US BROILER CHICKEN WELFARE

BETTER CHICKEN COMMITMENT

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INTRODUCTION

Over the past century, the broiler chicken industry has worked to increase chicken production through breeding and husbandry techniques, resulting in a bird that grows to 2.5 times the slaughter weight of a chicken in 1925 in 58% less time.[1] This focus on production neglected a relatively new science, animal welfare. The term "animal welfare" refers to the ability of an animal to cope with its environment,[2] and is comprised of three facets: health, affective states, and natural living.[3] When studying animal welfare, scientists examine both inputs and outcome-based measures. Inputs refer to what an animal is given (e.g., lighting conditions, feed, enrichment). Outcomes are measures of how an animal responds to an input (e.g., rates of footpad lesions resulting from litter conditions). While outcome-based measures are essential to assessing animal welfare, when they indicate poor welfare, it is too late for those individual animals. In the broiler chicken industry, where animal suffering is a chronic issue,[4–6] it is essential that animal welfare is protected through ensuring baseline levels of inputs that offer chickens the opportunity to experience "a life worth living".[7] A list of relevant outcomes can then be used to ensure that these inputs, paired with good husbandry, elicit a positive welfare state.[8]

Animal welfare scientists generally work to reduce animal suffering. We know that animals can suffer,[9,10] and they do, in very large numbers. Of the ten billion animals raised and killed for food every year in the United States, 90% of those are chickens,[11–13] with poultry production expected to rise.[14] Broiler chickens suffer from a wide range of health and welfare issues; and yet, with changes to genetics and husbandry, suffering can be greatly alleviated in commercial production.[15] These changes are outlined in the Better Chicken Commitment, and include a shift to alternative breeds, lower stocking densities, better lighting conditions, enriched environments, cleaner litter, and a transition away from live-shackle slaughter to controlled atmosphere stunning.

THE IMPACT OF BREED

A large body of research has examined the heritability of welfare outcomes as well as their association with different breeds of broiler chickens. By transitioning away from the most commonly used commercial breeds, which we define as typically faster growing and intensively raised with enlarged breast muscle (e.g., Ross 308, Ross 708, and Cobb 500), common welfare problems including reduced walking ability and activity, high mortality, and the presence of skin lesions can be greatly improved.

WALKING ABILITY

Research suggests that current commercial broiler chicken breeds, growing quickly to a heavy weight, are predisposed to leg weakness and skeletal abnormalities. This is due to an abnormally high weight gain on relatively immature bones and joints.[16] Angular bone deformity, tibial dyschondroplasia (lack of bone formation of the tibia), and osteochondrosis (abnormal bone growth which can lead to tissue death) are skeletal defects associated with rapid growth that result in reduced activity and feeding.[17–22] When compared to alternative breeds, commercial broiler chickens exhibit reduced walking ability[23] and much more lameness,[24–26] with skeletal abnormalities being a common cause.[17,26] Such bone abnormalities restrict movement, increase risk of injury, reduce the ability of a bird to eat and drink,[21] and are painful.[27–29] There is also a clear link between first-week mortality on farms and lameness.[30] Selection for fast growth and top-heavy conformation also affect general walking ability. While fast weight gain puts stress on the immature skeleton, the change in conformation due to a large breast muscle mass alters walking patterns.[23] A study comparing the walking pattern of alternative breeds and commercial breeds (Ross 308) found that the Ross birds walked slower, took shorter steps, and had decreased cadence as they grew heavier.[23] The slower walking speeds are believed to be a coping mechanism to minimize skeletal stress and reduce discomfort in fast-growing commercial broilers.[28]

ACTIVITY

In addition to causing bone abnormalities, rapid growth also creates a high metabolic demand[31] that reduces energy available for activity[32] and negatively impacts the ability of broiler chickens to move.[33] Because standing and walking may cause discomfort and pain,[32,34] activity is significantly reduced (with 53-86% of the time spent resting)[32,35–41] when compared to the chicken's wild ancestor, the red junglefowl (who spends just 10% of the time spent resting)[42] and to modern alternative breeds.[39] Alternative breed birds, which grow slower, can walk, run and use perches more than those that grow faster.[33] The low activity levels and increased sitting and lying toward the end of the rearing period may also be correlated to plumage dirtiness; clean plumage is also considered important for thermoregulation.[43] Despite their lack of ability, the motivation, or internal, biological drive, to move and perch is still present.[33,44,45]

PERCHING MOTIVATION AND ABILITY

Perching is a natural behavior of chickens - in the daytime it gives birds an elevated vantage point to monitor their surroundings, and at night it provides a sense of security from predators.[46] While the need for vigilance is decreased with domestication, the desire to perch has not been eliminated.[46] However, commercial broilers perch less than laying hens and this may be because rapid growth and body weight prevent expression of the behavior.[46] Leg weakness[47] and altered body proportions[48] reduce broilers' ability to access perches and balance. In a study comparing the Ross 308 (common commercial breed) with the Rowan Ranger and Hubbard CY JA57 (intermediate growth alternative breeds), the Ross 308 perched significantly less than the other breeds during the day and at night, and only used the lowest perches.[49]

SKIN LESIONS

Broiler chickens are typically reared in indoor broiler houses atop a floor covered with litter (typically wood shavings or a similar material), which is used for thermal insulation and cushion from the cement flooring beneath.[50,51] Birds resting on damp dirty litter have a heightened risk of ammonia burns on the skin, which can get worse over time, developing from mild to more severe inflammation which can then ulcerate.[52,53] Such lesions are likely painful.[53] Ammonia burns to the skin can cause breast blisters, hock burn, and footpad dermatitis. Hock burn and footpad dermatitis are correlated conditions caused by inflammation of the skin on the plantar surface of the hock (underside of the leg)[54] and the footpad. Foot pad lesions have been reported in 25 - 70% of birds[55–58] in broiler flocks (translating to around 2.5 - 7.5 billion birds annually[59]). There is also a genetic predisposition.[53,60–64] Poor feathering may also predispose birds to skin lesions. With broilers reaching slaughter weight at an immature stage, down feathers may still be present around the head, neck, and possibly the abdomen.[65] Poor feathering leaves unprotected skin prone to skin damage and possible infection.[66] Environmental conditions, particularly poor litter quality, are the major risk factor for FPD, hock burn and breast blisters.

Broiler genotype is among the main factors impacting prevalence of FPD, with the rapid-growth broiler genotype associated with deeper footpad lesions than slower-growing genotypes.[58] Underlying this relationship might be the differences in skin physiology and immune response. When compared to leghorns (a common breed used in egg production), the skin of fast-growing broiler breeds has been found to be more susceptible to injury and has a slower healing process, due to a combination of an inherent, structural skin weakness (including a thinner dermis layer, poorly defined connective tissue, and erratic collagen fibres), skin with a pH level favorable to E.coli colonization; and once infected, poor immune response to the infection site and lower quality white blood cells unable to contain the spread of infection.[67] Significant differences have also been reported between the fast growing breeds Ross 308 birds and Cobb 500 birds on footpad scores.[68] Since there is genetic predisposition to broiler foot pad lesions, using breeds with better skin integrity and healthier feet can help improve the welfare of broiler chickens.

MORTALITY

In recent years, the average mortality on US broiler farms has increased to 4.4 percent at 47 days of age.[69] A major cause of mortality is cardiovascular disorders,[70] including ascites (otherwise known as 'water belly' caused by fluid accumulating in the abdomen).[71] This is a multifactorial disorder that is chronic, causing discomfort and stress. It is estimated that up to 5% of broilers die from ascites.[72] The condition is linked to the high metabolic demands of rapid growth and is more common in heavier, male chickens.[73–75]

Another common cardiovascular disorder suffered by broiler chickens is 'sudden death syndrome' (SDS; also called 'flip over' by producers). Typically seen in heavy males when they are acutely affected by stress, birds suddenly begin violent wing flapping, and die within minutes.[74][73–75] It is estimated to cause mortality rates of 0.5% - 4% in broiler flocks equating to 50 million to 400 million birds a year.[76]

Heavy, rapidly growing broiler chickens are also predisposed to bacterial bone infections.[30] The sheer force of the bird's heavy body weight on immature cartilage damages the growing tissue and can lead to infection.[77] Bacterial chondronecrosis and osteomyelitis (BCO) are both significant causes of lameness and mortality in intensive systems.[30,70,77]

DEAD ON ARRIVAL (DOA)

Modern broiler chickens are predisposed to thermal stress, altered heat exchange capacity, and muscular pathologies. Along with cardiovascular weakness, these abnormalities reduce their ability to withstand transport stress.[78] The genetic predisposition to thermal stress is also thought to contribute to seasonal effects of 'Dead on Arrival' (DOA) birds, and this is more pronounced in extreme thermal conditions and over longer distances (up to 28 hours).[79–83]

THE IMPACT OF ENVIRONMENT AND SPACE

LITTER

Friable litter (material that crumbles easily) is a good substrate for dustbathing, an instinctive behavior that birds perform to keep their feathers clean and in good condition. Birds are highly motivated to dust bathe, and as dustbathing is a communal activity, there should be adequate daily access to loose, dry litter for all birds to avoid competition and frustration.[84] Various substrates have been used for litter with some more suitable for dustbathing than others. As tens of thousands of birds eat, drink, and defecate in the same space, litter quality is key for moisture absorption.[85–90]

Poorly managed (wet) litter can create an environment conducive to ammonia production,[91] which is an irritant to the birds' mucous membranes and respiratory tracts,[91,92] and is a contributing factor to the appearance of skin lesions, most notably foot pad lesions.[50,57,58,85,93] Hock burn levels are associated with litter depth, with models predicting reduced severity for every 1 cm increase in depth.[94] Caked litter is wet litter that forms a manure cap, carrying similar risks and consequences of wet litter.[50,93] Despite wet litter being flagged as a problem nearly 100 years ago,[50,95] the problem continues to be widespread[96] and along with it, the incidence of foot pad dermatitis.

Scientific recommendations on litter address broilers' basic needs for comfort and cleanliness. The provision of sufficient litter throughout the broiler house that is of an appropriate quality (loose, friable, non-toxic) at the outset is required to ensure access for the entire flock. Litter depth of at least 3 inches is reported to accommodate moisture build-up,[97] with 4 inches recommended for colder conditions. If litter is reused for subsequent flocks, caked litter should be removed and replaced with fresh litter.[51,64,90] Assessment of litter friability throughout the production cycle via checking moisture levels whereby litter is sampled in various locations should be performed since moisture may vary spatially within a broiler shed.[50,98]

LIGHT

Vision is a chicken's strongest sense and is impacted by light intensity and day length.[99,100] The light environment cues production of melatonin and plays a key role in creating physiological and behavioral rhythms.[101–103] Despite the fact that inappropriate lighting leads to disruption of circadian rhythms and stress in captive animals including chickens,[38,104–107] chicken producers routinely utilize unnatural light environments to increase productivity.[108,109] The National Chicken Council (NCC) recommends that chickens are provided with four hours of darkness per day (which needn't be continuous) with no recommendation on intensity.[110] While the NCC states that there is "no conclusive research on the optimum light intensity for broiler chicken health and welfare," a large body of research reveals that intensity, day/night contrast, and length of the dark period all affect welfare.

Research demonstrates that low light intensity is detrimental to welfare with impacts on activity,[41,105,106] performance of comfort behaviors,[38,111] flock synchronicity and resting ability,[38,104–106] and the ability to communicate socially,[112] as well as leg,[105,113,114] eye,[105,106,113,114] and immune system health.[106] When compared to industry standard light intensities of 1-6 lux, activity,[115] preening,[116] and foraging [117,118] were all more common at higher light intensities, with 50 lux being the lowest intensity demonstrated to increase all three behavior patterns. Research shows that the contrast between day and night light intensity provides important environmental cues allowing the entire flock to rest simultaneously;[119] flocks are more synchronous with contrasts of 1 lux night to 50 lux day.[38,104–106] Finally, the incidence of footpad lesions,[113,114] poor leg health,[105] and eye abnormalities[105,106,113,114,120] decrease with increasing light intensity, while immune health increases.[106] The current research shows that light intensity must be kept above 50 lux to avoid negative impacts on behavior, rest, and health. Despite this knowledge, chicken producers often raise chickens at 5 lux intensity to limit activity but maintain high feeding motivation.[113,114,121] For comparison, office buildings are lit to 500-750 lux.[100]

The duration of the dark period also impacts health and welfare. Dark periods of less than seven hours result in decreased activity and comfort behavior,[122] inability to form sleep cycles,[115,119,122] reduced leg health,[120,123] eye health,[99] and increased mortality.[109,120,124] Research shows that broilers given 7 - 10 hours of nightly darkness had the lowest mortality, including reduced rates of sudden death syndrome and ascites, and less pathological skeletal issues, while simultaneously increasing leg and foot health activity, feeding, drinking, preening, dustbathing, leg and wing stretching, and litter pecking and resulting in distinct behavioral rhythms.[119,120,122] This is corroborated by research finding walking ability improved with increased dark periods.[125] Given these clear impacts on health and welfare, current dark periods should be increased from the standard four hours to a minimum of six hours, and must be continuous.

STOCKING DENSITY

A major contributor to poor broiler welfare is high stocking density (SD).[126] High SD reduces freedom of movement, including the ability to adequately perform natural, highly motivated behavior.[127–131] Under experimental conditions, broiler chickens preferred less crowded spaces.[132] Higher SD in broilers impedes preening behaviour, likely due to disturbance by other birds[130]. Densely stocked broilers show increased fearfulness in response to humans, probably as a consequence of the aversive conditions.[127,133] Birds at high SD have been shown to prefer lying next to walls, which is thought to function as avoiding disturbance due to overcrowding to enable birds to rest.[131] High SD also increases manure build-up reducing litter and air quality. [134–137] It can increase susceptibility to disease, including experimentally-induced Salmonella enteritidis infection [138] and necrotic enteritis.[139] High SD can decrease plumage cleanliness, increase skin and leg lesions, increase mortality, and impact carcass quality.[129,130,137,140–147] High SD can also increase stress,[128,143,145,148,149] and reduces productivity and growth.[128,134,136,137,143,150] Leg weakness is significantly reduced at lower stocking densities,[146,147] and in one study at around 34 kg/m^2, even at the lowest SD, over 3% of birds suffered severe lameness compromising their ability to access feed and water.[146]

High SD can impact the welfare of broilers indirectly due to poor litter and air quality, temperature and humidity.[151,152] Due to restricted space, locomotor and litter directed behavioral activity are likely to be increasingly constrained by stocking densities above 6 lbs./ft². Higher SD also leads to skin problems from reduced litter quality, likely due to increased leg disorders,[153] which can reduce growth rates, and depress feed intake.[115] Although several studies show greater health, welfare and productivity benefits and bird preference for a lower SD, combined research results indicate a steep reduction in welfare beyond a maximum of 6 lbs./ft² (30 kg/m²).[147,153] While lowering stocking density improves broiler welfare, it should be done in combination with other housing, management and genetic improvements.[135] In other words, in well controlled environmental conditions, a maximum of 6 lbs./ft² is suggested, and lower stocking densities considered in less well controlled conditions[154].

ENVIRONMENTAL ENRICHMENT

Environmental enrichment is defined as: "an improvement of the environment of captive animals, which increases the behavioral opportunities of the animal and leads to improvements in biological function".[155] Increasing motivation and exercise opportunities through enrichment has positive effects on broiler welfare. The addition of enrichment items, such as perches, platforms, panels, straw bales, and pecking objects, has been shown in research trials to improve leg health and increase activity levels.[156] Exercise, in turn improves leg health by strengthening muscle and bones.[157 158]

In alternative breeds with outdoor access, providing access to perches inside the house increased the percentage of time the birds spent standing.[142,159142,159–161] In indoor environments, the provision of horizontal perches can improve leg health, as perch provision reduces tibial dyschondroplasia.[162] The provision of perches has been positively correlated with increased activity levels, and have been observed to be used by broilers as early as 6 days of age, and on average at 9 days of age.[163,164] Platforms have been found to have positive effects on leg health; birds with access to platforms have improved gait scores, and lower prevalence and severity of tibial dyschondroplasia.[163] Visual barriers may also have a positive effect on broiler behavior and welfare, as they act as areas for shelter.[165] The provision of barriers has been observed to reduce disturbances during rest.[166]

The provision of straw bales has also been observed to positively impact activity levels.[156] When provided in environments with natural light, straw bale enrichments have a positive effect on walking ability and time to lie down.[156] Pecking objects, such as bundles of string have also been found to positively affect walking ability, in conjunction with other environmental factors such as natural light.[167] The provision of multiple enrichments results in higher overall activity levels, and a higher likelihood of birds engaging with the enrichment items.[167]

SLAUGHTER

WATER-BATH STUNNING

Chickens in the U.S. are typically slaughtered in an electrical water-bath system.168 Birds are first hung upside down by their legs in metal shackles on a moving processing line while fully conscious. Then their heads pass through the electrical water bath designed to stun them before their throats are cut by an automated blade.[168] Water-bath stunning was originally designed for speed of slaughter,[169] however, and the system poses a number of serious welfare implications for chickens. The inversion of the birds into shackles is stressful and likely to cause pain.[170–173] Birds sometimes exhibit wing flapping at inversion and this can lead to dislocations and bone breakages.[168] The metal shackles used to hang birds often do not account for leg diameter variation and this leads operators to force larger birds with thick legs into narrow shackles.[174] Chickens may also experience painful pre-stun electric shocks if their wing tips enter the bath before their heads.[175] Birds may be stunned incorrectly or miss the stun bath altogether by raising their heads and missing the water.[168] Even when their heads do enter the water bath, if the current and frequency do not meet the required parameters to ensure unconsciousness, the stun may be ineffective and leave the birds conscious, having suffered a painful electrical shock, to experience their necks being cut.[168] In 2016 over half a million birds[176] were registered as cadavers post-mortem at the slaughterhouse, meaning they died for reasons other than slaughter. These birds were possibly alive and conscious when entering the scald tank.[168]

Slaughter conditions are improved by the use of controlled-atmosphere killing (CAK), which involves irreversible stunning of birds before slaughter using gas instead of electricity. This may be an inert gas, such as argon or nitrogen, or a mixture of carbon dioxide and other gases.[168] Birds are stunned and then killed by exposure to the gas or gases. CAK eliminates the need for live handling, shackling, and inversion of conscious chickens and should ensure chickens are fully unconscious at neck cutting and dead by the time they reach the scald tank.[168,177]

BETTER CHICKEN COMMITMENT

SUMMARY

The narrow focus of the modern broiler industry on productivity and efficiency has resulted in major welfare concerns and suffering for billions of broiler chickens every year. Current standards and policy fall short of the basic welfare requirements for broiler chickens, as determined by extensive research in the field of animal welfare science and related disciplines. The science has also made clear that animal welfare is a complex concept, and that its adequate assessment requires a comprehensive approach, such as the Better Chicken Commitment, that addresses the importance of each of the facets of animal welfare: health, affective states, and natural living. The interaction and interdependence of these three aspects of welfare cannot be overstated. Walking ability, for instance, which is significantly impaired in common commercial breeds, is affected by genetic selection favoring fast growth but there are also other contributing factors such as poor litter quality, high stocking densities, and dim lighting.

The complexity of assessing if birds are provided with what they need to experience "a life worth living" requires attention to both inputs and outcomes.[7] While a focus on outcomes, such as measuring levels of hock burn or assessing feather cover, can give us more accurate information about the actual welfare state of an animal, the role of inputs in determining these outcomes cannot be ignored. The extensive research on the correlations between genetics, environmental inputs, and welfare outcomes underlines the need to implement adequate thresholds for environmental provisions, especially those that severely affect aspects of broiler welfare, such as litter, light, stocking density, and environmental enrichment. Alongside these crucial improvements to the environment, a shift to alternative breeds that have a higher potential to thrive in better environments is essential. After decades of being genetically selected for commercially valuable traits, common commercial broiler breeds no longer have the physical ability to maintain the basic requirement of a "life worth living", even in the best of environments.

BETTER CHICKEN COMMITMENT

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