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A Comparison of Infrared and Hot Blade Beak Trimming in Laying Hens

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Abstract: Commercial egg laying farms are under intense pressure to eliminate the practice of beak trimming due to the potential for acute and chronic pain to the trimmed birds. However, elimination of beak trimming may have severe implications for animal welfare, as pecking between untrimmed birds can result in body damage that can ultimately lead to cannibalism. Infrared (IR) beak treatment may provide an alternative solution to the conventional Hot Blade (HB) beak trimming, with the potential for being a more welfare friendly means of reducing procedure-associated tissue injuries. In the present study we followed a flock of production hens from 5 to 35 weeks of age, in which a portion of the flock was trimmed with the IR method and the remaining birds with conventional HB. Thirty birds from each beak treatment were randomly selected for this study. Results showed that IR birds had significantly longer upper and lower beaks throughout the study. The frequency of beaks in which the lower beak was longer than the upper was greater in HB treated birds (10.48% in HB versus 7.62% in IR) and scar tissue was only evident on two birds from the HB treatment and no birds from IR. Behavior analysis showed that IR birds spent less time feeding compared with HB hens; however, these birds were consistently heavier than their HB counterparts, suggesting that IR beak treatment may allow for more efficient feeding behavior. The data suggest that IR beak treatment presents an useful alternative to traditional HB beak trimming.

Key words: Beak trim, hot blade, infrared, welfare, beak treatment

INTRODUCTION

Beak trimming is a common practice in the egg industry to reduce injury, pain and stress associated with feather pecking and aggression among birds. The practice of beak trimming, however, has come under great scrutiny from animal welfare advocates and the public for being a source of stress and pain (acute, chronic or both) to the animals. Traditionally, beak trimming has been performed by the Hot Blade (HB) method. The conventional HB technique utilizes a guillotine style blade heated to upwards of 750°C that cuts and cauterizes the beak tissue simultaneously (Jendral and Robinson, 2004). More recently, Nova-Tech Engineering, Inc. (Willmar, MN) developed an automated "infrared beak treatment system." The procedure focuses a short burst from an infrared lamp onto the beak tip. The treated beak tip will slowly soften and erode away within 2 weeks. Infrared beak treatment (IR) provides many seemingly beneficial aspects which suggest that this may provide a more welfare friendly means of beak trimming. Some benefits of the IR are 1) birds can be trimmed at the hatchery simultaneously with vaccinations, reducing the catching and handling stress compared with HB where birds are trimmed traditionally at 7-10 days of age, 2) the automation provides less room for human error, rough handling or variability of results, 3) in IR trimming the beak tip slowly erodes away giving the bird an adjustment phase in which to alter behaviors such as feeding to adapt to the change of beak shape and 4) the elimination of open wounds that contribute to bleeding, inflammation and pain. However, the effects of this system on beak morphology, bird behavior and welfare have not yet been tested, especially the long-term effects in production settings. The objective of the study was to examine the different effects of IR and HB on bird welfare through investigation of growth rate and re-growth of beak stumps, feather condition and behavior from 5 to 35 weeks of age.

MATERIALS AND METHODS

Layer room: White leghorn laying hens of the W-36 strain were caged in 12-bird cages at a commercial grower facility (Indiana, USA) until 16 wks of age at which time they were transported to a layer facility where they were mixed and recaged at random at 5-birds per cage. Each layer cage had a dimension of 40.64 cm x 50.80 cm to give a cage density of 412.90 cm^2 per bird. Cages were kept in tiers 5 cages high and each cage row was 136.54 m. The layer room had a total of 30,150 cages with a potential capacity of 150,750 birds. The birds were beak trimmed using one of two different methods; HB or IR. Feed and water were provided *ad libitum*. Overhead lights were on daily from 0400 until 2000 (16:8, L:D).

Two rows of cages were used (one upper row and one lower row), utilizing 15 cages per row per treatment (n = 30 birds/treatment). The sampled bird within each cage

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was chosen randomly. Upon removal from the cage for physical measurements, birds were marked with a numbered aluminum wing band on the right wing and on the tail with blue livestock marker for identification for behavioral measures. All procedures were approved by Purdue Animal Care and Use Committee.

Beak trimming treatments: Hot blade beak trimming was conducted on farm when the birds were 7 to 10 days old by a trained team. Infrared beak treatment was performed at the hatchery (Centurion Poultry MidAmerica Hatchery, WI) using equipment developed by Nova-Tech Engineering (Willmar, MN).

Body weight: Body weights were collected from 30 birds per treatment when they were 5, 10, 15, 20, 25, 30 and 35 wks of age.

Feather score: Feather scoring was used to asses the quality of feather coverage of each bird at 35 wks of age. Feathers were scored on a 0 to 5 scale, with the best score at "0" and the worst score at "5" (Dennis *et al*., 2009). Seven body regions were assessed and an average of these was taken as the total average feather score for each bird. Feather score data collection was conducted by the same trained person to eliminate inter-observer variations.

Beak morphology: A digital image of each beak was recorded at 5, 10, 15, 20, 25, 30 and 35 wks of age using the same method and equipment outlined by Fahey *et al*. (2007). Briefly, images of each beak were captured with a 5.1 mega pixel Nikon digital camera. Beak dimensions were determined using MCID Imaging Software (V4.0, Imaging Research Inc. Ontario, Canada) to examine beaks' length (both the upper and lower mandibles) at several points along the mandibles. To achieve this images were imported into MCID before being individually calibrated (number of pixel per horizontal and vertical centimeter) using a background reference scale incorporated into each image.

Behavior data: Direct focal observations were taken of a single marked bird per cage (n = 10/treatment) for ten minutes at 5, 10 and 35 wks of age. Total time spent inactive and duration of time spent engaged in eating, drinking and walking was recorded. Aggressive behaviors, feather pecks and cage pecks were recorded as number of incidents or frequency per ten minutes. Live observation scan samples were also taken to determine percent birds feeding. For this measure the total number of birds in the feeder at each scan were noted and converted into a percent of the total birds per cage at the feeder for statistical analysis.

Statistical analysis: Production and physiology data were checked for normality with the aide of histograms, QQ plots and formal statistical tests with the UNIVARIATE procedure of SAS v9.1. Body weights had a normal distribution. Feather scores were ranked and then analyzed using a mixed model. The data were analyzed using the MIXED procedure of SAS v9.1 (SAS Institute Inc., 2003, Cary, NC). Cages were analyzed by beak trim method (HB and IR) as well as the interaction between treatments and rows (top or bottom) in order to account for the effect of microenvironment within the house. Interactions with p-values greater than 0.50 were removed from the model.

RESULTS AND DISCUSSION

Beak trimming in hens provides the birds with long term benefits by reducing the amount of damage done by aggressive and feather pecking from conspecifics. On the other hand, the conventional procedure of beak trimming, i.e., HB, may also be a source of acute and potentially chronic pain. Current sentiment from animal right's advocates suggests that beak trimming should be banned in its entirety. Even though previous research has shown that by banning beak trimming practices, bird mortality resulting from aggression and feather pecking will increase (Huber-Eicher, 1999; Andreasen *et al*., 2005). Infrared beak treatment provides a potential compromise as this recent technology could provide a more welfare friendly alternative to conventional beak trimming, while providing the same benefits in both layer pullets (Dennis *et al*., 2009) and broiler chicks (Gentle, 1992). However, its long-term effects in a commercial setting have not been examined. In this study we compare IR treatment with conventional HB in an industry setting.

In the current study, IR birds had longer beak stumps compared to those of HB birds through 35 wks of age following the standard commercial beak trimming procedures ($p<0.05$; Fig. 1). In a recent review of beak trimming, Kuenzel (2007) suggested that the majority of negative effects of beak trimming can be eliminated or reduced by removing only a moderate portion of the beak (less than 50%). The increase in remaining beak tissue seen in IR birds in the present study may allow for increased sensory perception of the mechanoreceptors of the beak, thereby improving their ability to perform more natural feeding behaviors and fine manipulations with the beak.

Previous studies have shown that birds' ability to eat and feeding behavior are altered following beak trimming (Hester and Shea-Moore, 2003). Long-term reductions in feeding and body weight have been seen in birds trimmed with HB methods (Davis *et al*., 2004). In the present study, body weight was consistently and significantly greater in IR treated birds compared with HB trimmed birds over the observed time ($p<0.05$; Fig. 2). However, HB trimmed birds spent significantly more time engaging in feeding behaviors compared with IR birds at 35 wks of age ($p<0.05$; Fig. 3). No significant

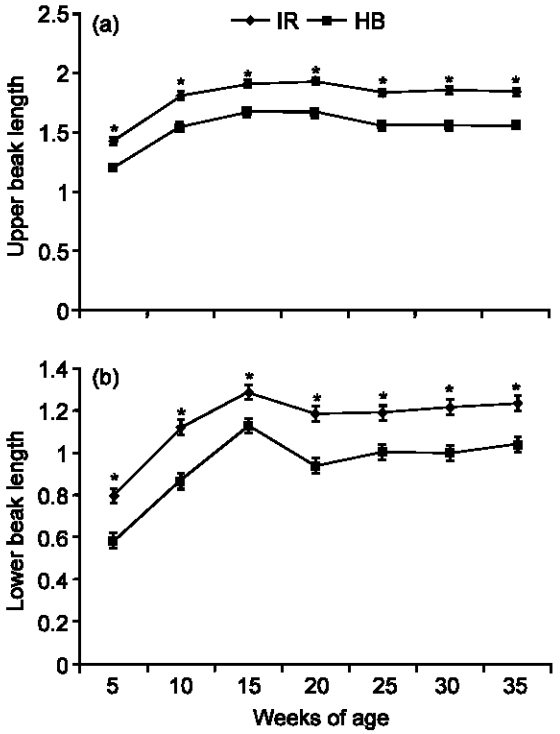

Fig. 1: Effects of beak treatment on upper (A) and lower (B) beak length over time. Data are presented as LS mean (± SEM). *, significant difference ($p<0.05$) between treatment means

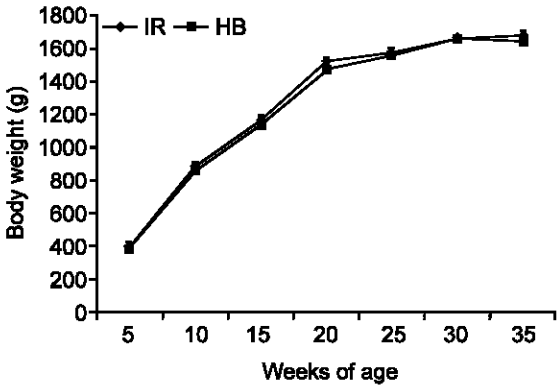

Fig. 2: Effects of beak treatment on body weight over time. Data are presented as LS mean (± SEM). Main effect over all time periods shows a significant difference ($p<0.05$) between treatment means

differences were found in percent feeding at 5 or 10 wks of age ($p>0.05$). This discrepancy could be explained by reduced feed efficiency or interference by the HB procedure to perform normal feeding behaviors. Asymmetric mandibles are a common side effect of beak trimming. In the present study, we showed more

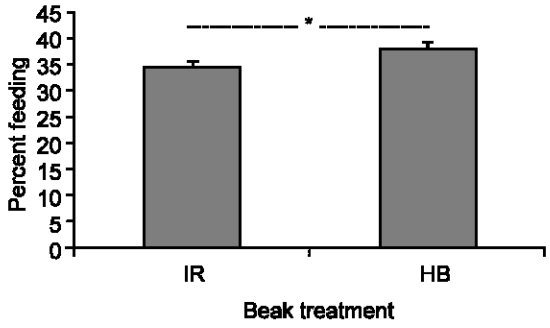

Fig. 3: Effects of beak treatment on percent birds feeding at 35 wks of age. Data are presented as LS mean (± SEM). *, significant difference ($p<0.05$) between treatment means

Table 1: Feather scores by body region[1]

Body region	Hot blade	Infrared
Head	0.93±0.14	1.10±0.14
Neck	2.44±0.32	2.38±0.30
Abdomen	3.33±0.12	3.62±0.12
Wing	0.96±0.15	1.24±0.14
Back	2.04±0.25	2.21±0.24
Breast	2.85±0.16[a]	3.31±0.15[b]
Tail	1.19±0.12	1.31±0.11

[1]Scores 0-5; 0 = perfect feathering; 5 = completely bare and skin damaged. [ab]Means within rows with no common superscript differ ($p<0.05$)

asymmetry in HB beaks compared with IR beaks (10.48% and 7.62% of the tested flock for HB and IR, respectively). In addition, commercial housing systems present feed to birds in a continuously replenishing thin layer at the bottom of a deep trough in order to eliminate spillage and waste. A recent study showed a negative correlation between mandible symmetry following beak trimming and feeding success, especially when feed was presented in a thin layer (Prescott and Bonser, 2004). Taken together, these conditions may make successful feeding more difficult in birds trimmed with HB procedures compared with those treated with IR.

Concerns about maintaining longer beaks on laying hens have centered on the potential for birds to display great feather pecking and cannibalistic behaviors. In the behavioral analysis, there was no difference observed in feather pecking behaviors. There were also no differences in the feather score of the head, neck, tail or abdomen (the normal origins of cannibalism and cannibalistic related injury; $p>0.05$; Table 1) between the treatments. However, we did determine that IR birds showed a reduced feathering in the breast region ($p<0.05$; Table 1), a region not normally associated with damage due to aggression, feather pecking or cannibalism. Breast feathers are often damaged due to cage wear (Sandilands *et al*., 2004). An increase in other behaviors such as sham dust bathing, qualitative changes in feeding behaviors or an increase in overall activity level could account for the difference in cage wear

between these birds, however this hypothesis has not yet been tested. Decreased overall activity and other behavioral changes have been documented in numerous behavior studies of the effects of beak trimming (review: Cunningham, 1992).

In conclusion, compared to HB trimmed birds, IR birds had a heavier body weight, superior feeding efficiency and longer, more symmetric beaks. The data suggests that this method may provide fewer painful and stressful negative effects. Infrared beak treatment may present a more welfare friendly alternative to conventional beak trimming methods.

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