Balancing broiler genetics and welfare

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The last five years have seen a continuing shift in expectations for broiler producers worldwide. Consumer trends and escalating commodity prices are redirecting the industry's focus.

There are the challenges of not only creating a safe, welfare friendly product for families but also accomplishing this at current feed prices. Cost per kg live weight or breast meat is the new magic number.

There is often speculation about whether one environmental consideration trumps all others in successful broiler production. In truth, all of the factors are vital in meeting expectations in a socially responsible way.

Temperature and humidity

The best guide for correcting temperature is chick behaviour. It is important to regularly assess how comfortable the birds are, taking into account the sounds and sights while birds are eating, drinking, resting, playing and 'talking'.

For at least the first two weeks, the ideal temperature should not deviate more than ±1°C from the set temperature. Good litter temperature is the most important factor because its absence compromises bird health, performance and uniformity.

Pre-heating is important and should begin at least 48 hours before placement, even in warm climates. This ensures that the air and the internal house structure are adequately heated for the baby chicks. Litter temperature should be at least 32°C at placement and supplementary feed and water should only be placed where litter temperature meets this target.

Radiant type heating and forced air heating are most commonly used in broiler production. In the US all broiler houses use a combination of both because the radiant heat is excellent at achieving good litter temperature and also higher house relative humidity at placement (60% plus), so less risk of dehydration.

Forced air heaters reduce house humidity (45% and less), so typically if using this type of heating system only for brooding a placement air temperature of 32-34°C is required by the chick compared to radiant heating of 30-32°C.

Pressure (Pascals)	Inlet space needed per number of m^3/hour of fan capacity	Width of house (metres)	Air speed (metres/second)
7.5	1 cm^2 for each 1.05 m^3/hr	10	3.5
10.0	1 cm^2 for each 1.20 m^3/hr	11	4.0
12.5	1 cm^2 for each 1.30 m^3/hr	12	4.5
15.0	1 cm^2 for each 1.45 m^3/hr	14	5.0
17.5	1 cm^2 for each 1.60 m^3/hr	15	5.5
20.0	1 cm^2 for each 1.70 m^3/hr	18	6.0
22.5	1 cm^2 for each 1.85 m^3/hr	21	6.5
25.0	1 cm^2 for each 2.00 m^3/hr	24	7.0

Table 1. Guide to correct pressure drop within a house.

Ventilation and air quality

Mastering the art of correct ventilation is one of the most common challenges, particularly where broiler houses have not updated their ventilation systems to meet the birds' improved genetic demand for oxygen.

The best return on any investment in a poultry house, regardless of the climate, is in the ventilation system and the most important part of this system is the minimum ventilation system responsible for meeting the chicks' oxygen demand. Adequate oxygen provision is essential during the early stages of cardiovascular system development and in times of cold weather to prevent ascites.

The minimum ventilation system should have a fan capacity at least equal to 12.5% of the cubic air volume in the house. This part of the ventilation system works best on a five minute cycle timer with the minimum run time of one minute to ensure that the incoming cold outside air has completely mixed and heated with the warm air at the top of the house before it reaches the chicks and the litter. The only fans that we should consider are fixed volume, and not variable speed, fans because of better fan efficiency and because it is easier for the operator to achieve consistent and correct negative pressure. From an efficiency and installation point of view, it is also more economical to use fans not smaller than 900mm.

The inlet system often gets little mention considering its importance to efficient ventilation. Without a good operating inlet system, based on pressure rather than temperature, efficient, consistent ventilation is very difficult to accomplish. The pressure on which the inlet works should be based on the width of the building or the distance the air has to travel from the inlet to the middle of the house before it is heated and falls to the chicks.

The ventilation system must allow for full control over the airflow and where it enters the building. The house must be completely sealed to make this possible. Sealing from the floor up is advisable because drafts on the chicks lead to chilling, poor uniformity growth rate and ascites. Fans should have back draft shutters and inlets, doors and curtains should be sealed to protect against air leakages.

Air should enter the building at a pressure drop that allows it to get halfway across the house before falling (see Table 1). Adjustments to the inlet area combined with the fan capacity work to provide the correct

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pressure drop, depending on the house width.

At no time in the life of the bird should ventilation be sacrificed to maintain desired house temperature and likewise temperature should never be sacrificed to maintain ventilation levels. Both are equally important for the chick and if you have to compromise it means that your housing, insulation and/or your heating capacity are inadequate.

Water

While pH is not a chemical or specific contaminant, it can impact water quality. First, it reduces the effectiveness of disinfectants such as chlorine.

If the pH is above 7.5, chlorine is present mainly as chloric ions that add very little sanitising value. Chlorine is most effective in water with a pH of 6.0-6.7. At this pH level there is a greater percentage of hypochlorous ions with strong sanitising power. In fact, free chlorine residual levels are not considered useful as sanitisers unless there is at least 85% hypochlorous acid present.

With a high pH it may be necessary to acidify the water to create a favourable level for effective sanitation with chlorine.

However, acid and chlorine sources should never be mixed directly to create stock solutions – this can result in a hazardous chlorine gas release. To adjust the pH, acidify the water before adding bleach. Install an inline pump with dual injectors and then add a stock solution of acid before introducing bleach.

Chickens have only two taste sensors – detecting salt and bitter. In nature, most poisons are associated with bitter or alkaloids, so it is natural for birds to consume less water if there is a bitter taste and it may be possible to mask the bitter with an acidifier. Over use of organic acids, such as citric or acetic, may also cause birds to consume less water. Organic acids are typically as weak acids as they have a low tendency to turn loose their H+ ions. These acids tend to have a strong taste associated with them. Inorganic acids tend to dissociate, or give up their hydrogen ion more readily, thereby causing less taste issues.

Chlorination

Chlorination is the most popular method for sanitising drinking water mainly because there is little opportunity for microbes to build resistance to chlorine. While chlorine is a great sanitiser, however, it is no miracle worker.

Contact time, pH, amount and type of organic matter present, water temperature and presence of minerals such as iron impact on the effectiveness of chlorine. To ensure an adequate chlorine level, check the free chlorine level at the end of the system. The suggested levels of free chlorine are 4-6ppm.

Water sanitation

Regular water sanitation and water line cleaning can provide protection against microbial contamination and bio-film build-up. While bio-films may not be a direct source of problems to the birds, once

established in water lines, they provide a place for detrimental bacteria and viruses to hide from disinfectants.

Salmonella can live for weeks in water line bio-films and detrimental bacteria can even use bio-films as a source of food. Products containing 50% hydrogen peroxide, stabilised with silver nitrate, have proven to be outstanding for removing bio-films in water lines.

Providing flocks with a clean, wholesome supply of water is essential. Should water be a suspect for flock problems, test for total bacteria numbers as well as mineral content.

While total aerobic plate count will not tell exactly what is in the water, it may indicate excessive levels of bacteria. By promoting regular water sanitation, producers can increase overall bird performance by preventing potentially harmful environments in water systems.

Feed

Adequate amounts of feed and feeding space are essential at placement and for the first week to ensure proper intake and minimal competition among the chicks. Afford the birds feeding space by using paper to cover at least 50% of the brooding area. Provide chick feed as crumb for the first 250g/bird to facilitate intake.

Offer feed on the paper at a rate of 50-65g per chick to minimise competition and to encourage early appetite and skeleton development.

Many businesses assess performance using only feed conversion data rather than feed cost per kg live weight. Increasing feed density may reduce feed conversion but at a higher feed cost per kg live weight, lowering profitability. Increasing feed density may, in fact, increase early growth rate and lead to increased metabolic issues such as skeleton defects and cardiovascular problems.

Light

Light programmes have a track record for improving bird efficiency by reducing activity during the dark period. Lighting programmes increase bird activity during the light period, leading to appropriate leg and skeleton development.

A new European broiler welfare directive requires producers to keep the birds in eight hours of darkness from three days of age until three days before processing. Lighting programmes should begin after the full development of the chicks' appetites, which is complete after achieving 100g in bodyweight per bird.

Ideally, lighting programmes should continue until at least 21 days of age, which marks full skeleton development.

Light intensity initially during brooding should be 25lux at floor level and deviate by no more than 20%.

After the first week it is normal practice to reduce light intensity so that by 14 days the birds are in a reduced but comfortable light intensity.

The need for careful attention to these basic requirements was true 50 years ago when the modern broiler industry began and equally the statement rings true today.

Now, more than ever, in this age of welfare consciousness and social responsibility, this approach is vital for industry leaders to remain ahead of the pack. ■