

## ANIMAL SCIENCE

**Title:** Practical evaluation of linoleic acid and antioxidant supplementation for lactating sows housed under high ambient temperatures – NPB #15-071

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### Scientific Abstract:

Heat stress imposes significant challenges to lactating sows, including decreased feed intake and impaired reproductive performance. Linoleic acid, as a precursor of eicosanoids, has been shown to improve subsequent reproduction of sows. High producing lactating sows are under oxidative stress, and the use of antioxidants could ameliorate adverse effects associated with it. The purpose of the current study was to determine and verify the impact of linoleic acid supplementation on reproductive performance of sows under practical field conditions and evaluate the impact of commercial antioxidants on oxidative stress markers and sow performance. A total of 605 sows entered the farrowing room and finished lactation in groups of 22 to 24 sows per group. Sows were allotted to a RCBD balanced by parity and assigned within groups to 4 dietary treatments, in a 2 x 2 factorial design. Factors consisted of levels of linoleic acid (LA; 1.4 or 3.3%) and antioxidant supplementation (0 or 0.1%). The first 14 groups (n = 313 sows) of sows were used to assess sow and litter performance during lactation. Milk and blood samples were collected from 16 sows per treatment prior to weaning for oxidative stress status assessment. Sow BW change and ADFI was not affected by dietary treatments. Sow BW at 21 d of lactation tended ( $P=0.09$ ) to be higher for mature sows consuming 1.4% LA than other treatments. Sow G:F was improved ( $P=0.03$ ) by 6% in sows consuming 1.4% rather than 3.3% LA in their diets. Mature (parity 3 and over) sows had higher BW and lower BW loss (change) at d 21 of lactation ( $P<0.001$ ). Mature sows consumed ( $P<0.001$ ) more feed and had lower feed efficiency than young (parity 1 and 2) sows at d 21 of lactation. Litter performance, number of pigs weaned and pre-wean mortality were not affected by dietary treatment or parity group. Total antioxidant capacity in sow serum was 9% higher ( $P=0.02$ ) and protein carbonyls tended ( $P=0.07$ ) to be 5% lower in sows fed 1.4% LA compared to sows fed 3.3% LA. Concentrations of MDA increased 20% in sows fed 1.4% LA compared to 3.3% and tended ( $P=0.05$ ) to be higher in mature sows compared to young sows. Serum 8OHdG increased ( $P<0.01$ ) 28% in mature sows compared to young sows. Vitamin E concentrations in serum were highest in mature sows fed 1.4% LA compared to other treatments (LA x parity group interaction,  $P<0.01$ ). Antioxidant supplementation tended ( $P=0.07$ ) to increase serum vitamin E by 13% compared to dietary treatments without antioxidant. Vitamin E was 17% higher ( $P<0.01$ ) in milk from sows fed 1.4% LA. All 27 groups (n=603) of sows were used to measure subsequent reproductive performance. Wean-to-estrus interval was not affected by dietary treatment, but young sows came into estrus almost one day earlier than mature sows ( $P<0.001$ ). Percentage of sows bred, returns and wean-to-farrow interval were not affected by dietary treatment, parity group or their interactions. Farrowing rate

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tended ( $P=0.07$ ) to be higher in mature sows fed 3.3% LA with antioxidant than in young sows fed the same dietary treatment (93.4 vs. 82.0%, respectively). Culling rate was 11 percentage points higher in young sows fed 3.3% LA with antioxidant than in mature sows fed the same diet and young sows fed tallow with antioxidant (antioxidant x LA x parity group interaction,  $P<0.02$ ). Number of pigs born alive was not affected by diet or parity group, but total number of pigs born tended ( $P=0.08$ ) to increase in mature sows fed 3.3% LA with antioxidant compared to young sows fed the same diet. Supplementation of antioxidant during lactation did not improve oxidative stress status of sows, nor did it affect performance of sows and litters during lactation or sow subsequent reproductive cycle. Furthermore, inclusion of 3.3% linoleic acid in lactation diets did not improve performance during lactation or subsequent reproductive performance of sows.