

# The challenges of animal welfare in modern Brazilian poultry farming



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Received: January 28, 2020 • Accepted: March 14, 2020 • Published Online: April 07, 2020

**Abstract** The Brazilian poultry industry is undergoing a process of increasing rigor regarding production practices related to breeding and pre-slaughter operations since animal welfare is an extremely important subject that has received great attention in the developed countries. Brazil is one of the greatest producers of chicken meat, concerns have existed in the sense of adequacy to continue attending to the demand of export and maintenance of the position of leadership, in front of the other market players. One of the key points is the necessity to improve the intensive farming, which currently has many obstacles that prejudice the basic principles of animal welfare assurance. Relatively simple problems in handling animals, litter and equipment, as well as the lack of preventive maintenance in the facilities are the main ones responsible for the thermal discomfort and quality of life of these animals. Despite all the considerations raised, a large part of the Brazilian consumers is still unaware of intensive farming and the way animals are raising on the farm until their plates, being surrounded by myths and false beliefs. Therefore, the purpose of this review is to address the main critical issues affecting the welfare of broiler chickens in intensive commercial production.

**Keywords:** chicken litter, intensive production, thermal comfort

## Introduction

Animals raised for commercial purposes are beings with the ability to feel pain, emotions and interact with the environment, being considered sentient. There are many definitions of the well-being, but perhaps the most complete and accepted in the scientific milieu is that of Broom (1986) who states that the well-being of an individual is his statement in relation to his attempts to adapt to his environment.

Intensive farming is the predominant structure in the production of chicken meat in Brazil. Advances in the field of genetics have brought benefits and productivity in strains that are better suited to the stages of the poultry industry. It is also noteworthy the advances in the production of vaccines and nutritional area, as well as improved environmental conditions, facilities and high-tech equipment. The different inputs suppliers are important links in the chain and generators of a significant part of the productivity gains in the poultry industry.

However, there is a challenge to be overcome, the way intensive poultry production will attend the requirements of BEA and loss mitigation. Therefore, the aim of this literature review is to address the main critical points that affect the welfare of broiler chickens in the commercial production systems.

## Losses before the broiler farm

"Pre-portress" operations are all activities involving the transport of fertile eggs, the activities carried out in hatcheries and the transport of one-day-old chicks before they are housed in the farms. Several losses occur in this process. For example, the temperature oscillations in the load are harmful for the neonates, as they do not yet have a thermoregulatory system developed. Several losses occur in this process. For example, the temperature oscillations in the load are harmful to the neonates, because they do not have a thermoregulatory system developed. In addition, heat loss in the first days of life affects the acid-base balance of blood and body fluids, reducing maintenance energy and compromising growth (Abreu and Abreu 2011), consequently, these animals are highly dependent on the microclimate around.

Therefore, it is important to point out that losses are always present during the entire production cycle, but it is up

to each integrator to closely review the operations performed in its integrated companies, to reduce them to the maximum extent.

### Losses at the broiler farm

The term "inside the portress" refers to activities during raising the broilers on the farm, until the birds reach approximately 42 days old and are catching for slaughter. This topic will address the losses during the production of broilers on the farm and the factors related to them.

#### Main injuries during raising of broiler chickens

Contact dermatitis, breast blister and scratches are the main carcass lesions in broiler chickens, which are caused by improper handling during the farm period. Such lesions are positively related and can occur simultaneously, being associated mainly with litter quality (Saraiva et al 2016), so it is influenced by a complex interaction of several factors that involve the production system, genetics, stocking density, zootechnical index, flock health, nutrition and farm management (Menzies et al 1998; Nagaraj et al 2007).

Nutrition is important in the development of dermatitis since influencing the consistency of the feces and, consequently, the quality of the litter is related to the improvement of the quality and resistance of the skin (Shepherd and Fairchild 2010). In the study by De Jong et al (2015), reported a lower incidence of pododermatitis and hock burn injury in diets with low energy compared to high energy diets.

The weight of the birds may also influence the development of these lesions since lighter birds do not tend to present hock burns, whereas birds with moderate weight have mild injuries and pododermatitis, and heavier birds may present severe hock burn and breast injuries (Saraiva et al 2016).

The incidence of scratches may be affected by stocking density, the distance between feeders and drinkers, levels of bird activity, feed shortage, farm management, genetic of the birds, transportation, and crate density (Proudfoot 1973; Bilgili 1990; Frankenhuus et al 1991; Broom and Reffmann 2005).

The scratches may have a negative correlation with contact dermatitis, since birds with severe dermatitis in the legs have a lower locomotion ability (Kristensen et al 2006), being less active and lie down longer, being more susceptible to develop breast blister and less capable to scale or inflict scratches on other birds (Allain et al 2009).

#### The broiler litter

Many elements are involved in litter quality directly or influence flock health or behavior, such as temperature and relative humidity of the air indoor and outdoor, production

system, season, genetic of the bird, house lighting, drinking system, litter management (material, depth and reuse of the litter), periods between flocks and nutrition (Bilgili et al 2009; Shepherd and Fairchild 2010; De Jong et al 2015).

Diseases that lead to diarrhea are potential contributors to worsening litter quality, such as intestinal coccidiosis caused by *Eimeria maxima*, *Eimeria acervulina* and *Eimeria necatrix* (Dunlop 2015).

The litter reuse should be carefully thought out, as the accumulation of waste and the lack of adequate management leads to the generation of gases from the microbial decomposition. Ammonia is a colorless gas and mucosal irritant that can injure the respiratory tract of birds. In addition, it predisposes to diseases and increases the risk of infections secondary to vaccinations.

High litter moisture is a multifactorial problem in poultry production (Van Der Hoeven-Hangoor et al 2014) affecting bird welfare, flock health, food security and productive efficiency (Dunlop 2015) defined as wet when it presents more than 25% moisture (Collett 2012).

De Jong et al (2014) observed that very wet litters result not only in a greater number and severity of pododermatitis but also greater severity in hock burns, breast irritation, and dirtier plumage. These same authors found a higher incidence of scratches in groups of broilers raised in litters with low moisture. The justification presented for this observation is that broilers raised in litters with high moisture have greater problems of locomotion, preferring to rest and reducing their activity, as it was also justified by Vestergaard and Sanotra (1999), while the other broilers have more interaction, which leads to an increase in the number of scratches mainly on the thighs.

Although some authors claim that the quality of litter is the most important factor in pododermatitis generation, Kjaer et al (2006) suggest that pododermatitis has a relatively high heritability, and this problem should be included in genetic selection programs. According to Dawkins and Layton (2012), the association between management practices and genetics is an important tool to improve conditions related to the welfare of livestock animals, which according to Federici et al (2016) means that the resolution of welfare problems - such as the incidence of injuries - can go beyond the actions performed by poultry companies through management practices.

It was noted that the litter quality worsens with the increase of the birds' weight; and pododermatitis lesions and walking ability get more severity, due to the increased pressure and the contact surface of the cushions with the litter (Costa et al 2014). Because fast-growing broiler tend to remain seated from the third week of age onwards, with the hock and breast in contact with the litter, increasing the incidence of dermatitis in these regions, which can cause pain and prevent access to the feeder and drinker, leading to lower

body weight gain and bird performance (Allain et al 2009; Alvino et al 2009).

For these reasons, it is considered a challenge to keep the litter dry until the end of the production cycle. Because the birds grow and reach the slaughter weight, and the moisture and nutrients in the litter increase too. Thus, it is necessary a balance between the replacement of the litter, the cost of this exchange, and the availability of alternative substrates, in times of scarcity or difficult access (Bilgili et al 2009).

#### *Stocking density*

Stocking density is a critical factor in the poultry industry. It influences the economic return of broiler production since higher revenues can be obtained by placing more birds per square meter, and the costs of workers' wages, farm maintenance and inputs are diluted (Estevez 2007; Tsioris et al 2015) to the detriment of bird health and welfare. However, bird genetics, farm management, and environmental conditions should be considered to allow a BEA condition and good carcass quality (Moreira et al 2001).

In the literature, there are several international laws and protocols that recommend maximum stocking densities of 30 kg/m<sup>2</sup> to 42.5 kg/m<sup>2</sup> (EC 2007; Welfare Quality 2010; Switzerland 2011; New Zealand 2012).

The stocking density affects litter quality, carcass quality, and broiler performance. It generates increased the litter moisture and affects the severity of locomotor problems. In addition, they have a significant linear effect on the generation of dermatitis, lesions, and injuries, such as bruising and scratching due to agglomeration of birds (Mendes et al 2010). It reduces carcass performance and yield because of lower feed and water intake which leads to lower body weight gain and higher incidence of injury. It results in rejection of these parts in the slaughterhouse (De Jong et al 2014).

The amount and severity of the scratches seem to be affected according to the stocking density of the broilers. Garcia et al (2002), for example, found average values of 15.8, 20.0 and 25.6% of scratches in broilers reared at densities of 10, 13 and 16 birds/m<sup>2</sup>, respectively.

The stocking density may have a positive correlation with the incidence of breast burn and scratches. Because a higher stocking density is related to a lower degree of warping which results in greater exposure of the abdominal skin and contributes to the development of callus and scratches. The birds walk less and spend more time lying on the litter, then it leads to the development of callus. Because of the smaller area, birds are prone to climb, disturb and scratch other birds to access the feeders and drinkers (Harris et al 1978; Allain et al 2009).

There are problems related to high stocking densities and thermal discomfort during broiler raising. According to Bessei (2006), heat transfer from the surface of the litter to the

airspace is inhibited when the area is covered by many birds. But it should be considered that the level of litter compaction is also an impediment to the heat exchange between the litter and the air, because it impairs convection and evaporation, and it can contribute to the thermal stress in the broilers. Higher stocking densities are associated with higher environmental temperatures. It may affect the BEA, especially, when the farm has an inadequate environmental control and it is unable to provide thermal comfort for the birds which it may favor the incidence of scratches on them (Pilleco et al 2011).

#### *Design of farm facilities and thermal comfort*

The design of poultry house is related to the climatic conditions exposed to broilers during the growth period. However, it is necessary to study the relationship of the birds with the environment. It should be integrated with animal behavior, birds' physiology, basic concepts of the environment and production systems (Abreu and Abreu 2011).

Thermal comfort is an issue of extreme importance as it is related to the welfare and performance of birds. Although broilers are capable of regulating body temperature, approximately 80% of the energy obtained from the feed is used to maintain homeothermy and the remaining of the energy is used for other activities (Abreu and Abreu 2011).

Broilers need to be reared in facilities that provide thermal-neutral zones and attend health and nutritional requirements to guarantee welfare and performance of broilers (Baêta and Souza 1997). It is a result of their physiological peculiarity, which eliminates up to 70% of the sensible heat by radiation, conduction, and convection - It is influenced by the environmental temperature - while latent (or insensible) heat loss occurs by evaporation through the skin and respiratory system - where the relative humidity of the air assumes great importance (Abreu and Abreu, 2011).

It has been proven that poultry houses with high temperatures ranging from 26.7 °C to 36±1.0 °C may affect the health of broiler chickens, as it was shown by Olanrewaju et al (2010) and Quinteiro-Filho et al (2010).

In general, thermal stress induces activation of the hypothalamic-pituitary-adrenal axis, and it is responsible for the negative (catabolic) effects usually observed in the performance and immune function of broilers. According to Rao et al (2013), the relative weight of the lymphoid organs and their morphology are often used to estimate the immunity of broiler chickens to adverse situations.

One of the indicative of thermal stress, or thermal comfort assessment, is the measurement of the specific enthalpy of air expressed as the amount of thermal energy (heat) in kJ contained in 1 kg of dry air. This index is used to quantify and classify the thermal discomfort of broilers, which they may have their physiological responses and performance

affected, as described by Rodrigues et al (2010) and Damasceno et al (2010).

In situations where the amount of heat from outside air exceeds 67.0 kJ.kg<sup>-1</sup> of dry air, the Scientific Committee on Animal Health and Animal Welfare of the European Union (Sciahaw 2000) recommends that additional measures should be taken in the facilities. In general, it is proposed to increase the rate of ventilation, reduction of feed supply, cooling drinking water and nebulization until the relative air humidity does not exceed 80% within the aviary.

Broilers are greatly affected by environmental thermal conditions. Therefore, it is fundamental to integrate the farm management with this specific knowledge to promote improvement in the quality of life. Moura (2001) expressed that animals can present high prostration and mortality rates depending on the magnitude and duration of thermal stress, which is contradictory to the aims of the producer and the poultry industry.

## Final Considerations

The challenges of BEA in the poultry industry currently are diverse, among them the productivity losses are related to the zootechnical indexes, carcass lesions, mortality rate and meat quality defects. Besides the economic relevance, they can serve as indicators of broilers welfare and health, as well as it indicates how the birds were raised. Then they can trace the origin of problems production and minimize the economic losses.

BEA is multifactorial, so several aspects of broilers production are interrelated and related. It represents the complexity and importance of this subject in modern poultry farming, and the necessity for more complete studies involving the various stages of broiler production.

## Conflict of Interest

The authord declare no conflict of interest.

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