Managing rapid growth rate in broilers

Broiler chickens have been bred to reach market weights at a rapid rate. Management and breeding strategies are designed to increase growth rate with minimal feed intake during growing and learner carcasses at processing. Currently, broilers are processed at 40 days or less with a live weight of approximately 2 kg. Even though rapid growth rate has successfully reduced the amount of time to market age, it has caused negative effects on bird health. What should be done?

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Over the past forty years, improvements in genetic stock and breeding strategies have caused broilers to reach market weights in half the time. It has been a common practice to feed broilers ad libitum throughout the production cycle. This may have been sufficient for the broiler of the past; however, today’s broiler has a phenomenal growth rate. For example, chicks are approximately 45 g at hatch and reach body weights of approximately 1100 g by 28 days followed by another 900 g increase till 40 days. The practice of unrestricted feeding for the faster growing broiler has caused obesity. This is evidenced from higher amounts of carcass and abdominal fat at time of processing. Excessive fat means that the producer has lost economically in feed efficiency because unused energy obtained from feed is stored as fat in the bird’s body. Approximately 85% of the cost of production is attributed to feed costs. Unrestricted diets may not maximize the available nutrients especially when birds receive more energy and protein from feed than is required for maintenance. This may not be the most efficient method of feeding and is certainly not the most cost effective. Management practices have begun to shift to feed restriction at critical times of the cycle. During the time of restricted feeding, growth rate decreases. However, this is compensated after birds are given an unlimited access to feed. This is also known as compensatory growth, where growth rate increases later in life to catch up to or increase beyond typical rates (Figure 1).

Effect on carcass characteristics
Compensatory growth strategy has generally resulted in a leaner broiler carcass by market age. A leaner carcass implies a decrease in the amount of abdominal and body fat as opposed to an increase in the amount of carcass protein. Feeding behavior will most likely change from small amounts and frequent meals to larger amounts of less frequent meals. Meal feeding has been shown to decrease body weights and increase feed efficiency as compared to continual feeding.

Common diseases associated with rapid growth rate
Growing broiler chickens at a quicker rate than their predecessors has resulted in skeletal and metabolic problems. Compensatory feeding strategy may slow down growth rate and provide adequate time for skeletal development. Consequently, mortality rates and number of culls will most likely reduce. High growth rates have lead to higher incidences of diseases such as asclites, cellulitis, sudden death syndrome and disorders such as tibial dyschondroplast (TD). Broilers have a high incidence of leg problems above all other poultry species. Increasing growth rate has increased leg weakness and decreased walking ability. Fast growth of meat muscle during the early period of life does not allow for complete skeletal development to support body muscle mass. Tibial dyschondroplasia (TD) is a common disorder and is caused by hypertrophy of the growth plate of the tibia. A proper balance of calcium and phosphorus ratios will help decrease TD, however decreasing growth rate is the most effective. Leg weakness may be reduced through lighting programmes but this may also decrease final body weights.

Ascites has developed as one of the leading causes of mortality and is especially apparent as market age is reached. Several factors; rapid growth rate, high energy diets or low quality environment due to high temperatures and poor ventilation cause this disease. This condition results in fluid accumulation in the body cavity caused by right ventricular hypertrophy (heart failure). Rapidly growing birds require a larger volume of oxygen to sustain respiratory function compared to slower growing birds and this may lead to increased demands from the cardiopulmonary system. In the past, problems with ascites was found in regions of high altitude compared to regions of low altitude, but now ascites may occur in any region, regardless of altitude.

Cellulitis is a disease caused by the E. coli bacterium and is characterized by infected scratches on the surface of the skin. Contaminated carcasses are condemned at the processing plant and result in huge economic losses to the producer. Birds with slow feathering may develop the disease at a higher rate than birds with adequate feather coverage. Fast growth rates may be the cause of some incidences; however, this is not clearly understood. Sudden death syndrome occurs when birds flip over on their back and incur ventricular fibrillation. Aside from environmental stressors, increasing growth rates has lead to an increasing number of cases.

How can growth rate be decreased?
Feed restriction - Broiler chicks grow rapidly during the first three weeks of life. For example, body weight increases from approximately 45 g to 700 g from placement to three weeks of age. Feed efficiency is high during this time (1.3-1.5) and body weight gain is mostly attributed to protein. Since the broiler grows so quickly during the early stages of life it is essential to implement a quantitative feed restriction programme at this time. In other words, only the amount of
required energy is fed. Young birds maximise nutrients in the diet strictly for growth; however, this changes to maintenance at a later age. Feed restriction early in life decreases available protein, increases energy efficiency and increases carcass composition. The problem with physically reducing feed amounts occurs after ad libitum feeding begins. Large appetites may cause more frequent feeding and larger amounts of feed during meals so that energy requirements are balanced back from the time of restricted to unrestricted feeding. This may be slightly controlled by gradually allowing access to ad libitum amounts. Even though compensatory growth occurs, longer than necessary duration and severe restriction of feed may not enable birds to regain typical market weights.

Reducing nutrient density - As an addition to quantitative feed restriction, growth can also be reduced through qualitative restriction. Dilution feeding decreases nutrient density, particularly the amount of protein and energy. Balancing protein and energy will help birds to mobilize fat from the body for energy rather than obtaining extra energy in the feed. The disadvantage to this feeding approach is that feed intake increases and may subsequently increases feed costs.

Lighting programmes - Typically broilers are exposed to high amounts of light throughout life in order to encourage feeding behaviour for maximal growth. Implementing a strategic lighting programme may increase feed efficiency and reduce growth rates. Decreasing the growth rate early in life can be accomplished by maintaining short day lengths early on (up to 2 weeks of age) and gradually increasing the day length with the use of a step-up lighting programme. The final step should maximise the photoperiod at 23L:1D. This type of lighting programme allows birds the appropriate time for rest when it is dark and for feeding when it is light. Resting during the dark period is beneficial and even necessary because it reduces energy requirements used for maintenance while continuing skeletal development.

Summary
From the above it can be concluded that managing today’s commercial broiler is much more complex than it was years ago. The most dramatic change has been the increase in growth rate and it seems that the achievement of this trait has not yet ceased. Breeder companies are continually looking for ways to increase growth rate so that market age is reached at less than 40 days without compromising final body weights, carcass weights and carcass composition. But we all have to realise that such rapid growth rates could be detrimental to the health welfare of the bird if management is not carefully carried out.