

Nutritional measures to improve chick hatchability for increased profits

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The global poultry market currently produces over 100 million tons of chicken meat annually and is steadily growing. Indeed, increasing demand is driving a 2.5% annual growth in output, with global consumption projected to reach 128 million tons by 2020. Expansion is therefore on the horizon for broiler production across the globe.

However, there also remain real opportunities to significantly increase the output of healthy broiler chicks from the breeding flock that currently exists. Producers can gain extra profits from existing units by maximising the efficiency of chicks placed per breeding hen.

Nutrition plays a central role in this objective. A growing body of scientific evidence has demonstrated that dietary supplements, such as 25-hydroxy vitamin D₃ and canthaxanthin, can significantly improve broiler breeder performance and chick hatchability – particularly when they are used in combination.

Hatchability in practice

Broiler parent breeding flock performance averages around 180 eggs per cycle for the hen, according to recent US figures from the Mississippi State University Extension Service.

However, while the hatchability objectives of major breeding companies typically stand at between 80-85%, actual figures from commercial production tell a different story.

In a major study of hatchability performance in practice, researchers from the University of Wageningen recorded the results of 511 breeder farms in the Netherlands between 2004 and 2006.

The study found average hatchability to be just 66% at the beginning of the laying period (age 25 weeks), rising to 86% between weeks 31-36, before falling to 50% at the end of the breeding cycle.

It is clear from these findings that there is substantial room for improvement. There is also no shortage of robust scientific evidence that performance can be signifi-

cantly and cost effectively increased through nutritional measures. Indeed, a convergent body of research has demonstrated the ability of various nutritional additives to optimise laying flock health and fertility, egg quality and embryo vitality, in addition to output of healthy chicks.

Increasing production

An example of such a nutritional measure is DSM's MaxiChick, which combines vitamin D metabolites such as 25 OH D₃ and the carotenoid canthaxanthin to increase the productivity and efficiency of broiler breeder performance.

Numerous studies have demonstrated the performance gains these supplements make possible when included in the diet of poultry.

Effects of 25 OH-D₃ (Hy-D)

Vitamin D₃ is critical for bone formation and poultry quality. 25-hydroxy vitamin D₃ is a metabolised form of vitamin D₃ which makes the vitamin more readily available to the laying hen.

In 25-hydroxy vitamin D₃ form, vitamin D bypasses the metabolic changes that normally take place in the bird's liver. This allows rapid and straightforward absorption from the small intestine.

The metabolite provides a variety of important benefits for hatchability. In the breeding hen, 25-hydroxy vitamin D₃ mobilises calcium for stronger eggshells, as well as encouraging the production of more eggs. Additionally, it plays an important role in boosting the immune systems of breeding birds and chicks.

Comparatively large amounts of the vitamin D₃ metabolite are also transferred straight into the eggs, aiding embryo development. This stimulates the movement of calcium from shell to embryo, boosting chick skeletal growth. Another practical advantage of this action is that the shell is weakened, making it easier for the chick to hatch.

Studies have shown that DSM's Hy-D can help achieve a 0.87% increase in broiler

breeder laying, when included in the diet from 18 weeks of age. Trials have also demonstrated the supplement's effectiveness in increasing the number of eggs fit for incubating.

This is achieved mainly through its ability to promote higher egg production and improved eggshell quality.

The canthaxanthin effect

Although carotenoids cannot be synthesised by birds, they are extremely important in the broiler breeder diet.

Carotenoids have a positive influence on the quality of eggs for incubation and also act to neutralise free radicals, which are harmful to the embryo. Increasing carotenoid concentration in chick embryos has a strong antioxidant and immunostimulatory effect, thus improving the quality of the egg for incubation.

Canthaxanthin is a particularly effective carotenoid for supporting improved hatchability. It has long been known for its pigmentation qualities, however DSM was the first company to recognise the substantial benefits it can bring to improved embryo health and fertility.

The naturally occurring antioxidant comes from plant material in feed, although seldom at levels optimal for high performance bird health.

Its particular effectiveness as an antioxidant derives from the fact that it places itself at a higher concentration in the yolk when compared to other carotenoids.

Canthaxanthin is readily absorbed in the small intestine and transported into the liver.

It is then distributed very efficiently in egg yolk and embryonic tissues, ensuring a stronger membrane and helping protect the embryo.

What's more, adding canthaxanthin to the rooster's feed formula improves egg fertility at breeding by aiding:

- Semen production.
- Sperm concentration.
- Sperm motility in roosters.
- Plasma testosterone levels.

These advantages combine with the

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boosting of hen ova antioxidant capacity for overall higher fertility in the breeder flock.

The power of vitamins C and E

Broiler breeder performance in the production of quality eggs can also be helped through supplementation of other vitamins such as vitamins C and E.

Vitamin C plays an important role in broiler breeder quality egg production. When added in a stable form, it helps support the production of strong shells, as well as breeder fertility and rooster spermatozoa function. While birds are capable of synthesising vitamin C, experience has shown that when flocks are under any sort of stress (for example by disease or high temperatures) vitamin C supplementation offers definite improvements in egg production, interior egg quality and chick vitality.

Vitamin E helps to protect the cell tissues and vital organs of the growing embryo from oxidation damage, boosting tissue integrity and membrane fluidity. It also actively decreases toxins that can destroy immune system cells and other tissues.

The embryo also uses vitamin E in the yolk to help start strong bone structure.

Combining advantages

With a commitment to supporting poultry producers in addressing key industry challenges and improving performance and efficiency levels, DSM's MaxiChick is a breakthrough in feed supplementation science. MaxiChick combines the advantages of 25-hydroxy vitamin D₃ with those of canthaxanthin to cost effectively deliver improvements in egg, embryo and chick quality. This optimised solution is the result of years of innovation and collaboration with leading research partners and has been proven in over 70 field trials across the globe. Numerous studies have demonstrated the improvements made possible by this vitamin/carotenoid blend.

Unique combination

Research conducted by the Aviculture Laboratory, Universidad de Santa Maria, Brazil in 2010 has found that chick embryo development is actively encouraged by the addition of 25-hydroxy vitamin D₃ and canthaxanthin in combination. The results demonstrate the benefits of MaxiChick supplementation to egg production, fertility and hatchability.

In the study, 80 breeders were split into two groups. Half received a supplementation of MaxiChick, with the remaining breeders acting as a control group. The two groups were inseminated one week before the egg incubation date. The breeders in the groups receiving the dual additives were

served with semen from roosters also on the same ration. Eggs were monitored over a 62-week period. During this time, egg production for the breeders on the supplemented diet averaged 68.30% against the control group's 64.79%. Fertility of the eggs produced averaged 85.67% against 83.27% and hatching percentage of fertile eggs was 86.21 compared to 82.34.

The positive effect of the dual additive solution could perhaps be best summed up through the final figures for chicks per housed hen. The group fed the supplemented diet produced 13.5% more chicks with an average 60.03, compared with 52.86 in the control group; a significant improvement potential in chick production.

The study also found that MaxiChick supplementation significantly reduced embryo mortality during the first third of the incubation period.

Rooster potency

Rooster performance with MaxiChick has been explored by the School of Animal Science and Food Engineering (FZEA) at the University of Sao Paulo, Brazil. In this study, 24 Cobb 500 roosters were divided into two groups. One group was fed a diet supplemented with Rovimix MaxiChick, and the other was provided a plain base ration. Semen was collected every 14 days and monitored for motility and vigour.

While there was little difference in those parameters in the initial breeding period (weeks 30-45) the overall performance up to week 60 demonstrated improved characteristics for the MaxiChick group in terms of sperm motility (+2.38%) and vigour (+4.68 on a 0 to 5 point system). Testosterone content was higher, and cell concentration significantly higher, for the roosters on the supplemented diet. Conversely, roosters on the control diet recorded significantly higher morphological alterations in sperm which tend to detract from fertilising efficiency (at 23.51 against 14.33%).

A proven opportunity

Growing global demand represents exciting new opportunities for poultry producers. With breeding flock performance typically falling below the objectives set by major breeding companies, there are significant opportunities for producers to cost effectively meet this demand by improving the efficiency of existing units.

A variety of academic studies have shown that the combined supplementation of Hy-D and Carophyll Red delivers significant improvements in breeder hen and rooster health and performance, as well as egg quality, fertility and hatchability. For producers, MaxiChick represents a proven solution for improving performance – and therefore profits – from the same investment in breeding stock, housing and labour. ■