FOOT LESIONS IN CAGED LAYERS: WELFARE IMPLICATIONS

C.A. LUNAM* and P.C. GLATZ**

Summary

To assess the effect of foot lesions on the well-being of commercial caged laying hens (70 weeks of age) the behaviour of hens and the histopathology of the toes of hens with foot lesions were compared to a control group having no foot lesions. Hens with foot lesions had significantly more drinking bouts of less duration per bout, and spent significantly more time feather ruffling than hens without foot lesions. No significant differences in bouts of sitting, preening, hen pecking, cage pecking and eating or incidence of head scratching or dust bathing were observed between the treatments. Histology of the toes revealed a marked inflammatory response associated with the site of the lesion. Immunohistochemistry revealed nerve fibres of the type capable of transmitting pain in all toes examined. These observations indicate that the well-being of hens with foot lesions is likely to be compromised.

I. INTRODUCTION

Laying hens are subject to lesions (hyperkeratosis) in different parts of the foot. The majority of lesions occur at the distal toe pad, with the most severe inflammation involving swelling of the foot pad from pressure resulting from standing on the wire. The aim of this study was to assess the welfare of caged hens with foot lesions compared to a control group of hens without foot lesions using behavioural and histopathology indices.

II. METHODS

(a) Hens

Forty hens (70 weeks of age) selected from a caged flock of 2000 crossbred commercial layers were allocated in pairs to single tier laying cages (45 x 45 x 40 cm) and maintained on a layer ration. Each pair of hens was allocated to one of two treatment groups on the basis of the presence or absence of foot lesions. Treatment 1, n = 20 hens with foot lesions and Treatment 2, n = 20 with no foot lesions.

(b) Video recording of behaviour, viewing video tapes and analyses

A video recording was made for each pair of hens in each treatment post-lay from 1300h-1600h with food and water available ad libitum. Data on behaviour were obtained from watching video records and manually keying observations into a hand held microcomputer. The activities recorded were time and bouts of pecking at food, drinking, preening, sitting and the number of pecks made at the cage and other birds. Separate bouts of behaviour were recorded if they were separated by a pause of at least five seconds.

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duration. The incidence of dust bathing, feather ruffling and head scratching were also recorded. SAS linear modelling procedures were used to analyse the effect of foot lesions on the behaviour of the hens.

(c) Histopathology and immunohistochemical labelling of nerve fibres

After video recording, all hens were killed by cervical dislocation and toes taken from each treatment group. A total of twelve toes were taken from eight hens with foot lesions and another ten toes taken from five hens with no foot lesions. The toes were fixed by immersion in Zamboni’s fixative (Stefanini et al., 1967) for two to four weeks at 4°C. Six toes from each treatment were processed by routine wax-embedding and 5μm-thick transverse sections stained with either haematoxylin and eosin, or Verhoeff and van Gieson, for visualisation of tissue types and any inflammatory response. Another four toes from each treatment (total of eight) were processed for immunohistochemical identification of nerve fibres labelling for substance P as described previously (Lunam, 1993).

III. RESULTS

(a) Behaviour

Hens with foot lesions showed no significant differences in numbers of bouts of sitting, preening, eating and hen or cage pecks compared to that of hens with no foot lesions. The number of drinking bouts was significantly higher in hens with foot lesions compared to hens without foot lesions (P=0.006) (Table 1). The incidence of hen peck bouts in birds with foot lesions was lower compared to hens without foot lesions, though this difference was not statistically significant (P=0.06).

Table 1. Effects of foot lesions (FL) on number of bouts per hour of sitting (SB), preening (PB), hen pecking (HPB), cage pecking (CPB), eating (EB) and drinking (DB). (NFL) is no foot lesions. P = probability value in analysis of variance.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>SB</th>
<th>PB</th>
<th>HPB</th>
<th>CPB</th>
<th>EB</th>
<th>DB</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL</td>
<td>5.2</td>
<td>32.7</td>
<td>4.5</td>
<td>1.9</td>
<td>17.6</td>
<td>8.8</td>
</tr>
<tr>
<td>NFL</td>
<td>3.8</td>
<td>32.2</td>
<td>8.9</td>
<td>1.3</td>
<td>16.7</td>
<td>4.1</td>
</tr>
<tr>
<td>P</td>
<td>0.17</td>
<td>0.85</td>
<td>0.06</td>
<td>0.52</td>
<td>0.74</td>
<td>0.006</td>
</tr>
</tbody>
</table>

Table 2. Effects of foot lesions (FL) on time (seconds) spent sitting (ST), preening (PT), eating (ET), drinking (DT) and incidence of feather ruffling (FR), head scratching (HS) and dust bathing (DB) averaged over one hour. P= probability in analysis of variance.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>ST</th>
<th>PT</th>
<th>ET</th>
<th>DT</th>
<th>FR</th>
<th>HS</th>
<th>DB</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL</td>
<td>1027</td>
<td>1016</td>
<td>732</td>
<td>146</td>
<td>0.25</td>
<td>3.7</td>
<td>0.9</td>
</tr>
<tr>
<td>NFL</td>
<td>735</td>
<td>949</td>
<td>683</td>
<td>187</td>
<td>0.03</td>
<td>4.4</td>
<td>0.7</td>
</tr>
<tr>
<td>P</td>
<td>0.16</td>
<td>0.51</td>
<td>0.64</td>
<td>0.44</td>
<td>0.02</td>
<td>0.26</td>
<td>0.55</td>
</tr>
</tbody>
</table>
Hens with foot lesions showed no significant differences in time spent sitting, preening, eating, drinking, head scratching or dust bathing compared to hens without foot lesions. Feather ruffling was the only behaviour which differed significantly between the treatments, the incidence of bouts of feather ruffling being significantly higher in hens with foot lesions compared to that of hens without foot lesions (Table 2).

(b) **Histopathology**

Macrophages and small aggregations of lymphocytes were observed in all toes with and without lesions. An inflammatory response, marked with mast cells and eosinophils, was more extensive in regions of toes with lesions than in comparable anatomical regions of toes without lesions. Immunohistochemistry revealed few freely ending nerve fibres labelling for substance P. The distribution and number of these immunolabelled nerve fibres were similar in toes with and without lesions.

**IV. DISCUSSION**

These studies examined whether hens with foot lesions exhibited changes in behaviour that may indicate they were in pain. Although both treatments spent a similar average time per hour drinking, hens with foot lesions had significantly more drinking bouts, each bout of shorter duration, than hens with foot lesions. One explanation for the difference in drinking bouts is that the foot lesions become sore when additional pressure was placed upon them as the birds reached to drink from the water nipples. There was a non-significant trend (P=0.16) for hens with foot lesions to spend more time sitting, suggesting they found it more uncomfortable to stand than hens without lesions. In addition, there was a trend for hens without foot lesions to be more aggressive, as they engaged in more bouts of feather pecking than hens with lesions. No explanation can be given as to why birds with foot lesions had a greater incidence of feather ruffling than hens without lesions.

The often extensive inflammatory response in the region of the foot lesions, marked with numerous eosinophils and mast cells, is consistent with inflammation associated with acute and/or consistent pain in mammals. The presence of free nerve endings labelling with substance P indicates that at least some nerves associated with the lesions are likely to be nociceptive, that is, they are capable of transmitting painful stimuli. These data, when considered with behavioural findings support the suggestion that foot lesions are likely to be painful and thus compromise the well-being of the hens.

**V. ACKNOWLEDGEMENT**

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**REFERENCES**

