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A retrospective study on effects of storage time of liquid boar semen on reproductive performance in Norwegian swine

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Abstract

The objective of this retrospective field study was to determine the effects of storing, for up to 62 h, heterospermic and homospermic semen in the short-term extender Beltsville thawing solution (BTS), on reproductive performance in Norwegian swine of four different breed combinations. The study was based on fertility records after single or double inseminations with semen collected at an AI station in Norway from January 1998 to June 2001. Increasing the duration of storage of homospermic semen, but not heterospermic semen, from an interval of 4–14 h to an interval of 52–62 h, was associated with a 0.5 piglet reduction in litter size. There were differences in reproductive performance among breed combinations that appeared to be associated with duration of semen

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storage. In conclusion, prolonged semen storage decreased reproductive performance; the extent varied among breeds and was prevented by the use of heterospermic versus homospermic semen.

Keywords: Liquid boar semen; Storage time; Homospermic semen; Heterospermic semen; Reproductive performance

1. Introduction

The effect of storage time of boar semen in a liquid state at 15–20 °C has been investigated in several studies of reproductive performance in swine [1,2]. The storage tolerance of spermatozoa, without noticeable decrease in quality, depends, among other factors, on the choice of extender [3]. In some studies, the short-term extender Beltsville thawing solution (BTS) had no negative effect on in vivo fertility after storage for 3 days [4,5]. The maximum recommended storage time of semen is associated with the dilution level and the number of spermatozoa in the artificial insemination (AI) dose [2]. The threshold number of spermatozoa for optimum fertility depends upon the individual male [6] and semen quality [7]. Increasing the number of spermatozoa per dose can reduce the loss of fertilizing capability associated with storage. Both Johnson et al. [8] and Machaty et al. [9] found that doubling the number of boar spermatozoa (to 6.0×10^9 per AI dose) prevented the decline in fertility associated with storage for up to 4 days. However, this approach was costly, as it reduced by half the total number of AI doses per ejaculate.

Mixing semen from several boars (i.e. heterospermic semen) in the same AI dose may increase the reproductive performance compared to the use of semen from only one boar (i.e. homospermic semen) [10–12]. Heterospermic semen might be beneficial because it encourages sperm competition, i.e. spermatozoa from different males compete in fertilization success [13], thus increasing the probability that high viability spermatozoa will fertilize ova. Considerable individual variation in in vitro semen storage tolerance have been reported by the Norwegian swine breeding industry [14–16], suggesting that heterospermic semen may be beneficial for maintaining satisfactory fertility for stored semen. Martin Rillo [17] reported that the use of boars with good semen quality could prevent the decline in fertility associated with storage. Whether semen from males of different breeds varies in storage tolerance has not been well studied.

Some field studies have shown higher reproductive performance in sows after double insemination versus single insemination [18,19]. The beneficial effect of double inseminations on reproductive performance might have masked the effect of storage time in earlier studies. Alexopoulos et al. [4] found that AI doses of 3.0×10^9 spermatozoa diluted in BTS could be stored for 72 h without any negative effect on fertility. In contrast, Johnson et al. [8], using the same dose and extender, reported that the farrowing rate for semen stored for 21–30 h was superior to that of semen stored for 69–78 h. However, it was noteworthy that Alexopoulos et al. [4] used double insemination and crossbred boars, while Johnson et al. [8] used single insemination and purebred boars.