Managing eggs and chicks from young breeders

Most hatchery managers and poultry farmers know from experience that eggs and chicks from very young breeders (25-30 weeks) need special attention. These eggs and chicks are generally smaller than those from older breeders, but this is not the only reason for the required extra care.

by Lotte Hebbink, Incubation Specialist, Royal Pas Reform. www.pasreform.com

There are also less visible differences, which we will consider in this article to understand why chicks from very young breeders are generally more vulnerable.

First week mortality

Breeder age influences first week mortality (FWM) in the broiler farm. Generally, the older a flock becomes, the higher the FWM. However, there is an exception to this rule for very young breeders of between 25 and 30 weeks, as several studies show that the chicks from these breeders also have a higher risk of mortality in the first week.

For example, a study by Yassin et al. (2009) showed that FWM is significantly related to hatchery, year, breed, feed and seasonality, but also that the average FWM is highest for breeder flocks aged between 25 and 30 weeks (see Fig. 1). Not every study finds a high FWM for young breeders, but this may be due to differences in management in the breeder farm, hatchery or broiler farm.

Broiler farm management

One of the reasons for the higher FWM for broiler chicks from very young breeders could be that farm management is not tailored to the needs of these chicks. As very young breeders generally lay smaller eggs, the chicks are also smaller.

Therefore, the drinking lines should be lowered to make it easier for chicks to reach the drinking nipples. Also, as small chicks have a relatively higher body surface area compared to body mass and therefore lose heat more quickly, a higher brooding temperature is needed to maintain a rectal temperature of 104-105˚F.

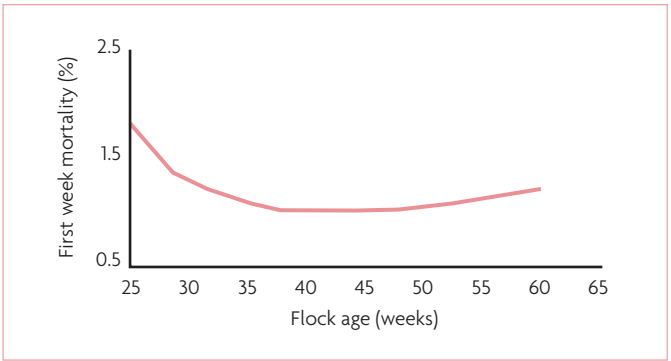
When chicks hatch, they act like poikilothermic animals, which means that they depend on the environmental temperature to maintain their body temperature. In general, it takes around four days before the chick's thermoregulation is developed to such an extent that it can regulate its own body temperature.

However, chicks from very young breeders need one to two days more to make the transition from semi-poikilotherm to homeotherm. In other words, it takes a bit longer for these chicks to be able to regulate their own body temperature compared to chicks from older breeders.

Besides providing optimum temperature conditions, additional nutritional support can also help these chicks to make a good start. This can be done by supplying a good quality pre-starter, and it can also help to make sure that the chicks have access to early feeding in the hatchery.

Chicks from very young breeders may benefit from extra nutritional support directly after hatching, to reduce FWM. In a field study by Royal Pas Reform, it was found that the effect of early feeding on FWM is more pronounced in chicks from very young breeders of 25-30 weeks compared to chicks from older breeders.

Fig. 1. Average first week mortality in relation to breeder age. Data extracted from Yassin et al. (2009).



Characteristics of eggs from very young breeders

The developing embryo utilises nutrients from the yolk sac during incubation. The nutrient composition in the egg depends on several factors, one of these factors being the age of the hen. As mentioned above, younger hens generally lay smaller eggs than older hens, with less yolk in relation to albumen.

Depending on the egg size, the yolk content can be 5-7% less (Nangsuay et al., 2011). Therefore, the older the breeder, the higher the proportion of yolk to albumen. This is related to the follicular growth pattern in the ovary of the hen: as the hen becomes older, she becomes more efficient in depositing the nutrients that form the yolk in the follicles (Zakaria et al., 1983).

As well as differences in yolk to albumen ratio, the nutrient composition of the yolk is also different.

The yolk of very young breeders contains 3% more water and 2% less fat than that of older hens (Yadgary et al., 2010) and different fatty acid profiles (Hu, 2013).

During the main part of incubation, the chick embryo relies for more than 90% on the oxidation of yolk fatty acids to meet its energy demand.

The differences in the yolk composition of the eggs therefore influences the embryo's development, for example by altering certain metabolic processes.

Besides these differences in yolk composition, the uptake and utilisation of nutrients from the yolk sac are known to be affected by breeder age.

Embryos and chicks from young breeders are less able to mobilise lipids and transfer lipoprotein for energy and have a relatively lower yolk absorption (Latour et al., 1998).

During incubation, the yolk is initially taken up in the bloodstream through the yolk sac membrane via endocytosis, and later during

Continued on page 23

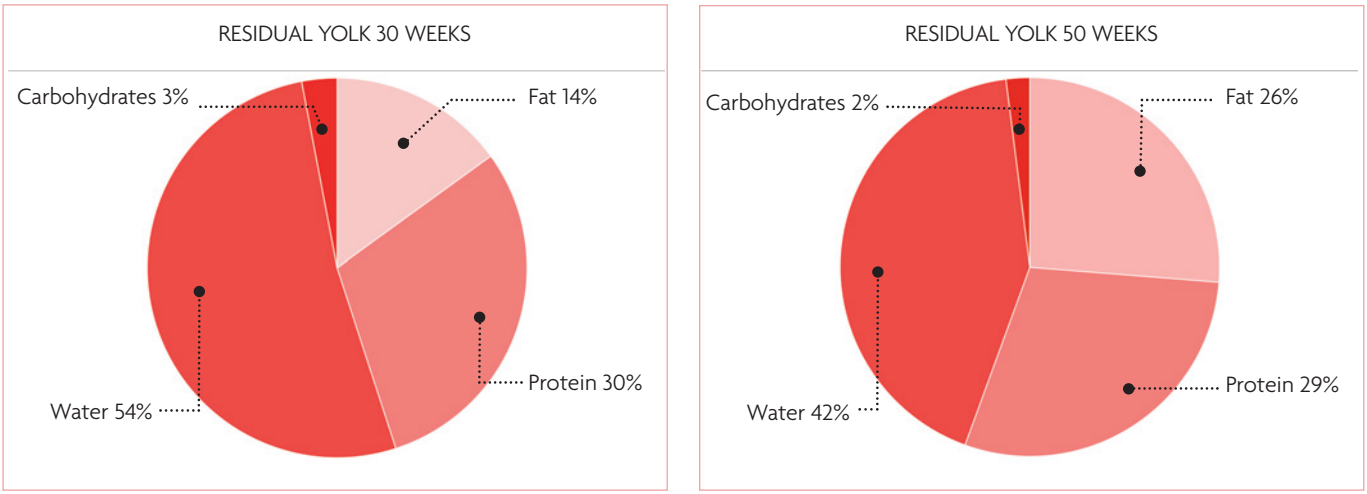


Fig. 2. Residual yolk composition of 30- and 50-week-old breeder flocks (data extracted from Yadgary et al., 2010).

Continued from page 21
incubation also in the small intestines through the yolk stalk.

During incubation and at hatch, the yolk absorption is both absolutely and relatively lower in embryos and chicks from young flocks compared to older flocks (Nangsuay et al., 2011).

The residual yolk of newly hatched chicks from young flocks contains 12% less fat and relatively more water compared to chicks from older breeders (see Fig. 2).

This means that the chicks from very young breeders have less fat available in the residual yolk sac to use for nutrition post-hatch compared to those from older breeders (Yadgary et al., 2010).

Effects on embryonic gut development are also noticeable, as the height and depth of the villus and microvillus of the middle part of the small intestines have been found to be shorter in embryos from young flocks the day before hatch (Maiorka et al., 2016).

The formation of an egg takes slightly longer than 24 hours. As a consequence, hens have one or more days on which they do not lay an egg. The eggs that are laid on consecutive days are part of a clutch, and the 'pause' day indicates the end of a clutch. The first egg of a clutch spends around 16 hours extra in the oviduct and these embryos are therefore generally more developed.

The clutches of younger hens are generally longer, so there are fewer first-clutch eggs in egg batches from younger breeders compared to older breeder hens.

Consequently, there are fewer eggs with embryos that are further developed, so egg batches from younger hens are on average in an earlier developmental stage.

Consequences for incubation

In practice, hatchery managers usually give eggs from very young breeders a few hours longer incubation time. This can be explained by a combination of factors, such as the earlier developmental stage of the embryos, the differences in yolk nutrient composition and/or the lower egg weight.

As eggs from very young breeders are generally smaller, the total egg weight and heat production inside the incubator is also lower.

Fertility percentages are also generally lower in very young flocks, leading to less heat production. As small eggs lie deeper in the egg tray, the air flow over these eggs will also generally be higher.

In practice, a single incubation programme is often used for all flock ages, but it is advisable to investigate the need for a different incubation programme for eggs of different sizes, for example very small, normal and large eggs.

However, it is crucial to measure the eggshell temperature (EST) regularly before making any adjustments to the incubation programme. This means measuring at a sufficient number of different places in the setter, at different times during incubation.

Measurements should be taken at least once in week one, twice in week two and three times in week three (until transfer), as the difference between EST and air temperature rapidly starts to deviate after embryonic day 13.

Temperature variations are found in every incubator, making it impossible to maintain every egg at an EST of exactly 100°F. For eggs from very young breeders, adjustments to the temperature setpoints may be necessary to prevent eggs from becoming too cold during the last part of incubation.

However, a slightly low EST is not as damaging as overheating, which occurs when the EST is higher than 102°F for a longer period of time (for example 12-24 hours). Therefore, the temperature setpoint of the setter should be reduced if an EST of 102°F is measured, to start with in small steps (for example 0.2°F).

Give the setter time to respond and stabilise, then measure the EST again after a few hours to see whether the temperature needs to be reduced further.

It may not always be possible to change the incubation programme for eggs from very young flocks, as hatcheries often fill up the rest of the setter with other eggs.

In that case, differences in flock ages inside the setter should be minimised. If this is not possible, a few other tricks could be considered.

For example, the largest eggs could be placed closest to the fan and the smallest eggs furthest away from the fan, as the positions closest to the fan are usually a bit cooler. Another option is to pull the chicks from very young breeders four hours later, to increase their incubation time. ■