE extenders. b) To study the efficacy of PGF2α (175 µg D-Cloprostenol) for synchronization of estrus in seasonal infertile pigs.

Introduction

Prolonging the storage time of semen without compromising reproductive performance could increase the economic benefit and production efficiency, which makes the choice of extender a major focus of concern for the swine-breeding industry \[6\]. The fertility of liquid boar semen decreases with duration of storage \[1\] and is associated with a reduced ability of sperm to bind with oviductal epithelium \[17\]. However, in pig production systems where all semen is used within 2-3 days, short-term extenders are as good as expensive long term extenders \[7\]. NBSE was the first short term porcine semen extender to be prepared and filed for patent in Indian subcontinent. Hence it was proposed to investigate the reproductive performance of swine with NBSE extended semen with natural and synchronized estrus.

Major problem associated with summer infertility is a higher number of sows not returning to estrus after weaning during the summer months \[10\]. It is proposed that LH is reduced during summer-fall period \[10\]. These changes in LH secretion may explain, at least partially, the prolonged weaning to oestrus interval as well as the reduced fertility in sows mated during the low fertility season \[12\]. The injection of 5mg of PGF2α into the vulvar lips at insemination is an effective method of compensating for the low fertility together with the decreased fertility of the summer months \[11\]. The injection of D-cloprostenol (37.5 µg) in 0.5ml through the vulvar lips at weaning and at insemination is an effective method to increase the reproductive performance of swine herds during the low fertility season \[12\]. The effective therapeutic dose of D-cloprostenol for induction of farrowing in pigs is 175 µg \[9\]. Hormonal preparations like PG 600 are restricted to certain nations and are expensive. Hence, in the present study PGF2α was selected for estrus synchronization as they are economical and are available worldwide.

Materials and methods:

The study was performed in an intensively managed piggery at Instructional Livestock Farm Complex, College of Veterinary Science, Hyderabad and at a private farm in Mahabubnagar, Telangana, India. Experimental animals consisted of LWY cross breed or local pigs. Water was provided ad libitum and 2.5 - 3 kg well balanced ration was provided per animal per day. A total of 32 non-pregnant, healthy crossbred sows (75% LWY x 25% local) irrespective of parity were selected and randomly divided into two groups: group 1 (12 animals observed for...
natural estrus) and group 2 (20 seasonal anestrus pigs treated for estrus synchronization). The seasonal anestrus sows treated with 175 µg of D-Cloprostenol (VETMATE™) intramuscularly irrespective of the day of oestrus cycle. The animals in group 1 and group 2 (which responded for PGF2α treatment) were further divided into two sub groups equally based on the semen diluents used - PRIMXcell (IMV, France) and NBSE – Normal Boar Semen extender (ICAR CCARI, Goa, India). Three LWY cross breds boars were trained for semen collection using a stainless steel dummy sow and semen was collected by “Double hand gloved method” twice a week from each boar. Ejaculates having thick consistency, rapid wave motion, > 70% motility, ≥ 85% normal sperm morphology and concentration > 25 to 65×10⁷ sperm/ml were used for AI. Semen was extended with a dosage of 3x10⁹ sperm cells in 60 ml volume and was utilised within 24 hours after collection.

Pigs were checked twice daily for estrus behaviour and cervical artificial insemination was performed twice in pigs using golden pig catheter (IMV, France), at 12 & 24 h after standing heat was detected in the presence of a boar. Pregnancy was diagnosed 30 days after AI was done with ultrasound scanner (Aloka, Japan) using 5 MHz transabdominal probe to determine conception rate. The estrus response was noted as percentage of sows showing estrus after treatment and duration of estrus was observed as the period between onset and end of estrus signs. The conception rate, expressed as the ratio of number of sows positive for pregnancy to the number of sows inseminated, litter size was recorded as total number of piglets born alive, birth weight per piglet was calculated as individual weight of piglet. The estrus response, duration of estrus, litter size, and birth weight per piglet was analysed by t-test using compare means procedure of IBM SPSS Statistics version 21. (2012), conception rate was analysed by using the chi-square test.

Results and Discussion
The results of the present study were represented in Table 1 and Table 2, which indicate that the seasonal anestrus pigs could be successfully synchronized using 175 µg D-Cloprostenol. At the same time it was concluded that AI can be performed using NBSE and PRIMXcell diluted semen with cloprostenol. At the same time it was concluded that AI can be successfully synchronized using 175 µg D-Cloprostenol. The seasonal anestrus pigs were reported [13, 9]. The estrus response rate after PGF2α treatment of sows might be due to treatment of animals in the unknown stage of spontaneous estrous cycle [14, 4].

Use of AI doses older than 12–24 h following extension of the semen may lead to fertility losses, particularly in terms of litter size [3]. Hence, eighty-five percent of all inseminations are conducted on the day of collection or on the following day [8].

### Table 1: Fertility results of artificially inseminated pigs with PRIMXcell and NBSE with natural and synchronized estrus

<table>
<thead>
<tr>
<th>Diluents</th>
<th>PRIMXcell</th>
<th>NBSE</th>
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<tbody>
<tr>
<td>Conception rate (%)</td>
<td>66.66% (6/9)</td>
<td>75.00% (9/12)</td>
</tr>
<tr>
<td>Litter size (n)</td>
<td>8.50 ± 0.85</td>
<td>8.00 ± 0.95</td>
</tr>
<tr>
<td>Litter size at weaning (n)</td>
<td>7.19 ± 0.91</td>
<td>6.75 ± 0.90</td>
</tr>
<tr>
<td>Birth weight per piglet (kg)</td>
<td>8.10 ± 0.55</td>
<td>7.68 ± 0.74</td>
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</tbody>
</table>

### Table 2: Different fertility parameters noted for synchronized estrus in pigs during summer with single intramuscular injection of 175 µg D-cloprostenol.

<table>
<thead>
<tr>
<th>Fertility parameters recorded</th>
<th>Estrus response rate (%)</th>
<th>60 (12/20)</th>
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<tbody>
<tr>
<td>Animals with high estrus intensity (%)</td>
<td>25 (5/20)</td>
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</tr>
<tr>
<td>Animals with low estrus intensity (%)</td>
<td>35 (7/20)</td>
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<tr>
<td>Onset of estrus (days)</td>
<td>3.75±0.44</td>
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<tr>
<td>Duration of estrus (h)</td>
<td>42.00±1.80</td>
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</tr>
<tr>
<td>Conception rate (%)</td>
<td>41.25</td>
<td></td>
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<tr>
<td>Litter size (n)</td>
<td>6.83</td>
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In summary artificial insemination with both the diluents has shown to be beneficial for efficient utilisation of a breeding boar, as acceptable conception rate, litter size at birth and weaning, litter weight at birth and weaning were noticed. Also good estrus response rate was noticed with cloprostenol synchronised estrus. However further studies are addressed with larger herds to know the efficiency of cloprostenol synchronised estrus and also to know the efficiency of the newly launched semen diluents. AI of swine in the Indian subcontinent is very rare and so this experiment was designed to study the beneficial effects of AI. The lower performance of AI in field condition most likely to be due to the failure in maintaining of correct temperature while storage and transportation [9]. Hence, extenders which could preserve the semen at low temperature (5 °C) and ultra low temperature (cryopreservation) without effecting conception rate and litter size are needed to address the successful spread of AI under field conditions in India.

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Reference