RESEARCH ABSTRACT
ANIMAL SCIENCE

Title: *"Evaluation of contributions to seasonal reproductive inefficiency."* **NPB #14-052**

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Scientific Abstract

The objective of the current study was to evaluate quality of semen collected from June (spring), August (summer), or January (winter) and either stored and used as cooled-extended (ExT) or cryopreserved (FrZ) for breeding gilts in summer (August) or winter (January). Semen quality evaluation included: % motile, % viable sperm, and Fourier Harmonic Analysis (FHA) of sperm nuclear shape resulting in harmonic amplitudes 0–5 (HA0-5). Six boars were selected for breeding by least- and most- absolute nuclear shape change between June and August collections. Gilts were artificially inseminated 1x following synchronization in August or January with one of three semen types (August ExT or January ExT, August FrZ, and June FrZ). An additional control group of females (CC) was artificially inseminated following natural heat detection and 2x insemination with ExT semen. Fertility rates tended ($P \leq 0.10$) to be greater in gilts inseminated with 1) least HA change semen, 2) semen collected in cooler months (i.e. spring or winter), or 3) if semen was cooled-extended (ExT) versus cryopreserved (FrZ). Largest litters ($P \leq 0.05$) were observed in CC females bred with semen having most HA change whilst smallest litters were in gilts bred with least HA change, and August FrZ semen at the August breeding event ($P \leq 0.05$). Fetal weights and placental weights were significant ($P < 0.05$) by semen collection time x semen storage x HA change x breeding season. Relative ribosomal protein L8 transcript from motile-rich sperm tended ($P = 0.0521$) to be increased in samples collected in June and cryopreserved in comparison to June collected, cooled-extended or August collected, cryopreserved. Relative lectin, galactoside-binding, soluble, 3 transcript tended ($P = 0.0551$) to be greater from June collected sperm in contrast to August collected sperm. Methylation (5-methylcytosine; 5mC) and hydroxymethylation (5-hydroxymethylcytosine; 5hmC) activity in fetal liver and placenta was measured to estimate gene transcription activity as influenced by epigenetic factors. Fetal livers tended ($P \leq 0.0863$) to have increased 5mC:5hmC when derived from FrZ semen in comparison to ExT semen (18.6 ± 2.61 and 12.0 ± 2.70, respectively) or summer breedings versus winter breedings (20.4 ± 3.03 and 10.1 ± 2.63, respectively). In contrast, placentas derived from summer breedings had reduced 5mC:5hmC versus winter breedings (4.7 ± 0.70 and 1.2 ± 0.74, respectively). The findings in the current study support the occurrence of factors contributing to seasonal infertility even in the absence of extreme heat. Of great interest, male and female components may contribute to epigenetic actions influencing piglet gene transcription.