

Influence of nutrition and management on eggshell quality



Conference report

Many factors affect eggshell quality, such as nutrition, disease, genetics, environmental conditions, age of birds, stress, egg collection and handling, and packaging and transport. Eggshell quality, however, is primarily related to management and nutrition, not genetics or other factors. It is becoming a bigger issue as the length of the laying period has extended because, as hens get older, shell quality drops.

"The information in the genetics companies' management guides is for direction and information only, as each egg producer's production goals and conditions can vary", says Vitor Arantes, Global Technical Services Manager and Global Nutritionist, Hy-Line International. He advises listening to your birds. For example, "diets should be aligned with the bird's bodyweight development, rather than the age of birds and following feeding phases according to pre-planned timings for feed changes," he noted.

Below are some of the nutritional factors impacting eggshell quality that producers should keep top of mind.

Early development and pre-starter diets

"Bodyweight at 6-12 weeks of age is key, but to achieve this goal, bodyweight up to 5 weeks of age is a MUST, stressed," Dr. Arantes. "This critical period is an investment, so don't be shy. Poor management in the first 5 weeks will delay production, increase mortality, and prevent the achievement of peak production targets. In turn, it will affect egg quality. Therefore, we must provide proper diets as soon as possible," he said.

As shown below, chicks hatch with relatively underdeveloped internal organs and systems. During the first 5 weeks of age, the digestive tract and the immune system undergo much of their development. The development of the intestine is crucial for nutrient absorption and will determine a hen's future production efficiency. Strong intestinal development will also strengthen the immune system and reduce the

possibility of future enteric diseases and improve the response to vaccinations.

Multi-phasic body weight development during rearing and the start of lay

Pre-starter diets support the chicks' transition from being fed by the yolk sac and are relatively high in energy, protein, and the vitamins and minerals required for growth and development. The chicks' limited digestive capacity post-hatch demands easily digestible raw materials. A crumble containing high-quality, functional ingredients provides a good nutritional start in life. The use of feed additives, such as enzymes to improve digestibility, and synbiotics to aid in the early development of a microbial population and to prevent the intestinal colonization of pathogens, known as competitive exclusion, should be considered.

Teaching hens how to eat - preparing for the pre-peak phase

The objective is to develop sufficient feed intake capacity for the period start of lay, by feeding a developer diet from 10-16 weeks of age. This is a diluted diet with high levels of insoluble fiber to develop feed intake capacity (crop and gizzard).

"You can train pullets to eat by taking advantage of their natural feeding behavior," commented Dr. Arantes "Because birds consume most of their feed before lights go off, the main feed distribution (60% of the daily ration) should be in the late afternoon, about 2-3 hours before 'light off'. In the morning, birds will be hungry and finish the feed, including fine particles. Emptying feeders helps to prevent selective eating and will increase the uniformity of the flock. In the middle of the day, there should be no feed in feeders for 60-90 minutes," he noted.

Don't neglect the pre-lay phase

Start feeding a pre-lay diet when most pullets show reddening of the combs, which is a sign of sexual maturity. Feed for a maximum of 10-14 days before the point of lay. This is important to increase medullary bone calcium reserves. Large particle calcium should be introduced in this phase. Do not feed pre-lay later than the first egg as it contains insufficient calcium to support egg production.

There can be a negative impact on feed consumption from the sudden increase in dietary calcium levels from 1% to above 4% at the start of lay. Field experience indicates that the use of pre-lay diets helps as a smooth transition between the developer (low calcium and nutrient density) and the peaking diet. Correct feed formulation and matching diet density with consumption will minimize the impact of reduced calcification of bone over the laying cycle and extend the persistency of shell quality. It also helps to avoid the often-reduced appetite/daily feed intake during early production.

The following are suggested for pre-layer feed:

- 1.25 to 1.40% P
- 2.5% Ca (50% coarse limestone)
- 900-1,100g per hen total
- Never before 15 weeks of age
- Never after 2% hen day (HD) egg production

Understand your limestone

Calcium particle size is important for eggshell quality. Fine calcium carbonate particles pass through the gastrointestinal tract in 2-3 hours, whereas particles above 2mm are retained in the gizzard and will slowly solubilize, delaying the calcium assimilation. Eggshell formation takes 12 to 14 hours and occurs mainly during the night period. Providing a high amount of large calcium particle size before the night, when birds are sleeping, will help laying hens to produce a strong eggshell.

The ratio of coarse to fine calcium particles will increase with bird age as below. Changing the particle size ensures that more calcium will be available at night from the diet instead of from the bone.

Calcium particle size recommendations

Particle size	Starter, Grower, Developer	Pre-Lay	Weeks 17-37	Weeks 38-48	Weeks 49-62	Weeks 63+
Fine (<2mm)	100%	50%	40%	35%	30%	25%
Coarse (2-4mm)	-	50%	60%	55%	70%	75%

The solubility of limestone may differ according to the source. Calcium with high solubility will not be stored for a long time in the gizzard, negating the particle size effect. Dietary calcium levels may need to be adjusted based on the solubility of your limestone. The in vitro solubility of your limestone source can easily be checked on the farm, with a simple technique using hydrochloric acid. The target is to recover 3-6% of the supplemented limestone.

Water

It's impossible to have good eggshell quality if you don't have good water intake and good quality water. For example, excessive salt levels in drinking water can cause persistent damage to shell quality.

Conclusion: invest in the rearing phase

Good nutrition and management practices are key to good shell quality. The rearing period is a key developmental time for future success during the laying period – it is an investment phase.

EW Nutrition's Poultry Academy took place in Jakarta and Manila in early September 2023. Vitor Arantes, Global Technical Services Manager and Global Nutritionist, Hy-Line International, was a distinguished guest speaker in this event.