Increasing performance in the sow with enhanced vitamin D nutrition

As the number of nutritional feed additives increases, swine farmers are being presented with a growing host of opportunities to optimise their animal's genetic potential and productivity. Swine profitability grows when sows and gilts produce more, healthy piglets over their lifetime and this can be influenced by enhancing their diets with vitamin D_3.

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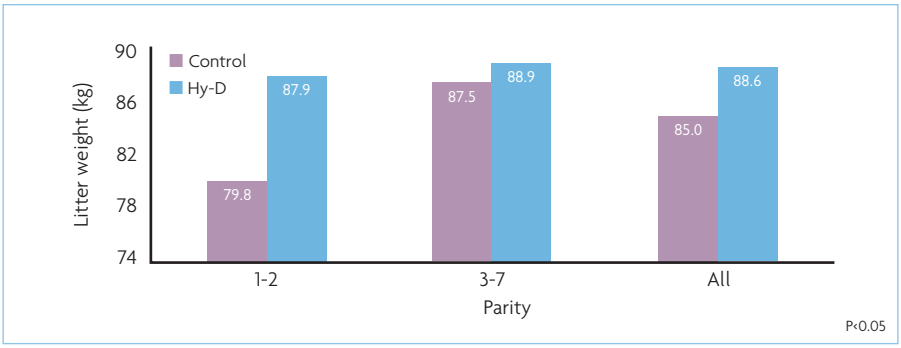

Fig. 1. Litter weight at weaning in control and Hy-D groups.

Although the role of vitamin D to support skeletal strength and bone health is widely known, farmers are increasingly turning to vitamin D_3 as a broader solution to help breeding sows achieve their full potential. Several studies have demonstrated that more durable sows not only live longer, but also produce a higher number of heavier and weaned piglets per litter. As profitability depends on optimising the lifetime output and performance of sows, these combined benefits result in higher financial returns.

Sow profitability

Sow profitability is increased when sows and gilts produce more piglets over their lifetime. This means keeping sows in the herd for more parities and producing larger litters of healthy piglets with high birth and weaning weights.

Piglets born with higher birth weights, for example, is important because they are more likely to experience higher growth performance and lower mortality pre-weaning.

To achieve their genetic potential and produce the healthiest piglets possible, hyper-prolific sows require more nutritional support, which includes vital vitamins and minerals. Vitamin D_3 is not bioactive on its own and must be metabolised to its functional form.

In a first step, the liver breaks it down to 25(OH)D_3. Then the final compound, calcitriol or 1,25(OH)2D_3 is formed in the kidneys. Sometimes though, this first step is hampered in hyper-prolific sows and vitamin D_3 is therefore not always fully transformed to its functional form.

This reduces the effective amount of the vitamin available to the animal and as a result of this, swine herds experience more leg problems, due to lower bone mineralisation, less foetal muscle development and less muscle contractions during the birth process; and consequently, lower herd performance and profitability.

For this reason, farmers are increasingly using Hy-D (25(OH)D_3) which is the bioactive metabolite of D_3 and hence more readily absorbed and utilised by the pig.

Table 1. The effect of treatment on blood content of 25(OH)D3 during lactation.

Group	Vitamin D_3	Hy-D	P-value
Sows	36	36	–
25(OH)D_3 in blood at farrowing (ng/ml)	19.7	43.6	–
25(OH)D_3 in blood approximately four days post-farrowing (ng/ml)	20.3	40.4	–
25(OH)D_3 in blood at weaning (ng/ml)	31.4	75.5	–
25(OH)D_3 in blood average of three samples per sow (ng/ml)	23.6	52.7	0.0001

Optimising vitamin D_3 availability

By introducing directly the active form of vitamin D3, 25(OH)D_3 in the sow feed, swine farmers can bypass the critical metabolic steps involved in the breakdown of standard vitamin D_3, thereby increasing its bioavailability. A recent study managed by SEGES (Danish Pig Research Center, Denmark) conducted in a commercial herd including 650 sows/year, aimed to determine whether inclusion of 50µg 25(OH)D_3 (Hy-D) per kg sow feed during the entire gestation period (corresponding to 2,000 IU vitamin D_3) might improve litter weaning weight compared to standard levels of vitamin D_3 in feed (800 IU per kg feed).

800 IU vitamin D_3 was used as a previous study demonstrated a limited effect when vitamin D_3 content was raised from 800-2,000 IU per FUsow. Furthermore, the trial aimed to assess whether daily gain and mortality, key indicators of swine profitability, were positively affected in weaners born and raised by sows given Hy-D during gestation.

Increased litter and weaning weight

Previous studies indicated that low-birth-weight piglets exhibited poorer growth

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performance, productivity and higher mortality pre-weaning, a major cause of profit loss in pig production. In this study, the greatest effects of Hy-D were seen among young sows. Results showed that litter weight was significantly higher in the Hy-D group (19.8kg compared to 18.8kg in the control group) and litter weight at weaning was 3.6kg higher compared to the group given vitamin D_3 (Fig. 1).

Litter gain was used as an indicator of the milk production in sows. As weaning weight was higher, the results indicate that Hy-D had a positive effect on reproductive efficiency by helping sows to farrow quicker, have healthier, better performing and longer living piglets. This was confirmed with the higher number of piglets weaned by the Hy-D group.

Increasing vitamin D_3 status

Achieving an optimum level of vitamin D by feeding Hy-D (the bioactive form of D_3) allows sows to reach their reproductive targets, increase their lifetime performance and thereby contribute to maximum overall farm profitability.

This study clearly demonstrated that the 25(OH)D_3 level in blood plasma was doubled in sows given Hy-D throughout their reproductive lifecycle (Table 1), compared to those receiving only vitamin D_3. This is a highly significant result considering the sows were given the equivalent dose of vitamin D_3 (2,000 IU per feed unit).

Group	Vitamin D_3	Hy-D
Sows	18	18
After two weeks (ng/ml)	15.7	35.8
After seven weeks (ng/ml)	14.4	46.7

Table 2. Effect of the treatment period on blood plasma content of 25(OH)D_3.

Table 2 further illustrates that sows given Hy-D for two weeks had a 25(OH)D_3 concentration in the blood at the time of farrowing that was 2.3 times higher compared with sows given regular vitamin D_3. Furthermore, following seven weeks of Hy-D feed supplements, sows' 25(OH)D_3 blood concentration was 46.7ng/ml, 3.2 times higher than in control sows.

A similar study in 90-day old foetuses showed an increase in vitamin D_3 status following the addition of Hy-D to gilt gestation feed when compared to using commercial vitamin D_3. The results also demonstrated a 9.3% increase in the foetuses' total number of muscle fibres – a factor that indicates healthy, strong piglets.

Furthermore, litters were larger and litter weight was also higher when gilts were given Hy-D. Further trials have also highlighted the positive effects of Hy-D on a number of other essential functions in swine including reproduction, muscle development and immune response modulation – all important factors contributing to improved performance.

Conclusion

In conclusion, significant economic value is created when feeding Hy-D as a result of enhanced sow lifetime performance and overall sow productivity. It is evident vitamin D plays a key role in breeding sow performance, sustainability and profitability as well as piglet health and growth.

Farmers are always looking for new solutions that will optimise the health and production status of hyper-prolific sows.

Recent studies strongly support the use of Hy-D for improving sow vitamin D status, which leads to increased litter numbers and viability of piglets as well as increased birth-weight and weaning-weight.

Hy-D is well proven as the most bioavailable form of vitamin D. It ensures more efficient and faster uptake of the required metabolite 25(OH)D_3, resulting in a stronger skeleton and healthier, more productive animals – the key for increased herd profitability. ■