

# Technical information

## The Most Important Benefits of Early Feeding

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### The hatcher and the hatch window

Around day 18 of incubation eggs are transferred from the setter to the hatcher, so that the chickens can hatch in the hatcher baskets. It is well known that chickens do not hatch at the same time. The time period in between the first and last hatched chicken is called the hatch window and can vary between 24 and 36 hours (Decuypere et al., 2001).

Every factor that increases the variation in embryo development before or during incubation also affects the length of the hatch window. Two factors that have a large influence on the hatch window in commercial incubation are the mix of egg batches that is made by the hatchery personnel (mix of storage durations or breeder flock ages etc.), and incubator design, incubator operation, and

incubation profiles or in other words: how uniform the air temperature is inside the incubator.

Nowadays, incubators become larger to reduce the cost price per egg. When incubators increase in size, the chance that batches of eggs of different breeder flock ages or storage durations are mixed increases. In addition, the design of the incubator becomes more crucial to provide uniform incubation conditions to all eggs. Due to the mix of egg batches and non-uniform incubation conditions the length of the hatch window in larger incubators can increase. An important question is: why should we concern about the hatch window?

In practice this question can be answered in two ways.

- 1) A hatchery has a planning for chick handling and transport. It is important to ensure that all chickens are hatched and dry when they are taken from the hatcher. A predictable and short hatch window makes it easier to take the chickens from the hatcher at the right time to have maximal hatchability.
- 2) For the chickens, a large hatch window is detrimental because it can take up to 72 hours before chickens are placed at the farm and finally have access to feed and water. Research has shown that no access to feed and water between hatch and placement at the farm negatively affects subsequent performance (Halevy et al., 2000; Noy and Sklan, 1999).

To ensure that chickens are hatched in time to meet the hatchery planning, actions can be taken in the hatcher to shorten the hatch window. Used methods are:

- 1) Transfer patterns in which eggs are moved from the relative cold spots in the setter to the relative warmer spots in the hatcher or vice versa;
- 2) Increase hatcher air temperature;
- 3) Increase hatcher CO<sub>2</sub> level.

Chick quality is negatively affected by these actions and the moment of first intake of feed and water is still postponed till the chickens are placed at the farm. Therefore, these actions are not beneficial for the chickens, but only for the hatchery personnel in the short term.

Reality is that there will always be a hatch window. A hatch window is part of nature. The best way to deal with a hatch window is to ensure that the rectal temperature of the hatched and dry chickens is between 40.0 and 40.6°C and to provide them with feed and water.



## The benefit of feed and water in the hatcher

Since the early 90's a lot of studies showed the benefits of early feeding and water on chick performance. In this paragraph a few studies are summarized to show the benefit of early feeding and water. During the last few days of incubation, the residual yolk is retracted into the body cavity as an extension of the intestine. Post hatch, the residual yolk is the only nutrient source of the chicken until exogenous feed is available. Chickens can use the residual yolk for maintenance during the first few days post hatch (Noy et al., 1996). However, research has shown that development and maturation of the gastrointestinal tract (Maiorka et al., 2003; Geyra et al., 2001), and important immune related organs (Dibner et al., 1998) is delayed in chickens that have to rely solely on their residual yolk and have no feed and water available between hatch and placement at the farm.

A study of Noy et al. (1996) showed that the residual yolk of chickens with access to feed during 96 hours after hatch reduced more rapid in size than in fasted birds. This can be caused by increased intestinal activity in fed chickens (Noy et al., 1996). A more rapid reduction in residual yolk size indicates that valuable nutrients are earlier used for important developmental steps.

Geyra et al. (2001) showed that fasting post hatch retarded body weight increase and intestinal growth. The effects of fasting were specific to both time of fasting and the intestinal segment examined (duodenum, jejunum or ileum). The jejunum appeared to be the most sensitive of the intestinal segments. Fasting between 0 and 48 hours post hatch decreased crypt size, the number of crypts per villus, crypt proliferation, villus area, and the rate of enterocyte (intestinal absorptive cells) migration in the duodenum and jejunum. Geyra et al. (2001) concluded that early access to feed is important for optimal early intestinal development.

Maiorka et al. (2003) also showed that the development of the gastrointestinal tract was directly linked to feed and water intake. They showed that relative weight and length of the jejunum and ileum increased when chickens were supplied with feed and water post hatch. In addition, intestinal mucosa development was affected by the availability of feed and water: the number of villi per area decreased because villi size increased. According to these findings Maiorka et al. (2003) hypothesized that the absence of physical stimuli caused by feed in the intestinal lumen and the specific need for certain nutrients, such as water, may be responsible for negative changes in the morphology of the intestinal mucosa.

Protein in the residual yolk is the source of antibodies from the hen (Larsson et al., 1993). To be effective, it is important that maternal antibodies move from the residual yolk into the bloodstream but also to sites of vulnerability such as the mucosal surfaces where bacteria and viruses can enter the body (Dibner et al., 1998). Dibner et al. (1998) evaluated the effect of early feeding on the development of the immune system in broiler chickens. They showed that providing nutrients immediately post hatch resulted in heavier bursa weight, earlier appearance of biliary IgA and germinal centers (secondary lymphoid organs), and an improved resistance to a disease challenge.

In broiler chickens the first week of life is not only important for further development of the gastrointestinal tract and important immune related organs but is also an important period for muscle production (Moss et al., 1964). Halevy et al. (2000) showed that the length and timing of fasting post hatch affects satellite cell activity. Short-term fasting can enhance satellite cell number. However, long-term fasting almost completely arrests cell mitosis and decreases the number of satellite cells. In the study of Halevy et al., (2000) the chickens that fasted during the first days of life did not regain their body weight or breast muscle weight by day 41, however chickens that fasted between day 4 and 6 post hatch had full growth compensation by day 41. Halevy et al. (2000) concluded that sufficient feed directly post hatch may be critical for later muscle development. A study of Noy and Sklan (1999) also showed that early feeding increased body weight and breast size at marketing age in chickens and poults. They showed that early feeding reduced mortality numerically.

Early feeding seems to have a positive effect on chick performance because development and maturation of important organs is not retarded post hatch, but continues.



This results in better growth performance and a better health status of the chickens.

## HatchCare

Although the positive effects of early feeding on chick performance have been known for more than 15 years, there was no commercial hatcher with feed and water available before 2014. During the last few years, society is confronted with the fact that the overuse of preventive antibiotics in the animal husbandry causes resistance to antibiotics in human health care. To prevent overuse of preventive antibiotics, every chain in the animal production industry has to be critical to their way of working including the poultry industry. Hatcheries have to be critical to their procedures and technology as well. Providing feed and water in the hatcher, might lead to a reduction of preventive antibiotics usage.

To improve the environment and wellbeing of the chickens post hatch, HatchTech developed a new hatcher, which is called HatchCare. In HatchCare, chickens are provided with their first necessities of life; feed, water, light, and fresh air at the correct temperature. This will continue development and maturation of important organs post hatch. In addition, HatchCare is developed to take away a few large stress moments that are present in the traditional hatching and handling situation. Chickens are used to light, the stress of seeing the first light when the hatcher is opened is taken away. Chickens do not sit between the eggshells and have room to move around and find the feed and water. Fans produce less noise because, due to the design of HatchCare, high air velocity is not necessary to obtain uniform embryo temperatures. Chickens will be transported in the HatchCare basket which will take away a lot of handling stress and opens up the opportunity to provide feed from hatch until placement at the farm.

The concern of the hatchery personnel about the hatch window will be reduced. The setters can be started earlier to ensure that all chickens are hatched in time. Moment of pull time is not crucial anymore because the chickens are comfortable during their stay in the hatcher.

The combination of providing the first necessities of life and taking away a few large stress moments by introducing HatchCare, will result in more robust chickens that can perform according to their genetic potential with lower mortality and without the need for preventive antibiotic use.



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