

The importance of an optimised day-old-chick feed during early brooding

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Modern commercial broiler strains have been selected for maximal processing yields and the ability to reach desirable processing weights as soon as possible. Due to a continuous shortening of the growth period, the first days after hatch become decisive for the technical results obtained at slaughter.

A good start leads to a flock with good uniformity and also beneficially affects the final body weight of birds. In practice, chick quality is influenced throughout different stages of the total process, including parent stock management, hatchery practice and efficient delivery of chicks.

Challenge

The best way to improve flock uniformity and performance is by decreasing the number of slow starters. In commercial hatcheries, chicks hatch over a 24-48 hour period, depriving the chicks of feed and water for up to 72 hours.

However, these first days are crucial

for the ultimate performance of the newly hatched chicks because the skeleton, internal organs and the gastro-intestinal tract (GIT) and central immune system start to develop.

Making use of a wide hatching window thus leads to a higher susceptibility to infections and a restricted development of tissues, organs and the pectoral muscle in late-hatched chicks, resulting in a high mortality rate (2-5% of hatchlings do not survive the critical brooding period) and more slow starters in the flock.

Therefore, the early feeding strategy should be optimised in order to ensure an optimal start for all chicks, which will result in better flock uniformity.

Brooding complement

Upon arrival, it is common practice in broiler houses to use chicken paper topped with the pre-starter feed to improve feed access for day-old chicks. A pre-starter is formulated for the first 7-10 days after hatch. However, the physiology of broilers is changing very fast during the first days of life.

The transition of the digestive system from embryonic absorption of yolk to ingestion and digestion of feed is taking place.

At the same time, a metabolic transition occurs: while in the embryonic stage most of the energy is supplied by fat, the main energy sources of the post-hatched chick are carbohydrates.

A brooding complement, which is specialised for the first two days after hatch, can therefore prepare the chick more optimally to overcome these dramatic changes during its life. As chicken paper is commonly used by the farm manager, no extra labour is needed to replace the pre-starter on the chicken paper by a special brooding complement.

Nuscience has developed DOC Star, a new brooding complement to overcome the difficult post-hatch period of broiler chicks.

This product was developed with

special attention to stimulation of feed intake, improved yolk sac absorption and immunity and early development of the GIT and internal organs, and thus an increased technical performance.

An extensive overview of the effects of Nuscience's brooding complement DOC Star on performance during early brooding of chicks is shown on the next page.

Early feed intake

To achieve the best start, chickens should begin to eat and drink straightaway. Feed intake is influenced by many factors. The GIT is suggested to be involved in short-term regulation of feed intake. The presence of feed in the stomach and/or other parts of the GIT gives rise to satiety signals which negatively affect feed intake.

A brooding complement provided in the form of a quite soft and fine crumble which easily disintegrates in the crop into its constituents (i.e. highly digestible raw materials), improves the emptying of the crop and gizzard which reduces the satiety signals and increases early feed intake.

Furthermore, hatchlings have difficulties consuming feed particles that are too large relative to the dimensions of their beak and therefore prefer a very fine crumble the first days after hatch.

Yolk sac absorption

As the chick embryo prepares for hatching, the yolk sac is internalised. The latter comprises 20-25% of the body weight at hatch but becomes negligible in size within the first following week.

During the first days after hatch, the contribution of the yolk sack is approximately 40% of the total protein supply. It is, however, not economical to use yolk proteins as an amino acid source. After all, a large fraction of the yolk proteins are immunoglobulins, which are not intended to be digested as amino acids.

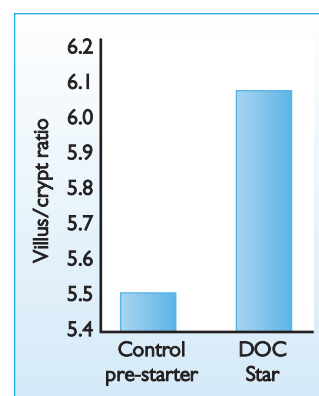


Fig. 2. Villus/crypt ratio of four-day-old chicks.

If the protein needs of the hatchling are immediately covered by a well digestible brooding complement, the yolk can be optimally used as a source of (maternal) immunoglobulins, thereby strengthening passive immunity of the bird.

Also the residual yolk lipid, with its specific fatty acid composition, has a positive effect on the development of the early immune response of the birds.

Therefore, even though it contributes approximately 50% of the total energy supply, the residual yolk lipid should not be used as an energy source.

The residual yolk is taken up more quickly in birds that start eating faster. Feed present in the digestive system stimulates the peristaltic movements and increases the yolk sac utilisation.

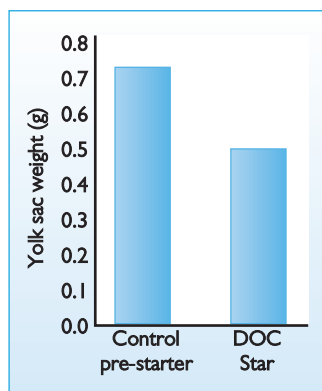
In-house trials showed that chicks fed with DOC Star for the first two days had a lower yolk sac weight at four days of age compared to chicks fed a control pre-starter diet (Fig. 1).

Improved yolk sac absorption will additionally result in less yolk sac inflammation, which can be further aided by supplementing highly antibacterial medium chain fatty acids to the brooding complement, which will result in the control of opportunistic bacterial pathogens.

The first contact of the chick with the environment brings a dangerous microbiological threat to the chick.

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Fig. 1. Yolk sac weight of four-day-old broilers receiving 20g/chick control pre-starter and 20g/chick DOC Star respectively.



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Most hatchlings are fasted for 48 hours or more which makes them more susceptible to pathogens. Since maternal immunity only protects against microbes similar to those previously encountered by the hen, medium chain fatty acids provide an extra barrier for 'other' pathogenic bacteria.

Development of GIT

The period immediately after hatch is critical for the morphological development of the intestine. This is evidenced by an increased intestinal organ-to-body weight ratio of approximately 30% the first day after hatching and initiation of feeding.

This rapid development of intestinal organs is essential for optimal feed digestion and nutrient assimilation.

In order to provide enough 'building blocks' for the rapid growth of demand organs (such as muscles and bones), first a rapid growth and maturation of the supply organs (GIT, liver, pancreas, heart) is required.

The formation of intestinal crypts starts immediately post-hatch. The crypts, containing enterocyte-producing stem cells, start to develop during the first hours and become well defined in two to three days.

New enterocytes migrate from the crypts up the villus, reaching the tips at full maturity after approximately 72 hours in chickens younger than four days.

The necessary nutrients have to be available for optimal crypt and villus formation.

However, digestion during the first days post-hatch is limited due to poor activity of digestive enzymes in broiler chicks.

Therefore, it is important to provide

highly digestible raw materials containing a correct balance of nutrients for the development of the small intestine.

Complementation of a special diet that is high in readily digestible ingredients for the first days after hatch will compensate for the limitations of the immature digestive tract.

Trial results

An animal trial has shown that feeding chicks with DOC Star increases the villus/crypt ratio by 10.5% four days post-hatch compared to a control pre-starter diet (Fig. 2).

During the last days of the egg incubation period, changes in the metabolic pathways take place.

Due to a high energy demand of the hatching process and the relatively low availability of oxygen, fatty acids from the yolk cannot supply all

the necessary energy. The embryo then shifts to anaerobic catabolism of glucose held in the glycogen reserves of the liver, kidneys and muscles.

Insufficient glycogen levels force the embryo to mobilise more muscle protein for gluconeogenesis, thereby reducing early growth and development until the glycogen reserves are replenished, ie. when the newly hatched chick has full access to feed

Faster development of the digestive system increases the digestion and absorption of nutrients, which are the building blocks for the development of the supply organs such as the liver, pancreas and gizzard.

Providing DOC Star on the chicken paper for the first days increases the relative weight of the liver by 6% and that of the gizzard and heart by 4.1% and 8.5% respectively. ■

The effects on performance during early brooding

In the early brooding period, chicks require a different diet for an optimal start. DOC Star is a high density brooding complement with well digestible raw materials, provided in the form of a 2mm crumble. It should be administered on chicken paper as 20g/chicken, next to the common pre-starter in the feeders.

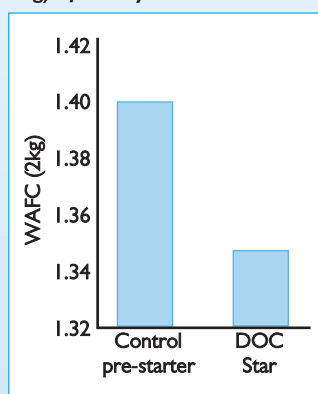
Stimulation of feed intake

Using DOC Star, the first observation in the broiler house is the fully populated chicken paper covered with chicks eating the brooding complement. Poultry farmers have shared their experiences with Nuscience advisors and confirmed that chicks love eating DOC Star. Preferring DOC Star over the standard pre-starter, chicks will first finish the DOC Star before starting to eat the pre-starter, resulting in a better overall performance of the flock.

Reduced mortality

Covering the exact protein needs for the day-old chick decreases the usage of egg yolk immunoglobulins and strengthens the innate immune system of the chick. Due to faster absorption of the yolk sac, an important source of infection is eliminated and the risk for yolk sac and other infections is decreased. Furthermore, the presence of the antibacterial medium chain fatty acids prevents other pathogens from entering the digestive system, resulting in a reduced (3.0% to 1.7%) mortality rate using DOC Star.

Fig. 3. Weight-adjusted feed conversion (WAF: 1 point = 25g) of 38-day-old broilers.



Increased technical performance

Through an optimal development of the digestive system during the first days of life, nutrient absorption increases throughout the entire lifespan of the chicks.

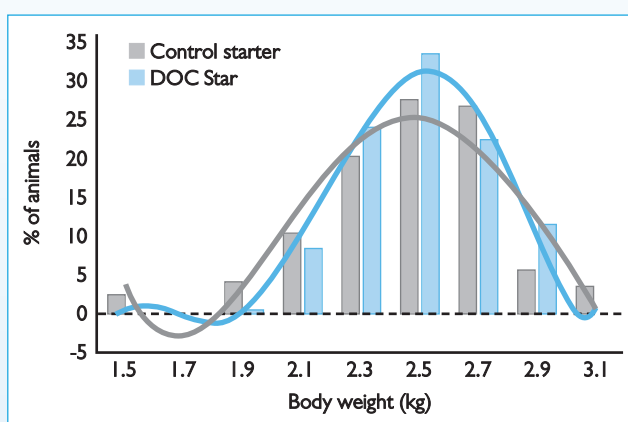


Fig. 4. Broiler body weight distribution at 38 days of age.

In combination with an improved immune status and gut health, saving more energy and nutrients for growth, this results in a faster weight gain during the entire growth cycle. The increased absorption capacity (microvilli) and better functioning of the internal organs result in better feed conversion (Fig. 3), eventually leading to a significant economic benefit.

Improved uniformity

Today's standard pre-starter feeds are specially developed for the first 7-10 days of age and do not meet all the special needs of the day-old chick. The typical nutrient composition of DOC Star results in faster growth of the digestive system and internal organs and an improved innate immunity.

Weaker chicks and early hatchers will even benefit more from DOC Star during the early brooding period. DOC Star stimulates each individual chicken to start to eat immediately, and, presented as a fine crumble, facilitates the intake for small chicks. Due to these characteristics, a smaller variation in time and amount of feed intake is obtained, resulting in a more uniform flock (Fig. 4).