Effects of carprofen, meloxicam and butorphanol on broiler chickens’ performance in mobility tests

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Abstract

Lame broiler chickens perform poorly in standardised mobility tests and have nociceptive thresholds that differ from those of non-lame birds, even when confounding factors such as differences in bodyweight are accounted for. This study investigated whether these altered responses could be due to pain, by comparing performance in a Group Obstacle test and a Latency to Lie (LTL) test of lame (Gait Score [GS] 2.5–4) and non-lame (GS 0–1) broilers administered analgesia or a saline control. We used exploratory subcutaneous doses of the non-steroidal anti-inflammatory drugs (NSAIDs), meloxicam (5 mg kg⁻¹) or carprofen (35 mg kg⁻¹) or the opioid butorphanol tartrate (4 mg kg⁻¹). We included butorphanol to explore the possibility that NSAIDs could improve mobility by reducing inflammation without necessarily invoking an analgesic effect. Lameness was a significant predictor in all analyses. Neither the number of obstacle crossings nor latency to cross an obstacle was significantly changed by either NSAID, but LTL was longer in lame birds given carprofen and meloxicam than in lame birds given saline. LTL was associated with foot-pad dermatitis and ameliorated by both NSAIDs. Butorphanol did not affect LTL but appeared soporific in the obstacle test, increasing latency to cross and, in non-lame birds, reducing the number of crossings. Combined with data from other studies, the results suggest carprofen and meloxicam had some analgesic effect on lame birds, lending further support to concerns that lameness compromises broiler welfare. Further investigation of opioid treatments and lameness types is needed to disentangle effects on mobility and on pain.

Keywords: analgesia, animal welfare, broiler chicken, lameness, mobility, pain

Introduction

A report in 2009 by the Farm Animal Welfare Council concluded that insufficient progress was being made in addressing the problem of lameness in broiler chicken production (FAWC 2009). Part of the difficulty in reducing lameness probably stems from its variability and multifactorial aetiology (Bradshaw et al 2002) and, so far, correlations between lameness and underlying pathology have proven to be weak (McNamee et al 1998; Sandilands et al 2011; Fernandes et al 2012). Recent work by our group has examined the influence of lameness on tests of mobility and nociceptive processing in commercially reared broiler chickens, while also modelling other factors that might explain test performance and that are often confounded with lameness (such as body mass, sex and signs of pathology). Lame broilers made fewer, later crossings than non-lame broilers in an Obstacle test and had a shorter Latency to Lie (LTL) in a shallow water bath — ie to avoid a mildly aversive experience (Caplen et al 2014). In a related study, lameness was also associated with altered thermal nociceptive threshold (Hothersall et al 2014). Importantly, lameness was the most consistent predictor of performance across these tests: other factors explained less variability in results or became non-significant when lameness was included in the models. These findings suggest that lameness in commercial broilers is not simply synonymous with reduced mobility or activity and may include an element of pain or discomfort.

A relationship between lameness and pain would be confirmed if differences between lame and non-lame birds’ performance on such tests were reversed or attenuated by administration of analgesic drugs. There is already some evidence to support this: data from kinematic analysis in lame broilers indicated that the NSAIDs carprofen and meloxicam caused objective changes in gait, including increased walking velocity (Caplen 2013a). Both drugs were also successful in reversing hyperalgesia (indicated by a lower nociceptive threshold) associated with induced hock inflammation (Caplen et al 2013b). Finally, meloxicam elevated nociceptive threshold in lame commercial broilers, though this group of birds did not show hyperalgesia before treatment (Hothersall et al 2014).

We therefore tested the efficacy of carprofen and meloxicam on the Obstacle and LTL tests described by Caplen and colleagues (2014). In addition, we included the opioid butorphanol tartrate, which is regularly used in the management of both chronic and acute pain in birds (Paul-