Effects of Colony Cages on Chickens

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There is growing interest in keeping meat chickens in modern colony cages (CCs) rather than conventional litter-floor barns. Researchers aim to determine the animal welfare impacts of CCs using slatted flooring, in comparison to litter-based non-cage systems. Significant welfare concerns exist about CCs, centring around behavioural deprivation. Given that over 70 billion chickens are farmed then slaughtered each year globally, widespread implementation of CCs would create a major animal welfare concern.

Keywords: broiler chicken ; meat chicken ; chicken behaviour

1. Introduction

Chickens are the most intensively farmed terrestrial animal species. From 1970 to 1990, the global population of chickens alive at any time during each year doubled. This further tripled over the next thirty years, exceeding 33 billion by 2020. Most are meat breeds slaughtered after only a few weeks. Hence, many more chickens are slaughtered annually, than the living population. Over 71 billion chickens were slaughtered annually by 2020 (**Figure 1**) [1].

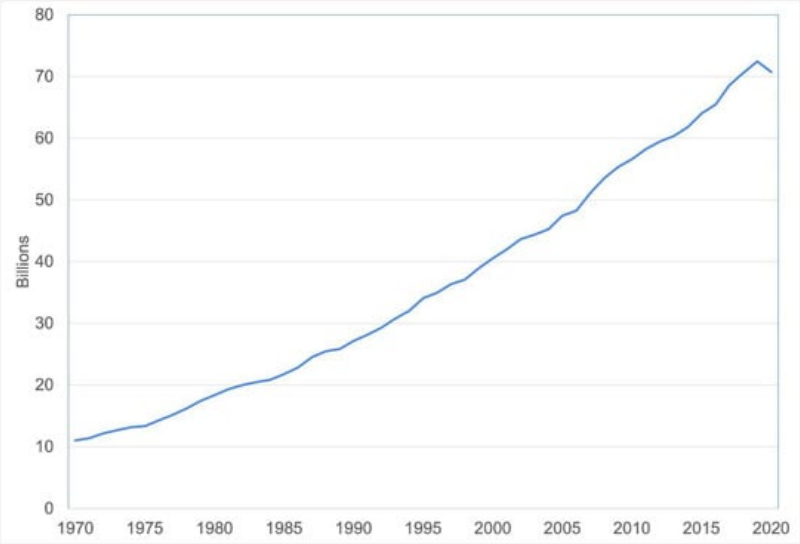

Figure 1. Chickens slaughtered globally. Data source: [1].

To maximise efficiencies of production, minimising feed, housing and management costs, most meat poultry production systems have relied on large group sizes and high stocking densities—typically with thousands of birds housed within barns on deep litter systems [2]. Recently however, some industry suppliers have developed multi-tier colony cages (CCs) for growing meat chickens. The Big Dutchman company, for example, markets CCs designed to house 60–120 growing chickens, in 50 cm high cages. The cages are designed to stack vertically (designs are provided for systems four tiers high, although some farms may use additional tiers as noted below), yielding “two to four times higher stocking density as compared to floor production” [3]. Cages are designed with front-opening panels facilitating removal. The increased production efficiencies offered by such systems could stimulate their widespread adoption, transforming meat chicken production globally. However, in light of the numbers of chickens potentially affected, this could have major implications for animal welfare.

The litter-free plastic flooring within the Big Dutchman CCs is slatted, allowing manure penetration onto plastic sheets for later removal. The company claims this system increases hygiene and reduces welfare problems such as feet, breast, and skin injuries, and infections [3]. However, such systems further inhibit the ability of chickens to fulfil highly motivated

behavioural needs, compared to chickens raised in barns, such as foraging, dustbathing, and perching [2]. Accordingly, concern exists about the impact of such systems on poultry welfare.

To assess such impacts, researchers conducted a systematic review to identify and evaluate studies of the welfare impacts of raising meat chickens within CC or litter-based systems. Cage systems invariably included slatted flooring, allowing manure egress. Such slatted flooring can create risks of abrasions, skin, foot, and leg injuries. Accordingly, researchers also aimed to identify and consider studies of the welfare impacts of slatted flooring.

2. Could Colony Cages with Slatted Floors Improve Chicken Welfare?

The most similar housing type to that of modern CCs featured in the study by Şimşek et al. [4]. The modern CC used was designed by the company Kutlusan [5]. It incorporated automatic faeces removal via conveyor belt, automated chicken movement to transportation crates (for onward transport to slaughter) also via conveyor belt, and a flexible plastic mesh slatted floor. This Turkish study found significantly higher serum malondialdehyde levels—indicative of stress—in chickens in the CCs, than in those reared on litter floors. It also found more wing/breast bruising and wing fractures in the cages, which the authors attributed to the automated conveyor belt process transporting chickens to collection crates. The study did also find higher footpad lesions in litter floor systems, but this welfare issue was far from absent in the cage system.

On the face of it, several factors initially appear to indicate that CCs with slatted floors could improve, or at least not decrease, meat chicken welfare: (1) some evidence suggests welfare improvements relating to footpad dermatitis (FPD), hock burn, and breast blisters, especially using soft, flexible slatted floors compared to more abrasive materials such as hard plastic, wire, or wood—although evidence is mixed; (2) ‘touch-free’ automated onward movement systems could decrease handling stress; and (3) the shortened lifespans of meat chickens until slaughter (around 35 days is common), can lower cumulative welfare impacts, compared to longer-lived chickens. These factors will be considered in turn.

First, claims exist of increased incidence of FPD, hock burn, and breast blisters in littered barns, relative to slatted floors [3][6]. This can result from greater bodily contact with contaminated flooring in littered systems due to increasing contamination with faeces and urine over time, and increasing immobility as chickens gain weight. It is true that these are pressing welfare concerns [2]; however, there is a lack of consistent evidence for improvements of these welfare problems when using slatted floors. **F**or instance, shows a comparable number of studies simultaneously claiming (1) litter to be the best floor type for avoiding FPD, breast blisters, and/or hock burn; (2) a slatted floor to be the best floor type for avoiding these same conditions; and (3) no significant differences in the prevalence of these same conditions between different floor types.

Evidence is also mixed regarding whether using a soft and flexible slatted flooring material will overcome FPD, hock burn, and breast blister risks. Of the four studies that made their use of a flexible material explicit showed superior welfare outcomes when using a litter floor. However, one did not examine FPD, hock burn, or breast blisters formally [7], one did not compare slatted floor with litter [8], one found higher FPD in litter [4], and one found a significantly lower prevalence of breast blisters in cages, but did not find the same for FPD [9]. Investigators also highlighted concerns with higher incidence [10] or at least an ongoing significant prevalence of FPD in slatted floors. For example, Çavuşoğlu et al. [11], p. 13 reported a 20% prevalence of FPD in slatted floors. Considering these mixed effects of slatted floors on FPD, hock burn, and breast blisters, and other key welfare concerns independent of slatted flooring material, such as behavioural deprivation, it is arguably a distraction to overall considerations of welfare, to focus overly on the effects of slatted floor systems on FPD.

Second, justifications for modern CCs have also been based on claims of decreased chicken stress resulting from ‘touch-free’ transfer from CCs to transport crates via conveyor belts [3][6]. The importance of this should not be underestimated as catching is considered one of the most stressful processes for chickens. However, in these automated modern CCs, the handling time is only reduced, not eradicated, with chickens still being handled afterwards when moving them from the table to transport crates [12]. The systematic review did not identify any studies directly focused on the welfare implications of such automated systems in modern CCs. However, Simsek et al. [4] postulated that the automated conveyor belt system forwarding chickens to transportation could be the cause of the increased wing fractures, and wing and breast bruising, identified in their study. Additionally, there are other automated initiatives that have been studied that could be used in litter floor systems, such as the Apollo Generation 2 chicken harvester [13][14][15]. Importantly, evidence for clear welfare advantages of automated systems relative to the more traditional abdomen-upright manual catching method appears to be lacking, with welfare levels dependent on factors such as line speed, handler training and handler disposition [14][15]. What is clear is that manual catching of chickens via one leg and carrying them in an inverted position risks injuries, is extremely stressful, and should be prohibited on welfare grounds. Simsek et al. [4] have also found a link

between this catching method and increased carcass bruising. Norway has prohibited this practice. Kittelsen et al. [16] even suggested that the abdomen-upright catching method can be faster than catching chickens by the feet.

Thirdly, with respect to the shortened lifespans of meat chickens prior to slaughter, compared to longer-lived animals, Nagar and Dov [6] noted that meat chickens are relatively immobile by six weeks of age (slaughter normally occurs at or before this age), arguing that their welfare may therefore not be very compromised relative to laying hens in cages. However, anecdotal evidence from those rescuing ex-meat chickens suggests that, with modified husbandry practices, meat chickens can walk, jump, and even fly at ages well surpassing industry slaughter ages [17]. Thus, there needs to be an emphasis on how to increase and optimise movement of meat chickens through nutritional, enrichment, and other husbandry improvements, as they are not irrevocably destined to immobility by six weeks of age.

3. Conclusions

Sixty five percent of the 23 most relevant studies retrieved and reviewed raised some form of welfare concern about slatted floors, and thus about modern CCs. Moreover, 100% of the empirical studies reviewed utilised incomplete behavioural analyses (if these were used at all). Thus, significant welfare concerns exist about modern CCs, centring around behavioural deprivation. Furthermore, their design constraints severely limit their potential for overcoming this problem. Additionally, a full behavioural analysis, as detailed in the Welfare Quality Assessment, should form a mandatory part of any future studies aimed at assessing the welfare impacts of housing systems on chickens.

References

1. Food and Agriculture Organisation of the United Nations (FAO). FAOSTAT: Crops and Livestock Products. 2022. Available online: https://www.fao.org/faostat/en/#data/QCL (accessed on 24 October 2022).
2. Widowski, T.M.; Rentsch, A.K. Farming poultry. In Routledge Handbook of Animal Welfare; Knight, A., Phillips, C., Sparks, P., Eds.; Routledge: Abingdon, UK, 2023; pp. 47–63.
3. Big Dutchman. AviMaxtransit: The Multi-Tier System for Hygienic, Efficient and Successful Broiler Growing; Big Dutchman: Holland, MI, USA, 2022.
4. Şimşek, G.Ü.; Erişir, M.; Çiftçi, M.; Seven, P.T. Effects of cage and floor housing systems on fattening performance, oxidative stress and carcass defects in broiler chicken. Kafkas Univ. Vet. Fak. Derg. 2014, 20, 727–733.
5. Kutlusan. Broplus Broiler Cage System with Drawer. 2021. Available online: https://www.kutlusan.com.tr/en/broplus-broiler-cage-system-with-drawer/urun-detay/178,132 (accessed on 5 February 2021).
6. Nagar, S.; Dov, D.B. Position Paper–Broiler Rearing in Cages; Israeli Ministry of Agriculture and Rural Development Veterinary and Livestock Health Services: Hadera, Israel, 2020.
7. Massey, J.W. Comparison of Broiler Breeder Production and Fertility in a Colony Cage System with Two Different Floors Versus a Slat-Floor System; West Virginia University: Morgantown, WV, USA, 2002.
8. Chen, Q.; Saatkamp, H.W.; Cortenbach, J.; Jin, W. Comparison of Chinese broiler production systems in economic performance and animal welfare. Animals 2020, 10, 491.
9. Li, H.; Wen, X.; Alphin, R.; Zhu, Z.; Zhou, Z. Effects of two different broiler flooring systems on production performances, welfare, and environment under commercial production conditions. Poult. Sci. 2017, 96, 1108–1119.
10. Kaukonen, E.; Norring, M.; Valros, A. Effect of litter quality on foot pad dermatitis, hock burns and breast blisters in broiler breeders during the production period. Avian Pathol. 2016, 45, 667–673.
11. Çavuşoğlu, E.; Petek, M.; Abdourhamane, I.M.; Akkoc, A.; Topal, E. Effects of different floor housing systems on the welfare of fast-growing broilers with an extended fattening period. Arch. Anim. Breed. 2018, 61, 9–16.
12. Animals Now. Investigation team footage - catching of the chickens. Personal Communication, 7 January 2021.
13. CMC Industries. Apollo Generation 2-The Chicken Harvester. 2016. Available online: https://www.youtube.com/watch?v=YqzpIqwpOdQ (accessed on 6 February 2021).
14. Mönch, J.; Rauch, E.; Hartmannsgruber, S.; Erhard, M.; Wolff, I.; Schmidt, P.; Louton, H. The welfare impacts of mechanical and manual broiler catching and of circumstances at loading under field conditions. Poult. Sci. 2020, 99, 5233–5251.
15. Wolff, I.; Klein, S.; Rauch, E.; Erhard, M.; Mönch, J.; Härtle, S.; Louton, H. Harvesting-induced stress in broilers: Comparison of a manual and a mechanical harvesting method under field conditions. Appl. Anim. Behav. Sci. 2019, 221, 104877.

16. Kittelsen, K.E.; Granquist, E.G.; Aunsmo, A.L.; Moe, R.O.; Tolo, E. An evaluation of two different broiler catching methods. Animals 2018, 8, 141.
17. Vegans with Chickens. Post by Treetops Jen. 2021. Available online: https://www.facebook.com/groups/VegansWithChickens/permalink/4307230129293310 (accessed on 5 February 2021).