

## **Proposal 12-09**

### **Ontario Pork Research Proposal Final Report**

**Project Leader:** Robert Friendship

**Project Title:** Vitamin D<sub>3</sub> supplementation in suckling and weaned piglets

#### **Introduction:**

Vitamin D is a fat soluble vitamin that can be absorbed in the diet or produced endogenously following exposure of the skin to UV radiation (sunshine). Piglets are naturally born with low serum concentrations of vitamin D which may predispose them to vitamin D deficiency (Horst and Littledike, 1982). Indoor rearing of sows and their piglets with limited exposure to natural sunlight, coupled with the fact that sow milk contains very low levels of vitamin D, makes it necessary to supply vitamin D to pigs via the diet (Littledike and Goff, 1987). The amount of creep feed that is ingested by the nursing piglet is highly variable and subsequently vitamin D levels in weaned pigs tend to be highly variable (Witschi *et al.*, 2011). Vitamin D deficiency has also been associated with immune-mediated diseases in humans and it has been suggested that low levels of serum vitamin D may predispose commercial piglets to suboptimal post-weaning performance and health. This has resulted in the adoption of routine supplementation with vitamin D in nursing or weaned piglets with the goal to improve average daily gain (ADG) and post-weaning health (Tousignant *et al.*, 2013).

#### **The objectives of this study were:**

1. To determine the association between sera vitamin D<sub>3</sub> concentrations in vitamin D<sub>3</sub> supplemented piglets vs. non-supplemented piglets.
2. To determine the association between ADG, morbidity, and mortality outcomes in vitamin D<sub>3</sub> supplemented piglets vs. non-supplemented piglets.

#### **Brief Summary of Research Results:**

**Farm 1:** A total of 110 piglets, from a commercial farm in Ontario, were randomly assigned to 1 of 2 treatment groups at 1-5 days of age. Group 1 (n = 53) was administered 1 ml of vitamin D<sub>3</sub> (Hydro-Vit D3®) orally and group 2 (n=57) was administered 1 mL of an oral strawberry syrup (placebo). Serum levels of 25 hydroxy-vitamin D<sub>3</sub> were determined for each piglet prior to treatment and again 23 days later.

Serum concentration levels (ng/mL) of 25 hydroxy-vitamin D<sub>3</sub> in the supplemented group (23.29±12.06) were higher than the control group (8.01±5.91) 23 days after administration ( $P<0.05$ ).

**Farm 2:** One hundred and eighteen piglets, from the same batch of a commercial farm in Ontario, experiencing high post-weaning morbidity, were individually identified and randomly assigned to 1 of 2 treatment groups at weaning (range 19-24 days of age). Group 1 (n=60) was administered 1 ml of vitamin D (Hydro-Vit D3®) orally and group 2 (n=58) was administered 1 mL of an oral strawberry syrup placebo. The investigators were blinded to the treatment groups. Piglets were individually weighed, and serum samples were taken to determine 25 hydroxy-vitamin D<sub>3</sub> concentrations at weaning and again 28 days later. Observations were recorded daily for morbidity and mortality outcomes.

Serum concentration levels (ng/mL) of 25 hydroxy-vitamin D<sub>3</sub> in the supplemented group (22.34±6.01) were higher than the control group (18.68±3.99) 28 days after administration of Hydro-Vit D3® ( $P<0.01$ ). However, using multilevel linear regression, there was no significant difference in ADG ( $P=0.581$ ) 28 days post-weaning between the two groups. There was also no significant difference, using multilevel logistic regression, in morbidity (OR = 0.71,  $P=0.451$ ) or mortality (OR 0.75,  $P=0.709$ ) outcomes between the two groups.

**Farm 3:** A total of 1950 piglets, from 3 different batches (650 piglets per batch) of a commercial farm in Ontario, experiencing high post-weaning morbidity, were randomly assigned to 1 of 2 treatment groups at weaning (range 17-24 days of age). The piglets were grouped by pen. All piglets in group 1 (n = 28 pens) were administered 1 ml of vitamin D (Hydro-Vit D3®) orally and all piglets in group 2 (n=28 pens) were administered 1 mL of an oral strawberry syrup (placebo). The investigators were blinded to the treatment groups. The number of piglets per pen ranged from 27-56. Approximately, 5 piglets from each pen were randomly selected and individually identified to have serum concentrations of vitamin D<sub>3</sub> determined prior to treatment and again 28 days later. Morbidity and mortality observations were recorded at the pen level from weaning (time of supplementation) to 28 days post weaning.

In the individually identified piglets, serum concentration levels (ng/mL) of 25 hydroxy-vitamin D<sub>3</sub> in the supplemented group (30.60±2.36, n=60 piglets) were higher than the control group (17.65±2.40, n=60 piglets) 28 days after administration ( $P<0.05$ ). However, using multilevel logistic regression (at the pen level), there was no significant difference in morbidity (OR=0.67,  $P=0.438$ ) or mortality (OR=1.66,  $P=0.523$ ) outcome between supplemented and non-supplemented pens.

## **Conclusions:**

This study demonstrated that the oral supplementation of piglets with 1 ml of Hydro-Vit D<sub>3</sub>® at 1-5 days of age or at weaning (17-24 days of age) resulted in significantly higher average serum vitamin D<sub>3</sub> concentrations when compared to non-supplemented piglets. However, piglets with a higher serum concentration of vitamin D<sub>3</sub> did not demonstrate improved ADGs or decreased morbidity or mortality outcomes.

The results of this study do not support the routine supplementation of Vitamin D<sub>3</sub> in piglets at weaning. However, more studies are needed to explore the optimal serum concentration levels of vitamin D<sub>3</sub> in piglets that may enhance health and growth, and what dose, frequency, and route of vitamin D<sub>3</sub> supplementation would achieve these serum concentration levels.

## **References:**

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