The Importance of Reducing Stocking Density to Improve Broiler Welfare

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Introduction

As global meat consumption continues to rise and consumers show ever more interest in the origin of their food, maintenance of the welfare of production animals has never before been so important (Decuypere *et al*., 2010). Of all the production animals, broiler chickens are the most intensively farmed, often to the detriment of their welfare. Although there are several elements to be considered with regard to broiler welfare, this essay focuses on stocking density – a major welfare concern in conventional broiler farming today (Petek *et al*., 2010).

Discussion

Stocking densities vary considerably with various countries and husbandry systems (Buijs *et al.,* 2009). Although there is a clear positive correlation between stocking density and economic return (Buijs *et al*., 2009; Petek *et al*., 2010), studies have shown that higher stocking densities compromise the welfare of animals involved. As the stocking density increases so do metabolic waste and heat production, with temperatures above housing litter frequently exceeding 30˚C (Meluzzi & Sirri, 2009).

Quinteiro-Filho *et al.* (2010) set out to investigate the effects of heat stress, such as that associated with high stocking densities, on performance, serum corticosterone concentrations, intestinal histology and peritoneal macrophage activity in broiler chickens in order to explore the influence of the nervous system on the immune system (neuroimmunomodulation). They housed 360 day-old broiler chicks in environment-controlled rooms for 42 days with 10 birds per square metre. Water and food were provided *ad libitum*. For the first five weeks, all the chickens were maintained at the same temperatures (33˚C, 28˚C and then 24˚C). On Day 34, they were sorted into three groups: a control group and two independent heat-stressed groups. The chickens in the control group were kept at 21˚C all day while the temperature for the other groups was increased to 31˚C and 36˚C respectively for a single 10-hour period daily. On Day 42, blood was collected to evaluate serum corticosterone concentrations and the lymphoid organs and small intestine of the birds were harvested following euthanasia. Performance was assessed through mortality rate, bodyweight (BW) gain, food consumption per bird and feed conversion ratio (FCR).

The results of this study showed that heat stressors decrease BW gain and food consumption. In the group of chickens exposed to 36˚C, 43.33% mortality was observed within the first two days. There was a decrease in the weight of the lymphoid organs of the heat-stressed birds as well as a significant increase in serum corticosterone concentration relative to the control group. In the jejunum of most of the heat-stressed birds, there was evidence of enteritis and the peritoneum showed reduced macrophage activity. These changes provide evidence of neuroimmunomodulation in chickens by showing that heat stress supresses the immunity of broiler chickens. Hence, by preventing heat stress in broilers, both welfare and individual productivity will improve.

In another study, Petek *et al.* (2010) investigated the effect of different lighting programs, stocking densities and litter amounts on the welfare and productivity of broilers. Twelve treatment groups based on lighting (continuous/intermittent), stocking density (15, 19 and 23 birds/m^2) and litter amount (5 or 7½ kg of rice hulls per m^2) were set up and 684 day-old chicks randomly assigned to them. Feed and water were provided *ad libitum*. Data on growth were collected from Day 1 to Day 35 by weighing birds individually and assessing food intake. Litter samples were collected from each pen on Days 1, 21 and 35 to determine moisture and pH. Welfare was assessed via mortality, blood parameters and footpad lesions at the end of the experiment and meat quality was gauged by means of meat pH after slaughter.

It was found that at densities above 19 birds/m^2 chickens grew more slowly and had a lower FCR than at lower densities. There was less uniformity in the BW of these birds but meat quality was unaffected. Also, as the stocking density increased, litter moisture, pH and footpad lesions increased. Lighting had no significant effect on growth, meat quality or welfare. However, it was found that low amounts of litter in high-density pens resulted in the worst footpad lesions. Therefore, using more litter is a possible strategy for improving the welfare of broilers in high-density housing.

In a novel approach to investigate the role of stocking density in broiler welfare, Buijs *et al*. (2011) conducted a study to assess broilers' preference for space. Two experiments were set up: a feeding motivation experiment and a density preference experiment. In the feeding motivation experiment, 16 chickens were randomly selected from a group of identically raised birds. Each bird was placed at one end of a closed runway with a feeder at the other end and an adjustable barrier between them. The number of birds crossing the barrier at different heights was recorded. Birds were then deprived of food for six hours before being retested. The maximum height 75% of the non-deprived birds crossed was used as the "low barrier" height for the density-preference experiment while the maximum height 75% of the deprived birds crossed was used as the "high barrier" height. In the density preference experiment, four pens were set up, each housing 104 birds. Each pen had two compartments, one of which was adjustable to create different densities (9.3, 12.1 and 14.7 birds/m^2). The fixed compartment had a constant density of 14.7 birds/m^2. The compartments were separated by the same adjustable barriers set at either the low or high barrier heights described above. Regardless of barrier height, considerably more broilers moved to the adjustable compartment from the fixed compartment than vice-versa if the density was below 14.7 birds/m^2. This demonstrates that broilers prefer lower stocking densities and are willing to work for increased floor space allowance.

Conclusion

The above studies demonstrate that reducing stocking density on broiler farms will significantly improve broiler welfare. However, because stocking density is so critical in maintaining economic viability, further research should be conducted to find an optimal stocking density at which suitable levels of broiler welfare and economic return are achieved.

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