

The effect of Keel Bone Fractures on the Welfare of Free-range Laying Hens and an Alteration in the Belief that providing Aerial Perches increases the Risk of these Fractures

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Introduction

Fractures of the keel bone in laying hens occur frequently within free-range systems and are a significant welfare concern. As poultry farmers have increasingly adopted this type of housing, it becomes more urgent to address the problem of such fractures. More than 80% of free-range birds could be affected, compared to 36% of birds in furnished-cage systems (Wilkins *et al.*, 2011). A hen's ability to roam, fly and jump within a free-range environment provides greater opportunity for the anatomically vulnerable keel bone to contact objects with more force than can occur within the confines of a cage (Vits *et al.*, 2005). It has been suggested that falling from or colliding with aerial perches may cause keel bone fractures (Gregory *et al.*, 1990, in Donaldson *et al.*, 2012a & b). In recent years, the effects of providing aerial perches has been specifically studied, along with the impact keel bone fractures have on the behaviour of laying hens, and thus on welfare.

Discussion

One of the widely recognised five freedoms for animals is freedom from pain. While it is accepted that fractures in humans (Yates and Smith, 1994, in Donaldson *et al.*, 2012a) and other mammals (Flecknell *et al.*, 2010, in Nasr *et al.*, 2012b) elicit a pain response, the effect of a fracture on laying hens is unknown. To investigate this, Nasr *et al.* (2012b) tested the effect of an analgesic on the mobility of both affected hens (n=35) and unaffected hens (n=23). While the premise of the study was promising, the sample size of just 62 animals was small. Hens were timed jumping off perches to receive food. Affected birds given the analgesic reached the food 20% faster than they did without receiving the analgesic, while unaffected birds showed no time improvement after receiving the drug (Nasr *et al.*, 2012b). The authors regard this as firm evidence that hens with these fractures are in pain, as their movement improves when given an analgesic. To the authors' credit, they emphasise that as pain is understood to be a complex sensation with a strong emotional basis, it is still uncertain whether chickens do sense pain at all, or if they register it differently from mammals (Nasr *et al.*, 2012b). Although inconclusive, this study invites further research into pain perception in laying hens and, if its findings are confirmed, welfare could be greatly improved through treatment, or more effectively, prevention of these injuries.

Despite the uncertainty, it is tempting and perhaps logical to use pain as an explanation for some of the clear behavioural differences observed in an earlier study by Nasr *et al.* (2012a). Affected and unaffected hens were compared on aspects ranging from egg quality to activity levels. Unaffected birds walked a set distance in a shorter time, used perches more frequently and spent less time sleeping. A fracture may physically hinder movement, or pain could prevent the bird from using the adjacent muscles, causing atrophy and weakness, and further diminishing the hen's ability or desire to move (Nasr *et al.*, 2012a). Affected hens were also less frequent layers. Frustration, caused by this lack of mobility or, possibly, pain could be the cause (Nasr *et al.*, 2012a). This interference with laying is detrimental to welfare as it impinges on another of the five freedoms: the ability to freely perform a natural behaviour.

These results were recorded in a small experimental environment, which could have influenced the overall behaviour of the test subjects. However, a commercial study by Richards *et al.* (2012) found similar results. Affected hens jumped through "pop holes" to access an outdoor area less frequently than unaffected hens. Also, affected hens accessed the outside area even less frequently in cold weather. This finding has been likened to observations in humans, who report that pain occurs at old fracture sites when temperatures are low (Richards *et al.*, 2012). Taken together, these results add weight to the conclusions made by Nasr *et al.*, (2012b), that fractures could cause ongoing discomfort to hens, and interfere with their mobility and capacity to perform natural behaviours. This must compromise their welfare.

Perching is another natural behaviour and free-range systems are often adorned with aerial perches to cater for this. To investigate whether such perches were hazardous to hens by contributing to keel bone fractures, Donaldson *et al.* (2012a) conducted a study of five different commercial barns. Each barn was halved and perches provided to only one half. No correlation between the provision of perches and an increase in keel bone injuries was found, with the exception of one barn and this was attributed to poor design and layout of the perches. These design faults could be studied more closely to identify exactly how they contributed to an increase in fractures. With this knowledge, housing systems with perches could be modified to ensure an environment with low risk of fractures, potentially improving the welfare of many laying hens in the future. Although not absolute, the results of this study are convincing enough to show that with careful design it is beneficial to allow access to perches. In fact, in a second study, Donaldson *et al.* (2012b) concluded that providing perches improved the welfare of hens by reducing cannibalism and increasing body-condition scores. Nasr *et al.* (2012a) found that fracture-affected hens perched less frequently. Thus, those hens that already have their welfare compromised due to immobility or potentially pain, are then unable to derive the maximum benefit from perches, causing further detriment to their welfare.

Conclusion

In summary, these recent findings show keel bone fractures impact heavily on the welfare of laying hens by restricting their ability to perform a range of natural behaviours and possibly causing ongoing pain. Aerial perches within free-range systems were not found to increase the likelihood of hens sustaining these fractures, so denying them perches cannot be argued to benefit their welfare. Instead, the demonstrable welfare benefits of aerial perches should be recognised as positive economic outcomes by producers, giving them greater incentive to provide suitable perches for their laying hens.

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