

# Do foot pad scores measure turkey welfare?

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## ABSTRACT

The main aim of the project was to assess the painfulness of different levels of foot pad dermatitis (FPD) in turkeys. Three different analgesics (butorphanol, carprofen and meloxicam) were used to assess their effect on behaviour. Video recordings were taken when the birds were treated with either saline or one of the analgesics in a crossover experiment, with the aim of investigating whether or not FPD is a painful condition. The results did not show significant pain in affected turkeys. Carprofen may have an effect on behavior, whereas butorphanol and meloxicam did not.

## INTRODUCTION

Footpad dermatitis (FPD) is a common condition in commercial turkeys and other poultry. The main causative agent appears to be wet litter (Mayne *et al.*, 2007a), although sex, breed, dietary factors and bodyweight may also be contributing factors (Mayne, 2005). FPD is a contact dermatitis, associated with an acute inflammatory response (Mayne *et al.*, 2007b) that begins with hyperkeratosis and cracking of the footpad, followed by loss of the epidermis (erosions) and in severe cases progressing to an ulcer with loss of the underlying basement membrane.

European legislation has mandated the measurement of FPD as a means of assessing broiler welfare and it is assumed that the same approach will eventually be adopted for turkeys. It is not clear what aspect of welfare such a scheme is meant to assess: possibilities include control of stocking rates, improving litter quality, minimising the number of farms practicing intensive husbandry systems or simply preventing painful dermatitis. It is the latter perspective that will be addressed in this paper.

The aim of the research was to assess the welfare consequences of FPD by using behavioural observations of turkeys with increasing severity of dermatitis in conjunction with three different analgesics (butorphanol, meloxicam and carprofen). It was hypothesised that birds with higher FPD scores (more severe lesions) would show behavioural changes that could be attributed to pain, but will behave more like control birds (with no FPD) when given an analgesic.

## MATERIALS AND METHODS

A total of 432 male B.U.T Premium turkey poults were obtained from a commercial hatchery at one day of age. The poults were distributed at random into 24 pens at a stocking rate of 18 poults/pen: husbandry details are presented in the next paper (Experiment 2, Veldkamp, Hocking and Vinco, page 25).

At 12 weeks of age, footpad lesions were scored by one person on a 5 point scale (0=none, 4=lesion covering more than half the foot pad) and the highest score for both feet was recorded. Birds with adverse comments (e.g. curly toes) that could have impeded movement, or with unilateral score 1 or 2, were rejected. FPD scores 1 and 2 (FPD1) and scores 3 and 4 (FPD2) were combined and 24 FPD1 and 18 FPD2 birds were selected for the experiment. A control group of 24 unaffected birds (FPD0) were selected using a random number generator. Birds were also assigned to the analgesic and order of application using a random number generator. Half of the birds received the analgesic and half a saline injection on day one and the alternate treatment 48 hours later so that each bird would act as its own control. Injections were given subcutaneously in the back of the neck at doses of 2 mg/kg butorphanol (Torbugesic 10 mg/ml, Pfizer, Spain), 5 mg/kg meloxicam (Metacam 20 mg/ml, Boehringer Ingelheim, Spain) 25 mg/kg carprofen (Rimadyl 50 mg/ml, Zoetis, Germany). Injections were carried out between 09:00 and 11:00 and video recording was completed at 13:00 – 14:00 and 17:00 – 18:00.

The day before injections began, dry shavings were added to each of the 12 test pens, so that the litter was of the same quality for all of the observations Observer XT version 11 (Noldus Information Technology, Wageningen, NL) using a standard ethogram (stand, rest, walk, peck, feed, drink, preen and other (Sinclair *et al.*, 2015). Data from both clips

per day for each bird were summed to provide results for 40 mins/bird/day. For each behaviour, statistical analyses were conducted using the Observer output for percentage duration, mean length of bout, and total number of bouts within the 40 minute period. Analyses of variance of these three statistics were conducted for each behaviour to evaluate the effects of FPD score and analgesic.

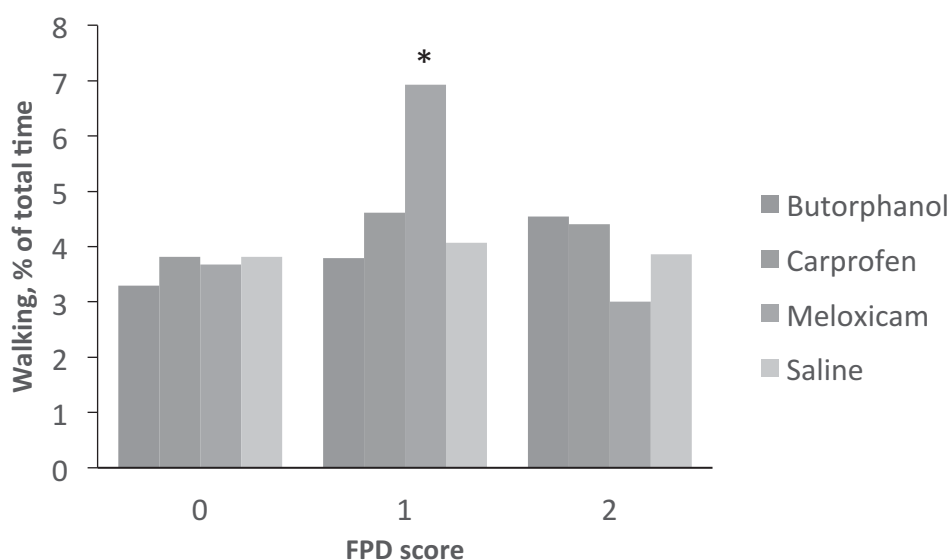
In a second analysis, unique sequences of behaviours for each 20 min period were obtained using THEME software as previously described (Sinclair *et al.*, 2015). The number of unique behavioural sequences (variety), the number of occurrences of all patterns (frequency) and the mean number of behaviours within a pattern (complexity) for each 20 minute observation period were summed for both days and subjected to statistical analysis as described above.

## RESULTS

### *Bout length, frequency and total duration*

There were no interactions between FPD score and analgesic use for any of the behaviours except for the total duration of walking (Figure 1): this appears to be an anomaly associated with meloxicam in birds with FPD=1 and is considered to be of no biological significance.

**Figure 1.** Interaction between FPD score and analgesic for the duration of walking



There were no statistically significant differences between turkeys with different FPD scores for any of the measures of behaviour (frequency, bout length and total duration). However there were differences between the three analgesic drugs for the number of resting bouts, the number and length of preening bouts, and the length of bouts of various “other” behaviours (Table). In general, carprofen decreased each of these behavioural traits whereas butorphanol and meloxicam had no effect.

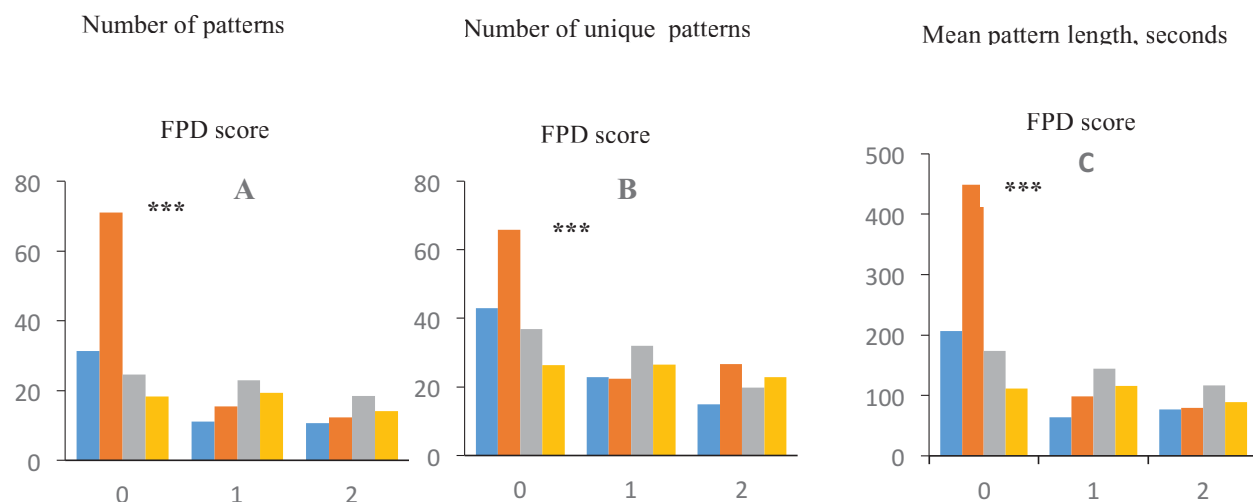
**Table.** Mean effects of butorphanol, carprofen and meloxicam compared with saline injections on behaviours with overall significance  $P<0.05$ .

Trait	Butorphanol	Carprofen	Meloxicam	Saline	Significance, $P=$
Resting (bouts/h)	7.9	7.6*	9.1	9.3	0.045
Preen (bouts/h)	14.2	9.8*	17.5	14.4	0.022
Preen (bout length, sec)	20.5	12.6*	25.0	22.0	0.013
Other (bout length, sec)	2.7	2.1*	3.3	3.4	0.030

\* Significantly different from saline injection ( $P<0.05$ )

## PATTERNS OF BEHAVIOUR

The analysis of T-patterns showed an interaction between analgesic and FPD score associated with significantly higher values for turkeys with no PFD (FPD0) given carprofen compared with FPD scores of FPD1 and FPD2. Combining the results for all three analgesics (Figure 2), turkeys with no FPD (FPD0) had significantly more pattern occurrences ( $P<0.001$ ), different patterns ( $P<0.001$ ) and mean pattern lengths ( $P<0.01$ ) compared with turkeys with FPD (FPD1 and FPD2) but this is heavily affected by the results for carprofen treated birds.



**Figure 2.** Histograms of the results of an analysis of sequences of behaviour (behavioural patterns) of turkeys with (FPD1 and FPD2) or without FPD (FPD0) given saline (yellow) or an analgesic drug (butorphanol (blue), carprofen (orange) or meloxicam (grey)). (A) average number of unique patterns detects; (B) mean pattern length; (C), total number of unique patterns; \*\*\*  $P<0.001$ .

## DISCUSSION

Measures of behavioural repertoire, such as the number of different behaviours and their relative frequency, may reflect the affective state (the scientific term of how an animal is “feeling”) whereas THEME analyses the quality of behaviour and is a more direct measure of poor welfare (e.g. when a bird is distressed or in pain). Previous experiments (Sinclair *et al.*, 2015; Wu and Hocking, 2011) demonstrated that wet litter has a negative effect on both the number and range of behaviours and on the quality of behaviour. Taken together, these reports highlight the importance of dry litter for maximising turkey well-being.

Comparing the behaviour of birds with and without FPD given an anti-inflammatory drug (betamethasone) provided some evidence for the presence of pain associated with FPD (Sinclair *et al.*, 2015), as did an analysis of gait (Weber Wyneken *et al.*, 2015). The effects of the analgesic drugs in the present experiment were associated with behavioural changes in birds given carprofen that would appear to contra-indicate its use in turkeys (Table). Furthermore the quality of behaviour appeared to be better in turkeys with no FPD (FPD0) given carprofen compared with saline whereas the drug did not affect patterns of behaviour in turkeys with FPD (FPD1 and FPD2) (Figure 2). Compared with the turkeys used in the earlier research, the birds in the present study had relatively recent, shallow lesions in spite of covering a significant area of the foot pad. Nevertheless among the sample of birds assessed for the underlying pathology of the foot pad, all but one of 18 affected birds, and no FPD0 turkeys, showed evidence of changes associated with inflammation.

The present results may provide some justification for differentiating between low and high FPD scores as in the broiler directive. Whether the absence of an effect of analgesia in turkeys with FPD in this study is a consequence of

relatively mild histopathology, the experimental paradigm, volume of drug injected or endogenous analgesia (Gentle and Corr, 1995; Hocking, 1994) is unclear. The results do, however, emphasise the importance of the analgesic drug selected for experiments on the welfare of poultry and raise questions about the use of specific drugs such as carprofen if they have a significant effect on the behaviour of birds with no pathology.

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