RESEARCH ABSTRACT
ANIMAL SCIENCE

Title: Effects of melatonin feeding before and following breeding in mature gilts and primiparous sows to reduce failures in estrus expression and pregnancy establishment associated with seasonal infertility in summer and fall **– NPB #14-081**

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Scientific Abstract:

Effects of feeding melatonin during proestrus and early gestation in gilts and P1 sows to minimize the effects of seasonal infertility

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Seasonal infertility is associated with heat stress and changing photoperiod in summer and fall and is thought to be the cause of delayed puberty, increased wean to estrus interval, pregnancy failure, and reduced litter size. Research suggests that changing photoperiod determines the seasonality of reproduction by modulation of the function of hypothalamic-pituitary axis and ovary. The aim of this study was to determine if extending the duration of the nighttime increase in melatonin during summer and early fall would reduce the incidence of seasonal infertility. Gilts and parity 1 (P1) sows were given oral melatonin once daily beginning in proestrus and extending into early gestation, coinciding with the periods of the follicular phase, corpus luteum formation, pregnancy recognition and embryo survival. The experiment (Expt.) was conducted at a 6,500 sow, breed to wean farm in Illinois, USA. Expt. 1a and 1b were performed in 12 sequential replicates from Jun to Sep. In Expt. 1a, only gilts (n=420) that had expressed a second heat-no-serve (HNS), were assigned by weight to receive either Melatonin (MEL, 3 mg once daily) or Control (CON) in a syrup solution at 1400 h for 3 wk starting 1 wk before insemination. In Expt. 1b, P1 sows (n=470) were randomly assigned by lactation length and backfat to receive treatment for 3 wk starting approximately 1 wk before estrus expression after weaning. Data were subjected to ANOVA with binary responses variables analyzed using PROC GENMOD and continuous response measures analyzed using PROC MIXED for the main effects of treatment, season and their interaction using SAS 9.4. Season was classified in sequential 4 wk intervals as mid-summer, late summer, and early fall. In Expt. 1a there was no effect of treatment (P>0.10) on age at HNS (203 d) and cycle length (22.6 d). However, there was an effect of treatment and season (P=0.03) for number of follicles (MEL 14.6 and CON 13.1) but only an effect of season (P< 0.005) for gilts expressing estrus within 23 d after HNS (mid-summer (61.3%), late summer (74.9%) and early fall (80.3%)). There was

no effect of treatment or season (P>0.10) on return to estrus (RE, 9.2%), conception rate (CR, 84.5%), farrowing rate (FR, 80.0%), total born (TB, 13.6) or born alive (12.8). In Expt. 1b, MEL treatment did not affect follicle number (15.4) and wean to estrus interval (8.2 d), however there was an effect of treatment (P=0.03) on females expressing estrus within 7 days for MEL (73.5%) compared to CON (82.0%). Season did affect (P=0.002) follicle number and RE (14.6%) following P1 insemination (P=0.0003) with mid-summer (24.6%) higher than late summer (11.6%) and early fall (7.5%). There was no effect of treatment on CR (88.3%) and FR (83.0%), but there was an effect of season (P=0.001), with mid-summer (73.6%) lower than the other seasons (late summer 85.9% and early fall 89.5%). Total born was not affected (P>0.10) by treatment or season (13.0). In conclusion, seasonal effects were apparent for gilt follicle development and estrus expression and for P1 sows on return to estrus following breeding. In gilts, MEL increased follicle number but without effect on fertility. In P1 sows, MEL reduced estrus expression within 7 d after weaning. These results suggest that the dose and duration of MEL treatment may interact with the physiological status of the female to have positive or negative effects on reproduction.