

Improving the hatchability of broiler breeders for increased profitability

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Supplementing broiler breeder diets with a combined product that includes extra vitamin D₃ metabolite and the carotenoid canthaxanthin has given breeders a decade of improvements including uprated embryo survival, better hatchability, increased chick health and the definitive bonus of more profitable broilers.

A combination of two tried and tested feed additives offers significant advantages in bird health, welfare, meat production and therefore profitability from broiler breeding flocks.

Results from different trials reported below show improved average returns including 3.5% better hatchability and 5.6 more day-old chicks per housed hen. For the broiler offspring, studies indicate a 3.5% liveweight advantage over control at 42 days is possible, along with significantly better feed conversion ratios.

Rations for broiler breeder flocks are usually supplemented with vitamin D₃. A more efficient way is feeding the vitamin D₃ metabolite 25-OH-D₃ (trade name Rovimix Hy-D from DSM). Repeatedly demonstrated in commercial trials is the improvement this gives in overall bird health, while also boosting egg production, embryo viability and hatchability, resulting in healthy and vital chicks with high survival rates.

Regarding the performance of breeders and their offspring another effective feed additive is the

carotenoid canthaxanthin (the active component in DSM's Carophyll Red). It is one of the most potent lipid-soluble antioxidants in nature and supplementing breeding flocks with Carophyll has proved to efficiently increase the antioxidant status of tissues in semen, embryo and young chicks.

Trial results have demonstrated that embryo survival is greatly enhanced through the antioxidant function, giving significant increases in hatchability.

DSM has now developed the combination of the two additives called MaxiChick that actually offers much more than the sum of its parts.

This product combination has been tested now for more than 10 years, demonstrating an impressive series of advantages in flock health, egg hatchability and young chick viability. What's more, subsequent broiler performance is also proved to benefit through associated increased health and welfare, skeletal strength and enhanced muscle development with more saleable poultry meat, and therefore profit, at the end of the day.

Embryo development

But just how do these significant advantages occur? Well, first of all, feeding straight vitamin D₃ is less efficient because this means the bird has to process the vitamin in its liver with the enzyme 25 hydroxylase, transforming it into the more easily absorbable 25-OH-D₃ (25-hydroxycholecalciferol).

Example 2: What happens with the egg?

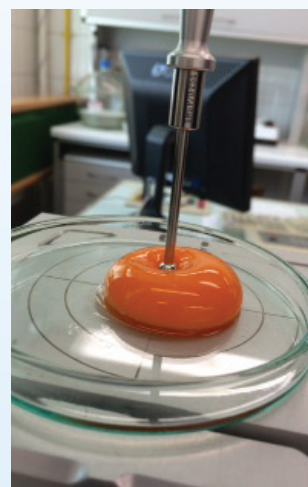
Other trials demonstrate that embryonic survival in the first 10 days of development is crucial and that an important factor in this period is the supply of Ca to the embryo via the yolk through the endodermal yolk membrane, a transfer efficiently promoted by the 25-OH-D₃ metabolite in MaxiChick.

The results emphasising this point also show clearly that vitamin D₃ on its own cannot be utilised by the embryo at this early stage. The embryo liver is not developed and therefore there is little or no 25-hydroxylase enzyme action. The vitamin D₃ metabolite, on the other hand, can be converted into its physiologically active form at this early stage. An embryo is protected from early death through the yolk vitelline membrane remaining intact during incubation.

The membrane has to be well protected against oxidation. The carotenoid canthaxanthin (along with vitamin E) is the only antioxidant present at high enough levels to fully protect the yolk membrane.

Protecting the membrane in this way appears to be increasingly important in line with the length of time fertilised eggs are stored before incubation.

Trial results prove that canthaxanthin supplementation of breeding flock feed (as with MaxiChick) increases vitelline membrane strength in stored eggs, giving increased embryo viability and hatchability.



This transformation in the liver does not always run smoothly. Efficiency can be reduced by stress conditions, or poor liver function. Offering the metabolite 25-OH-D₃ right from the start means the liver operation is by-passed, the metabolite is efficiently absorbed by the intestine, entering the blood circulation system for rapid distribution to tissues.

Using 25-OH-D₃ straight off aids absorption of the crucial minerals calcium (Ca) and phosphorus (P), too. These help ensure efficient and strong skeletal development, as well as enabling a robust eggshell. Also stimulated is the next step in this process where breeding flocks are concerned: the transfer of Ca from eggshell to embryo where the

mineral strengthens skeletal development and boosts other important aspects of embryo development.

More support for embryo growth comes from the canthaxanthin carotenoid (Carophyll Red). Out in the wild, this carotenoid is always present in bird eggs. Performance and health are boosted when it is added to the diets of domestic fowl.

Trial results continually demonstrate how this EU-approved product is efficiently transferred into the egg yolk and distributed in embryonic tissues. There, it protects the developing embryo against oxidative damage, particularly during the sensitive periods of hatching and early posthatch life. In other words, significantly improving hatchability poten-

Continued on page 9

Example 1: Reduced embryo mortality

At the Federal University of Santa Maria in Brazil, incubation efficiency was tested with fertilised eggs from Cobb 500 females. Egg age at hatching ranged from 45-65 weeks.

Results show that average embryo mortality is reduced from 5.46% where breeder hens were fed diets with only vitamin D₃ supplementation to just 3.46% where MaxiChick was included in the diet.

This represents an improvement of over 30%. High hatchability was also achieved in this trial with a significant 95.45% compared to 93.08% for eggs from the control breeding flock.

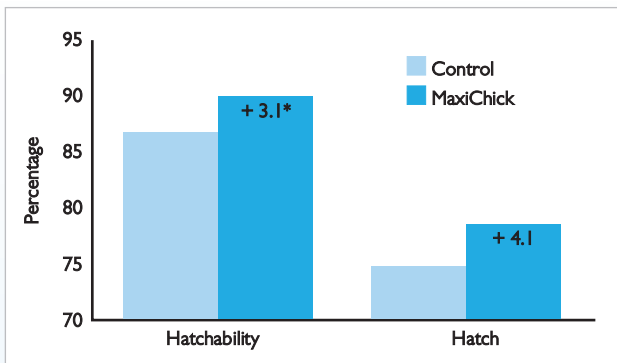


Fig. 1. The percentage increase within hatch and hatchability with the use of Control and MaxiChick (*paired T-test $P < 0.05$).

Example 3: More and better chicks

In 2014 a large scale trial was performed in Russia at Permskay Poultry Farms in the Ural region. In five Cobb breeder units the feed was supplemented with MaxiChick and the results were compared with those from a similar number of units where the birds received the usual diet (control). The supplementation resulted in 89.7% hatchability, 3.1% higher than the control. Also significant was an improvement in early embryo mortality: 1.6% versus 2.4% in the control. The number of dead embryos was reduced at 1.6% as opposed to 2% in the control.

The Russian comparison also demonstrates the clear advantage in hatching performance. The number of weak day old chicks was reduced to 1% of total hatchings against 1.3% in the control. Dead day-olds represented 2.2% against 2.8%. Overall, final hatching rate was 78% for the supplemented flocks, whereas the control just achieved 73.8%. Finally this represented 5.6 more viable day old chicks per housed breeder hen over a 24-60 day production period with a 6:1 Return on Investment (ROI).

Example 4: Increased muscle development

In a University of Sao Paulo, Brazil, study 50% of a broiler breeder flock received feed supplemented with MaxiChick with the remainder fed a control diet. Chicks were raised from three hatches at 35, 45 and 62 weeks of age. Significantly better lifetime performance was achieved by the chickens from the MaxiChick mothers. Broiler liveweight at 42 days was 2.96kg against 2.86kg. This gain is achieved with less feed, the conversion ratio being 1.66 against 1.72.

The advantages of the combined feed supplementation continued. The Sao Paulo trial produced broilers that delivered averages of 22.67% breast meat yield (against 21.59%) and 71.6% carcass yield (against 70.36%). These results clearly demonstrate the increased potential for muscle development from breeder flocks supplemented with MaxiChick.

Continued from page 7

tial. This is a particularly important point where eggs from broiler breeder flocks are stored for longer periods before hatching.

Generally, hatchability declines with length of storage, especially with older flocks. The canthaxanthin additive is a proven way of effectively reducing this decline.

Antioxidant status of the resultant bird tissues with this supplement in the diet is actually improved right through to slaughter. Starting with healthier breeding flocks, the advantages include better hatchability, healthier and faster growing chicks and then stronger and more vital broilers.

Combined, these two additives

present the poultry world with a practical and successful solution for profitable poultry meat production as depicted in the four examples.

Results from all the trials clearly demonstrate that MaxiChick offers efficiency and performance increases right through the broiler breeding and fattening sector.

A major result is significantly improved hatchability, even with fertilised eggs stored over a longer period. Finally, top performing broilers represent the conclusive evidence of the profit advantages right through the production chain. ■

References are available on request from the author