



Feather conditions and clinical scores as indicators of broilers welfare at the slaughterhouse



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ABSTRACT

The objective of this study was to evaluate the welfare of 64 different broiler farms on the basis of feather conditions and clinical scores measures collected at the slaughterhouse. A 3-point scale (0, 1 or 2) was used to classify dirty feathers, footpad dermatitis and hock burns measures, and a 2-point scale (present or absent) was used to classify breast burns, breast blisters and breast ulcer measures. Flocks were allocated into three body weight (BW) classes (A, B, C): class A (light) ≥ 1.43 and ≤ 1.68 kg, class B (medium) ≥ 1.69 and ≤ 1.93 kg; class C (heavy) ≥ 1.94 and ≤ 2.41 kg. The absence of hock burns was more common in class A, while mild hock burns was more common in class B flocks. Breast ulcer was observed in class C flocks. The association observed for mild hock burns, breast burns and severe footpad dermatitis can indicate a simultaneous occurrence of these painful lesions. Very dirty feathers and severe footpad dermatitis relationship suggest litter humidity to be the common underlying cause. In conclusion, it was shown that clinical indicators can be used at the slaughterhouse to identify welfare problems. In the studied flocks, footpad dermatitis, feather conditions and hock burns were the main restrictions for good welfare and should be considered significant welfare indicators of the on-farm rearing conditions.

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1. Introduction

Animal welfare has been a major issue in Europe over the last decades, which resulted in regulations and research being devoted to farm animal welfare and especially to standard poultry production, frequently considered as having very poor welfare (Beaumont et al., 2010). The Council Directive 2007/43/EC (EU, 2007) stipulated the minimum rules for the protection of chickens kept for meat production and also established a systematic welfare evaluation system at the slaughterhouse. Veterinarians should evaluate the results of the post mortem inspection in order to identify indicators of poor welfare conditions on farms, such as abnormal levels of contact dermatitis, parasitism or systemic illness (Council Directive 2007/43/EC). In addition to legislation, internationally agreed standards (OIE, 2010) and voluntary labelling programs have been designed to distinguish products according to welfare standards (Martelli, 2009). Currently, different animal welfare assurance schemes are being used to encourage the adoption of animal welfare standards in food production (Fraser, 2006; Sørensen and

Fraser, 2010). These developments have been created a rapid changing environment for production, marketing and international trade of animal products, with potential opportunities and constraints for the animal-based industries (Fraser, 2006; Xavier et al., 2010). The “Welfare Quality®” project developed welfare assessment schemes for broilers that include animal-based measures which indicate direct effects on animals, such as footpad lesions (Veissier et al., 2008; Butterworth and Niebuhr, 2009).

For this study, measures were selected based on their relevance for the evaluation of broiler welfare and their easiness of identification at the slaughterhouse. Contact dermatitis is characterized by an inflammation of the skin affecting the plantar surface of the feet - footpad dermatitis; the hock - hock burns; and the breast - breast burns (Allain et al., 2009). In contact dermatitis syndrome, the footpads are most commonly affected, followed by the hocks and breast, although all conditions may occur together in a single bird (Greene et al., 1985). These lesions are a direct source of pain and reflect many aspects of rearing conditions, being considered valid welfare indicators (Haslam et al., 2007; Meluzzi et al., 2008). The presence of hock burns may also be a useful indicator of broilers' health, influencing the welfare and profitability of affected flocks (Hepworth et al., 2011). In severe cases, breast ulcers can appear covered by necrotic tissue and subcutaneous oedema (Greene et al., 1985). Breast blisters are characterized by fluid-containing

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swellings of the sternal bursa and in severe cases, skin can be damaged adding to the discomfort of birds (Allain et al., 2009; Arnould et al., 2009). The dirty feathers measure is easy to assess at the slaughterhouse and could be an asset in gaining information regarding the birds' living conditions. The validity of this measure used at broilers slaughterhouse has not been adequately evaluated (Wilkins et al., 2003), though it may be a good indicator of the management quality and litter humidity (Arnould et al., 2009).

Several studies have used welfare parameters at the slaughterhouse to assess the welfare conditions on farms (Haslam et al., 2008; Allain et al., 2009; Arnould et al., 2009; Butterworth and Niebuhr, 2009; Xavier et al., 2010). However, there are very few published reports concerning the welfare status of flocks using all the measures selected for this study and, therefore relations between them have been poorly explored.

The objective of this study was to study the relation between different welfare indicators collected at the slaughterhouse, such as clinical scoring and cleanliness of feathers, and to analyze if these welfare measures differed between flocks of different average bodyweight (BW). A second objective was to establish the most adequate welfare indicators according to flocks of different BW.

2. Material and methods

This study was performed at a poultry slaughterhouse in Portugal. The welfare of 64 different mixed-sex flocks from 64 different farms with an intensive system production and a fast-growing genotype (Ross or Cobb) was evaluated in 900 birds per flock from a total of 5600 birds. Flocks had on average 36 days old ranging from 30 to 45 days, with an average body weight of 1.854 ± 0.26 kg. According to the BW, flocks were allocated into one of three BW classes (A = light, B = medium, C = heavy). Class A ≥ 1.43 and ≤ 1.68 kg ($n = 21$); class B ≥ 1.69 and ≤ 1.93 kg ($n = 22$); class C ≥ 1.94 and ≤ 2.41 kg ($n = 21$). Class A flocks were on average 34 days old (30 to 40 days); class B were on average 38 days old (32 to 45 days) and class C were on average 40 days old (36 to 43 days).

The removal of a proportion of the birds from the farm, referred to as thinning, is commonly carried out at the end of the growing period, providing the birds with more space and reducing environmental pressure. The majority of these farms, which resorted frequently to thinning during the growth, were dedicated to producing "barbecue chicken", while other farms, where thinning was rare, produced mainly heavier broilers. Class A flocks had never been subjected to thinning before. Due to the market demand for "barbecue chicken" class A flocks represented their "first thinning" for slaughter. However, 22.7% of class B flocks and 61.9% of class C flocks had been previously thinned during growth. The other 38.1% of class C flocks came from smaller farms (3000 to 6000 birds per rearing) with lower stocking densities.

For each flock, data were collected at the slaughter-line. Immediately after electrical stunning, 100 birds were randomly selected and scored for dirty feathers. After defeathering, 100 feet were randomly selected and scored for footpad dermatitis, and 100 hocks were randomly selected and scored for hock burns. These measures were classified using a 3-point scale, ranging from 0 to 2, and the means were calculated per flocks. Footpad dermatitis and hock burns scoring were done on the right foot and right hock of each carcass, as it was assumed that all flocks would present the same percentage of lesions on both legs (Ekstrand et al., 1997). Seven hundred broilers per flock were checked for breast injuries, namely ulcers, blisters or burns.

The classification of the measures was completed according to the following description:

Dirty feathers: 0 = clean feathers (white feathers with absence of dirt); 1 = moderately dirty feathers (soiling feathers localized in the breast and abdominal areas without caked dirt) and 2 = very dirty

feathers (generalized dirty brown feathers sometimes with dirt adhered or caked to feathers) (adapted from Welfare Quality®, 2009).

Footpad dermatitis: 0 = no lesions (no visible lesions: smooth epidermis, no discoloration), 1 = mild lesions (papillae only with hyperkeratosis and/or mild/superficial lesions with discoloration or erosions in the epidermal layer up to 5 mm) and 2 = severe lesions (severe papillae and ulcerations: discoloration, hyperkeratosis, ulcers and signs of inflammatory reactions with more than 5 mm) (Ekstrand et al., 1997; Dawkins et al., 2004).

Hock burns: 0 = no lesions (no visible lesions), 1 = mild lesions (brown lesion up to 5 mm) and 2 = severe lesions (black lesion with more than 5 mm) (adapted from Allain et al., 2009).

Breast blisters were defined as present when this was equal to or larger than 0.5 cm^2 (Allain et al., 2009).

Breast burn was defined as present when one or more breast burns were observed as having a brownish-coloured scab (erosion) (Greene et al., 1985).

Breast ulcer was defined when the breast skin was covered with black exudates (Greene et al., 1985).

All of the measurements were carried out by an official experienced veterinarian. Information concerning identification of farms, birds age, and BW was collected from the slaughter records.

2.1. Statistical analysis

The effect ($P < 0.05$) of flock weight class was studied using non-parametric tests (Mann-Whitney-Wilcoxon test and Kruskal-Wallis test) for twelve variables (clean feathers, moderately dirty feathers, very dirty feathers, absence of footpad dermatitis, mild footpad dermatitis, severe footpad dermatitis, absence of hock burns, mild hock burns, severe hock burns, breast burns, breast blister and breast ulcer). Spearman's correlation coefficients ($P < 0.01$) were calculated in order to study the relationships between variables. To get a broader view from the results, the variables were subjected to Principal Components Analysis (PCA). The appropriateness to perform PCA was confirmed by Bartlett's sphericity test ($P < 0.0001$). The number of components retained in the final solution was based on the Kaiser-Meyer-Olkin criterion for the analysis of eigenvalues (> 1) and the proportion of variance retained ($> 70\%$), usually seen as the minimum needed to make the model suitable for explaining the original data (Reis, 1997). The components of lesser significance were ignored since they did not have significant impact on the outcome. Variables were finally selected (clean feathers, moderately dirty feathers, absence of footpad dermatitis, severe footpad dermatitis, absence of hock burns, mild hock burns and breast burns) in order to calculate the first two principal components (PC) on the basis of factor loadings (FL) modulus higher than 0.50 in absolute values and communalities (CM) higher than 0.5. Data analysis was carried out using XLStat (release 2011, Addinsoft).

3. Results

Table 1 shows the effects of flock weight classes (A, B and C) on the welfare measures.

Only three (4.69%) flocks had no birds with moderately or very dirty feathers. Five (7.80%) flocks had no birds with footpad dermatitis lesions and twenty-seven (42.19%) flocks had no birds with hock burns lesions. Hock burn was more often absent in class A flocks than in class B flocks. The prevalence of mild hock burns was higher in class B flocks than class A flocks. Significant differences were observed for absence of hock burns ($P = 0.04$) and mild hock burns ($P = 0.03$) between class A and B flocks. Breast injuries were present in 1.51% of the total slaughtered birds, ranging from 0.14% to 17.71% per flock. The presence of breast blisters was almost equal in the three weight classes ranging from 0.86% to 0.97% of the total birds per weight class. Ulcers occurred sporadically in class C showing significant differences ($P = 0.04$) from other classes.

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