Getting off on the right foot: overcoming early life challenges

Day-old chicks have to overcome many pitfalls after hatching. Examples include extended hatch windows, the stress generated by delayed access to water and feed and by various transportation times from hatcheries to commercial poultry houses.

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Besides these drawbacks of common management practices, hatchlings face the additional challenge of being physiologically immature. Their sustained growth rate during the first week contrasts with their under-developed digestive organs, reduced immune competence, and limited level of gut colonisation by commensal microbiota. They also have a relatively high daily feed intake in view of their very low body weight (close to 20% of their body weight during the first week).

A good start is therefore a determining factor for flock health and profitability, and it is critical to ensure success during this period. So how can we help hatchlings carry off this period successfully?

Nurturing the breeders for optimal day-old chick quality

Appropriate nutrition and good management practices play an undisputable role in providing young chickens with the best start.

Giving special attention to the management of breeder flocks is one of the first steps to optimise day old chick quality.

It is well established that day-old chick quality greatly influences broiler productivity, and it is important to remember that some of the factors that drive broiler performance are delineated before day-old chicks are delivered to the poultry house.

For instance, young broiler breeders tend to produce smaller eggs with a reduced amount of yolk (lipid mobilisation from the yolk sac during the first days of life may be reduced), and smaller chicks, which may result in increased levels of first week mortality. On the contrary, old broiler breeders may show an increased incidence of dirty or cracked eggs.

This can deteriorate day-old chick quality by increasing the frequency of yolk sac infections, increasing the bacterial contamination of hatching eggs, and by reducing albumen quality. Table 1 shows the effect of broiler breeder shell cracks on egg quality and day-old chick quality.

However, it is possible to support the breeder-broiler production cycle in order to have healthy breeders and give day-old chicks the best possible start.

A study was carried out in Iran to assess the effect of CLOSTAT – a patented probiotic that consists of spores of Bacillus subtilis PB6 (ATCC PTA-6737) originally coming from the gut microflora of healthy chickens – on egg quality and hatchability of broiler breeders reared under commercial conditions.

20,000 Ross 308 broiler breeder hens of 57 weeks of age were divided into two groups: a control group fed a basal diet, and a test group fed with the basal diet supplemented with CLOSTAT. Each group consisted of two similar houses of 5,000 broiler breeder hens and 420 roosters.

The addition of CLOSTAT improved eggshell quality by significantly increasing shell thickness ($P<0.05$) (Fig. 1).

As a result, a reduced percentage of cracked eggs was obtained in the group supplemented with CLOSTAT in comparison with the group fed the control diet (-0.5% at 63 weeks of age).

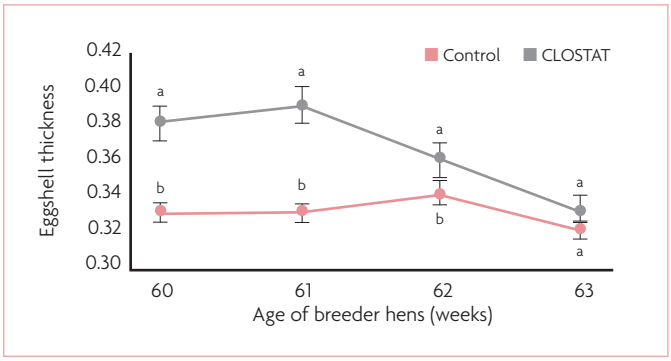

Fig. 1. Effect of CLOSTAT on eggshell thickness of broiler breeders (different superscripts indicate statistical significance, $P<0.05$, adapted from Darsi et al. 2020).

Additional results indicated that Haugh units, hatching eggs and hatchability were also significantly improved (data not shown), which altogether are in favour of the improved day-old chick quality.

Likewise, the group fed with CLOSTAT had a significantly improved faecal score (Fig. 2A) compared to the control group ($P<0.05$), which can be considered as an indicator of a balanced microflora and improved intestinal health litter quality.

The heterophil to lymphocyte (H/L) ratio, which is a stress biomarker in birds, was also significantly reduced with the addition of CLOSTAT ($P<0.05$) (Fig. 2B), indicating that the

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Table 1. Effect of hairline cracks on day-old chick quality in Ross 308 broiler breeders at 51 weeks of age (adapted from Khabisi et al. 2012).

Type of eggs	Egg weight at transfer to the hatcher (%)	Egg weight loss at transfer to the hatcher (%)	Hatchability (%)	Embryo contamination (%)	Chick weight (g)	Chick quality
Intact eggs	62.0[a]	11.4[b]	83.9[a]	2.77[b]	48.9[a]	99.52[a]
Hairline cracked eggs	53.1[b]	24.0[a]	30.0[b]	10.55[a]	45.6[b]	98.6[b]

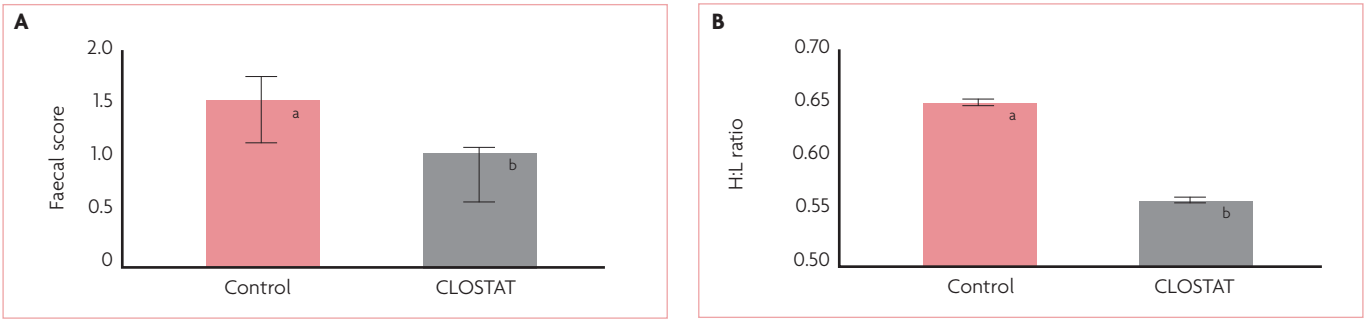

Fig. 2. Effect of CLOSTAT (1kg/t) on faecal score (A) and H:L ratio (B) of broiler breeders at 63 weeks of age (different superscripts indicate statistical significance P<0.05, adapted from Darsi et al. 2020).

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supplementation of CLOSTAT can contribute to the improvement of welfare.

Unlocking potential during the first week

As in many other species, the immune defences of young chickens have limited capabilities compared with that of adult birds. Their rather minimal immunological memory makes them vulnerable to infections and disease.

However, innate immunity, which encompasses anatomical and mucosal barriers, different cell types (heterophils, monocytes, macrophages, natural killer cells), receptors and effectors across tissues is a key tool to provide protection to young chicks. In this regard, the rapid establishment of a balanced and diverse commensal microflora not only contributes to pathogen control, but also stimulates the innate immune system of young chicks.

However, heterophils for example, have a reduced phagocytic ability and a reduced ability to kill bacteria in young chicks.

Therefore, immune system modulation is an important strategy to avoid disease and unlock potential during the first week, and it is possible to reinforce immunity with the right ingredients.

Aleta is a unique algal β-(1,3)-glucan used for immune support and derived from Euglena gracilis. Euglena gracilis β-(1,3)-glucans can bind Dectin-1 receptors found on macrophages and dendritic cells in the Gut Associated Lymphoid Tissue.

They are ingested by these immune cells which act as maestros of the immune system and are subsequently able to moderate the production of signalling molecules. They therefore act as an immune modulator, leading to a maturation of the immune system and supporting a sustained and adequate immune response.

A study was done in commercial field conditions in France to assess the effect of the in-feed supplementation of Aleta together with the supplementation of CLOSTAT in the drinking water on live performance. 26,928 Ross PM3 day-old broilers were placed in a commercial poultry house of 1,200m² for antibiotic-free poultry meat production.

Feed conversion ratio, average final weight, and mortality rate, were compared with performance parameters for the farm while only using CLOSTAT (Fig. 3).

The addition of Aleta to the diet reduced FCR (-1.2%), improved body weight (+1.6%) and, more importantly, reduced mortality (-1.8%). In another study done in Belgium, the effect of the dietary supplementation of Aleta on the efficacy of Infectious bursal disease (IBVD or Gumboro disease) vaccination in broilers was investigated (Fig. 4). A total of 96 Ross 308 chicks were assigned to three treatment groups as follows:

- Control feed, no IBVD vaccine (T1).
- Control feed, vaccinated for IBVD (T2).
- Control feed with Aleta, vaccinated for IBVD (T3).

Birds were orally vaccinated with a live freeze-dried IBVD vaccine at 18 days of age.

The supplementation of Aleta significantly improved the antibody titer for IBDV compared with the control diet (P<0.05), which highlights the ability of Aleta to make birds more resilient to disease. Additionally, Aleta increased the number of birds with antibody titers above the titer threshold for protective immunity.

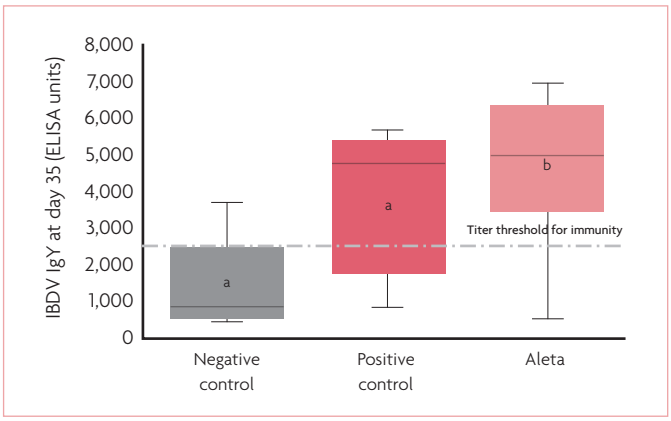

Fig. 4. Average specific infectious bursal disease antibody titer (IgY) at 35 days of age (different superscripts indicate statistical significance, P<0.05).

Conclusion

Early life has a direct impact on broiler health and performance. The results indicate that success during this period is achieved by strengthening broiler breeder health to optimise day-old chick quality, and by supporting the immune system of young chickens in order to maximise productivity. ■

References are available from the authors on request

Fig. 3. Feed conversion ratio, body weight and mortality at 35 days of age for Ross PM3 broilers fed with CLOSTAT HC SP Dry (50g per 1,000 litres of drinking water) and Aleta D (1kg/ton of feed).