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EFFECTS OF ENVIRONMENTAL ENRICHMENT ON THE WELFARE OF INDUSTRIAL BROILER CHICKENS

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ABSTRACT

Industrial broiler chicken houses are relatively barren in terms of environmental resources. The objective was to evaluate the effects of environmental enrichment on the welfare of broilers. From day 1 to 38, 400 male broilers were distributed in 20 pens of 2 m², 10 of which were regular industrial pens (RIP) and 10 enriched industrial pens (EIP) with perches, sand tray, kale, green cabbage and hanging objects. At days 7, 21 and 35, 40 birds/treatment were scored for lameness, valgus-varus deviation and footpad dermatitis (health indicators), and other 40 birds/treatment were sampled for blood. Two pens/treatment in week 1 and four in weeks 2-6 were observed; behaviour was scanned every 20 min for 13 h/d. Temperature was out of recommended limits 71.0% of the time. There was no difference (Chi square) for lameness (RIP/EIP 5.0%/5.0% at 7d; 7.5%/10.0% at 21d; 32.5%/17.5% at 35d), valgus-varus (5.0%/5.0% at 7d; 27.5%/20.0% at 21d; 50.0%/30.0% at 35d) and footpad dermatitis (10.0%/2.5% at 7d; 7.5%/2.5% at 21d; 32.0%/30.0% at 35d). There was no difference (F test) for heterophil:lymphocyte ratio ($0.47 \pm 0.02 / 0.45 \pm 0.02$); basophil counts were higher than normal values in both treatments ($1338 \pm 97 / 1212 \pm 106$ cells/ μ L), which may be related to health problems. Significant (Chi square) reductions in squatting (35.0%/31.8%), sleeping (14.6%/13.1%), and increases in dust-bathing (0.9%/1.5%), pecking

objects (0.2%/0.6%), body maintenance (12.7%/14.2%) and foraging (8.2%/12.0%) were observed. Environmental enrichment showed benefits for the behavioural repertoire of the birds; however, it showed no effect on health indicators and haematological parameters in both treatments.

KEYWORDS: behaviour, footpad dermatitis, heterophil:lymphocyte, temperature

INTRODUCTION

Industrial broiler chicken houses are relatively barren in terms of environmental resources. Thus, one strategy to increase the activities of animals may be increasing the environmental complexity. The objective of this work was to evaluate the effects of environmental enrichment (EE) on the welfare of broiler chickens.

MATERIALS AND METHODS

From day 1 to 38, 400 male birds, line Cobb 500®, were distributed in 20 pens of 2 m², equipped with tubular feeder and nipple drinker. The stocking density was 10 birds/m² with 10 regular industrial pens (RIP) and 10 enriched industrial pens (EIP). The experiment was approved by Ethics Committee of Federal University of Paraná. Enrichment items distributed per pen were perches, sand tray, kale, green cabbage and hanging objects like cans, bottle caps and colored balls. Maximum and minimum temperature were recorded throughout the

experimental period. The feed was provided *ad libitum* and lighting was natural. At days 7, 21 and 35, observations were made of the absence or presence of lameness (LAM), valgus-varus deviation (VVD) and footpad dermatitis (FPD) in 40 birds/treatment, as health indicators. For LAM, "absence" described a birds that walked normally and "presence" any change in the normal gait. For VVD, "absence" meant straight legs and "presence" any deviations. For FPD, "absence" meant no lesions and "presence" lesion(s) of any diameter or depth. At 7 days blood was collected to determine heterophil:lymphocyte ratio (H:L) and at 21 and 35, for hemogram analyses. Two pens/treatment in week 1 and four pens/treatment in weeks 2-6 were observed; behaviour was scanned every 20 min during 13 h/d. Behaviours were classified as: a) squatting; b) alert; c) drinking water; d) pecking, no aggressive; e) aggressive pecking; f) pecking objects; g) eating green feed; h) feeding; i) sleeping; j) perching; k) stretching legs in 90° in relation for body, because for Weeks *et al.* (2000), this position can be adopted to relieve pain or discomfort in the legs; l) foraging; m) walking or running; n) body maintenance behaviour; o) dust-bathing. Haematological results were compared by F test to 5.0% probability. Behaviour and health indicators results were compared by Chi Square

test to 5.0%.

RESULTS AND DISCUSSION

The average temperature observed was found out of the recommended range 71.0% of the time (Cobb, 2008). For LAM, VVD and FPD there was no statistic difference between RIP and EIP. LAM, VVD and FPD were significantly higher with age (Table 1).

Grandin (2009) recommended that 95.0% of birds should be able to walk 10 steps without locomotion problems, thus our results for LAM constitute an important problem as described for birds in industrial systems. Observed prevalence of VVD and FPD also suggest critical welfare points. In this work, the inclusion of EE did not improve health indicators, and the high prevalence of these suggests that the problems encountered are inherent to the system.

There was no significant difference between treatments for haematological parameters. There was a significance increase in values of erythrocytes, leukocytes, heterophils, lymphocytes, monocytes and eosinophils with the age of the birds, considered normal (Macari and Luquetti, 2002). The number of basophils was out of the reference values (Bounous & Stedman, 2000) in both treatments (1338±97 for RIP and 1212±106 for EIP), might be related to a challenge to bird health, such as the high prevalence of FPD. The mean and standard error for H:L was normal (0.47±0.02 for RIP and 0.45±0.02 for EIP) according to Bounous and Stedman (2000).

There was a significant difference between treatments for some behaviours (Table 2).

The results in this work are in agreement with results found by Bizeray *et al.* (2002) for decreased prevalence of squatting in the enriched treatment. Results for dust-bathing showed high prevalence in EIP treatment, which according to the

Table 1 – Number (percentage) of birds presenting lameness (LAM), valgus-varus deviation (VVD) and footpad dermatitis (FPD) of 40 broiler per treatment; in regular industrial pens (RIP) or enriched industrial pens (EIP), raised from 1 to 38 days old, from November to December/2010, Videira/SC, Brazil.

Health Indicators	Treatment	Age of broiler chickens (days)		
		7	21	35
With LAM	RIP (%)	2 (5.0) Ab	3 (7.5) Ab	13 (32.5) Aa
	EIP (%)	2 (5.0) Aa	4 (10.0) Aa	7 (17.5) Aa
With VVD	RIP (%)	2 (5.0) Ac	11 (27.5) Ab	20* (50.0) Aa
	EIP (%)	2 (5.0) Ab	8 (20.0) Ab	12 (30.0) Aa
With FPD	RIP (%)	4 (10.0) Ab	3 (7.5) Ab	13 (32.0) Aa
	EIP (%)	1 (2.5) Ab	1 (2.5) Ab	12 (30.0) Aa

*observation of the only broiler chicken with varus deviation, all others presented valgus deviation. Capital letters in different column and small letters in row indicate significant difference by Chi Square Test ($p < 0,05$)

Table 2 - Number (percentage) of behavioural observations of birds, in regular industrial pens (RIP) or enriched industrial pens (EIP), raised from 1 to 38 days old, from November to December/2010, Videira/SC, Brazil.

Behaviour	Treatment	
	RIP (%)	EIP (%)
Squatting	6113 (35.0) a	5306 (31.8) b
Alert	240 (1.4)	199 (1.2)
Dust-bathing	152 (0.9) b	255 (1.5) a
Drinking water	1246 (7.1) a	1108 (6.6) b
No aggressive pecking	152 (0.9)	162 (1.0)
Aggressive pecking	68 (0.4)	78 (0.5)
Pecking objects	36 (0.2) b	104 (0.6) a
Feeding	2379 (13.6) a	2119 (12.7) b
Sleeping	2551 (4.5) a	2189 (13.1) b
Stretching legs	76 (0.4)	85 (0.5)
Foraging	1438 (8.2) b	1996 (12.0) a
Walking or running	804 (4.6)	728 (4.4)
Body maintenance	2225 (12.7) b	2363 (14.2) a

Mean followed by same letter in row are not statistically different by Chi Square Test ($p > 0.05$)

European Commission (2000), is an activity of high motivation and helps to maintain good condition of plumage. The pecking behaviour towards objects was higher in the EIP treatment, as expected. Sleeping behaviour was higher in RIP, which may be negative since it reduces the practice of exercise (Appleby *et al.*, 2004). Foraging behaviour showed high prevalence in EIP and is considered important to broilers as part of their feed repertoire (Appleby *et al.*, 2004). Results were positive for body maintenance (stretch their wings and/or legs, shake the feathers, flapping their wings, scratching or examine the feathers) in EIP, considered important to maintain the physical integrity of birds (Appleby *et al.*, 2004). The prevalence of perch use (0.12%) and green feed consumption (0.96%) behaviours was observed low in EIP. The prevalence of LAM, VVD and FPD may have influenced these behavioural responses. With regard to green feed, the birds did not express interest in this item, different of broilers reared in free range system that receive and ingest natural feed based on grains and

vegetables (Crabone *et al.*, 2005).

CONCLUSION

The EE used in this work had a significant effect on the behavioural repertoire of broiler chickens, with no effects on health and haematological indicators.

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