Can Variations in Lighting and Nutrition Reduce Feather-pecking in Broilers?

Discusses whether manipulating light and nutrition regimens can diminish feather-pecking behaviour in broiler flocks.

By Dominique Chan

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Introduction

Feather-pecking is a stereotypic behaviour prevalent in the poultry industry, and it is of rising significance in broiler flocks (Morrissey *et al*., 2014). There are two forms of feather-pecking: gentle feather-pecking where feathers are pecked but not removed, and severe feather-pecking, which causes damage and removal of feathers (Dixon, 2008). Severe feather-pecking is of particular concern as it causes significant pain to the target bird and can lead to skin lesions and cannibalism of the exposed flesh (De Jong & Guemene, 2011). This has welfare implications for the birds, and decreased productivity and increased flock mortality are responsible for economic losses. Feather-pecking behaviour is a multifactorial problem, and previous studies have identified environmental, nutritional and genetic influences (Lambton *et al*., 2010; Hocking *et al*., 2004; Bennewitz *et al*., 2014). Commercially, broilers are feed-restricted during their rearing period to prevent obesity and premature death (Van Krimpen & De Jong, 2014). However, this leads to frustration due to chronic hunger and can contribute to the onset of feather-pecking (De Jong & Guemene, 2011). This paper will discuss recent research into manipulation of lighting and nutrition and the potential for this to decrease injurious feather-pecking in broiler chickens.

Discussion

A study conducted by Kim *et al.* (2014) indicates the potential of using lighting to influence broiler behaviour. Eight-week-old broilers (n=8) were exposed to light and dark periods as well as different colours of light in a respiration chamber, and their energy expenditure and behaviour were observed (Kim *et al*., 2014). In experiment 1, the chickens were subjected to six cycles of alternating two-hour periods of light and dark conditions for four days. In experiment 2, four different colours of lighting were used, where chickens were exposed to two-hour periods of white, red, blue and green light per day, over three days (Kim *et al*., 2014). Energy expenditure was calculated by monitoring oxygen consumption, while behaviour was observed through closed-circuit television and classified into three categories: pecking (at floor or feathers), standing and resting (Kim *et al*., 2014). It was found that both energy expenditure and pecking behaviour was higher in the presence of light (Kim *et al*., 2014). Although it is unclear as to how much specific feather-pecking behaviour the birds engaged in, these results align with those of a study conducted by Alvino *et al.* (2009), which concluded that high-intensity light increased behaviours such as feather-pecking and foraging in broilers. Experiment 2 showed that the broilers most frequently engaged in pecking behaviour when exposed to blue light, followed by white, green then red light (Kim *et al*., 2014). This finding is consistent with a study conducted by Schumaier *et al.* (1968), which showed less cannibalism in chickens exposed to red fluorescent light. It can be concluded from these results that a potential means of decreasing feather-pecking behaviour is the implementation of artificial, red-coloured lighting for a decreased photoperiod length. However, as the study performed by Kim *et al.* (2014) spanned only 7 days, further research is needed to investigate whether or not long-term exposure to red lighting has welfare implications for broilers.

Another proposed method of reducing feather-pecking is by applying feeding regimes that incorporate alternatives to commercial diets (Van Krimpen & De Jong, 2014). A study by Morrissey *et al.* (2014) examined the effect of including soybean hulls, to increase dietary fibre content, and adding calcium proprionate (CaP), which suppresses appetite. These ingredients were selected to alleviate hunger as there is substantial evidence of an association between feather-pecking, chronic hunger and the unsatisfied natural need to forage (De Jong & Guemene, 2011; Lambton *et al*., 2010). In the experiment by Morrissey *et al.* (2014), broilers (n=342) were fed either a commercial diet or an alternative diet (containing soybean hulls and CaP) and feather scoring was performed when the birds were 10, 14, 20, 26, and 36 weeks of age. The results showed that broilers fed the alternative diet had significantly better feather condition than those fed the commercial diet (Morrissey *et al*., 2014). It was also observed that birds on the commercial diet engaged in feather-pecking behaviour more frequently (Morrissey *et al*., 2014). However, as roosters were introduced to each experimental pen to imitate a production setting, it is unknown how much feather damage was caused during mating.

In addition to the aforementioned alternative diet, lowering dietary protein levels has been shown to decrease stereotypic pecking behaviour (van Emous *et al*., 2014). In this study, broilers were raised using three crude protein levels (low, medium and high) to assess the effect of dietary protein levels on feather-pecking. Daily observations revealed that the birds on medium and low protein diets participated in less pecking behaviour than those on the high protein diet (van Emous *et al*., 2014). This is attributed to higher feed intake of the lower protein diets to meet protein needs. As the birds spent more time eating, they had less time to engage in feather-pecking (van Emous *et al*., 2014). Thus, implementing a feeding regime with reduced dietary protein, increased fibre content and an added appetite suppressant (e.g., calcium proprionate) is a potential means of reducing feather-pecking behaviour. Further research is required to provide evidence on the efficacy of alternative diets. If shown to be effective, adopting such a diet would be a practical way of increasing the welfare of broilers by decreasing feather-pecking, which leads to a deterioration in health.

Conclusion

The three studies conducted by Kim *et al.* (2014), Morrissey *et al.* (2014) and van Emous *et al.* (2014) have together shown that feather-pecking behaviour may be decreased by altering lighting conditions and implementing alternative diets. By exposing broilers to shortened photoperiods of red light and using low dietary protein diets with increased fibre content and the addition of appetite suppressants, farmers can improve the health and welfare of their broiler flocks by minimising feather-pecking behaviour.

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