Investing in the future to sustain genetic potential

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he poultry industry is faced with increasing cost prices due to increased feed prices and/or changes in legislation. As the genetic potential of breeders is still improving, the production cycle can be prolonged in an economic way to compensate partly for these higher cost prices.

Evaluation of field data from the Benelux over the past 10 years, has shown that from the genetic progress made in terms of egg production only 50% of this can be qualified as first grade hatching eggs. As production cycles are getting longer, the need to maintain or improve the egg quality after peak production will be higher.

Genetic potential

Throughout the years, Nuscience has acquired an extensive experience with Medium Chain Fatty Acids (MCFA). With the knowledge of the different effects of MCFA and their combination with other acids on metabolism and intestinal health, Nuscience was able to develop Shellbiotic specifically to sustain genetic potential.

The reproductive system consists of two

		Control	Shellbiotic
Before Shellbiotic	Week 22-58	249.6	249.5
With Shellbiotic	Week 59-85	139.9	141.8
Total	Week 22-85	389.4	391.4 = 2 extra eggs
Trial with Lohman Brown laying hens at Provincial Centre for Applied Poultry Research, Geel, Belgium			

Table 1. The effect of Shellbiotic on egg production.

parts: the ovary and the oviduct. The ovary is responsible for the number of eggs, whereas the oviduct is more responsible for the egg quality. The development of a small follicle into a mature follicle, which is ready to ovulate, takes several weeks. Therefore influencing this process would need a long term effect. On the other hand, interacting on the activities in the oviduct requires a short term effect as the albumen secretion and the shell deposition are starting and ending daily.

As breeding companies have made significant progress in terms of peak production, this progress could only be made at the expense of the time an egg can stay in the oviduct. Decades ago eggs remained in the oviduct for 25-26 hours. Currently this is reduced to less than 24 hours putting a tremendous stress on shell and albumen quality.

The balance between improving long term effects and maintaining the short term effects is easily disturbed by any kind of factor affecting the development of the breed-

ers in the rearing period and at the start of the production period.

This is also the reason why geneticists no longer prioritise peak production but emphasise laying persistency. This no longer results in faster passage rate through the oviduct leaving opportunities to improve albumen and shell quality. Shellbiotic has a long term effect on production (Table 1).

Due to the time necessary for follicles to develop from small into mature ones, the first 4-6 weeks after the start of using Shellbiotic no effect on hen day production will be noticeable. However, once the effect has started the longer the production period, the bigger the benefit will be.

More than just calcium

Today, extra attention is paid to skeleton development and skeleton strength. However it is well known from literature that breeding for better skeleton strength Continued on page 13

Fig. 1. Shellbiotic limits the typical increase in second grade eggs at the end of the laying cycle.







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indirectly results in more second grade eggs. This can be explained by the fact that the available calcium will either be used for the skeleton development or its maintenance, for the formation of the shell or in the muscular physiology. Therefore, changing emphasis in the breeding program can have indirect effects on other parameters.

In the past, a lot of research in the egg and breeder industry has been dedicated to searching for the right calcium source and the right granule size in order to improve calcium solubility and calcium absorption.

Today, these effects are well documented and generally implemented but still the problem remains. The proper calcium source and the proper granule size should always be in line with the proper feeding strategy.

Just increasing calcium and reducing phosphorous in the feed in order to minimise shell problems will not result in the desired effect if, like in broiler breeders, the feed is consumed within two hours and the absorbed calcium is not retained in the bones. The calcium cannot be used later on during the shell calcification process, but is directly excreted.

Most central in the whole calcium metabolism is the blood and blood pH. It regulates the supply and demand of calcium from/to the bones, intestines, urine and to the egg.

The 'buffering capacity' of the hen to store the calcium, and to mobilise the calcium from the bones is therefore a determining factor for shell quality.

Shell structure

The quality of the shell is, however, not only determined by the quantity of calcium in the shell but also by the structure of the shell. Research has indicated that 40% of the differences in shell quality can be explained by the organic matrix. Building a good shell is like building a good house with strong foundations. This foundation is the albumen and the surrounding membranes. The better the albumen and membrane quality the better the calcification process can continue from the homogenous distributed mammillary knobs.

It is the time available during the calcification process which determines the thickness of the palisade layer and, therefore, the major part of the thickness of the shell.

However, like constructing a house, it would not be solid if no structure and no cement were used. The same is true for the eggshell. The organic matrix links all the crystals to each other making it a solid structure. Shellbiotic is able to limit the typical increase in second grade eggs at the end of the laying cycle (Fig. 1).

Albumen quality

Albumen quality is mainly defined and expressed in Haugh units. This parameter is based on the height of the thick albumen surrounding the yolk in relation to the egg weight. The higher this value the better the quality. This albumen quality is a good indicator for the freshness of an egg and for the health of a flock. Albumen quality commonly declines during storage and with age of the bird.

Fig. 2 shows that Shellbiotic is able to limit the decrease in albumen quality during storage of hatching eggs. A high quality albumen results in a direct improvement of the calcifi-





cation process. This results in less second grade eggs (Fig. 1) and less hair cracks.

Shell quality is mainly quantified by either % shell, shell deformation, shell thickness, specific gravity of the egg, % broken eggs or by the dynamic stiffness.

The latter indicates whether or not the egg has a hair crack. Hair cracks are responsible for a higher humidity loss compared with intact eggs. This higher humidity loss results in dehydration of the embryo and an increased embryo mortality leading to a lower hatchability.

The determination of the dynamic stiffness is a newer technology, now commonly being used in breeding programs. It measures the direct quality and has, therefore, a higher heritability. With this technology the effect of the organic matrix and shell structure on the shell quality and not only indirect quantitative factors are also measured.

Field trials have shown that Shellbiotic results in fewer hair cracks and thus in less moisture loss. The improved albumen quality, together with a high shell quality, resulted in a higher hatchability percentage (Fig. 3). Next to the higher number of hatching chicks their quality is also improved. When chicks were scored using parameters like activity, feathers, navel and legs it could be concluded that the MCFA product results in higher chick qualities.

Conclusion

With the genetic evolution from past decades, combined with today's and future economic challenges, production cycles should be prolonged. This implies that the period in which the risk of producing second grade eggs is increasing. By going back to the basis of how an egg is produced, not only laying persistency can be improved using Shellbiotic but also egg quality, even when no further improvements can be made on calcium metabolism/availability.

Although both hatchability and day old chick quality are very much related to shell quality and the loss of moisture during incubation, small differences in albumen quality enlarge these differences.