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Farmer attitudes to injurious pecking in laying hens and to potential control strategies

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Abstract

Farmers' recognition of health and welfare problems, and their responses to related intervention programmes, such as those to reduce injurious pecking in hens, directly influence the welfare of animals in their care. Changing those responses can be achieved through a re-positioning of social drivers as well as from individual behaviour. This study begins by considering how certain levels of plumage damage become normalised while others might be considered unacceptable. Drawing upon in-depth farmer interviews, the study investigates how management practices for addressing the issue of injurious pecking are developed and enacted, looking at the relative influence of intrinsic and extrinsic individual behavioural factors. Twelve farmers with varied uptake of evidence-based management strategies designed to reduce levels of injurious pecking were interviewed. Although farmers ranked images of flocks with various levels of plumage damage in a similar order to scientists, their perception of levels of injurious pecking in their own flocks varied, and was not consistently associated with the actual levels measured. Most farmers recognised both financial and welfare implications of injurious pecking and expressed pride in having a good-looking flock. The popular management strategies were those designed to redirect pecking to other objects, whereas a substantial barrier to uptake was the perception of creating other problems: for example, mislaid eggs if early access to litter and range were adopted. To achieve uptake of knowledge that improves animal welfare on-farm, it may be necessary both to shift the norms perceived as acceptable, and to overcome barriers to change that include lack of time and understanding, by providing impartial advice and facilitation of ownership of the issues.

Keywords: *animal welfare, changing attitudes, injurious pecking, laying hens, management strategies, perception*

Introduction

The effects of injurious pecking by one bird on another are recognised as significant welfare and economic issues in laying-hen flocks. Not only can the recipient bird suffer considerable physical damage, which is painful and can lead to death from heat loss, disease or cannibalism, but injurious pecking can have a wider effect upon the entire flock, raising stress levels and the susceptibility for disease. In this paper we use the term injurious pecking to include gentle and severe feather-pecking, cannibalistic pecking and vent-pecking (Lambton *et al* 2013). Injurious pecking does not include aggressive behaviour, which is usually directed at the head, as it is thought to be a form of redirected foraging behaviour and may indicate that the environment is not meeting the behavioural needs of the hens (Weeks & Nicol 2006). Injurious pecking is associated with lower egg-production levels at around 30 weeks (Huber-Eicher & Sebö 2001), partly explained by increased mortality, as victims of injurious pecking die sooner (Yngvesson *et al* 2004), thus producing fewer eggs over their lifetime with clear economic consequences. It is a widespread concern within the poultry sector as there is evidence of it occurring in all housing systems and across different bird ages (Bestman *et al* 2009). Between 50–90% of free-range and organic flocks show evidence of injurious pecking (Bestman *et al* 2009; Lambton *et al* 2010), while in 100 commercial UK free-range flocks monitored by Lambton *et al* (2013), the mean prevalence of severe pecking behaviour varied from 55% at 20 weeks, to 83% at 40 weeks of age.

In most commercial systems, the impact of injurious pecking is managed by routine beak-trimming although this does not necessarily reduce the performance of all injurious pecking behaviours (Pötzsch *et al* 2001; Lambton *et al* 2010) as it does not address the causal factors underlying injurious pecking. Beak-trimming is a welfare concern (FAWC 2007) as it is a potentially painful mutilation that, in principle, should be avoided (CEC 1999). In line with this, the UK Government has scheduled the current derogation that permits beak-trimming to terminate at the end of 2015 (House of Commons Library 2012). However, to ensure that hen welfare is not compromised, it needs to be possible to effectively manage injurious pecking by other means (FAWC 2009). The

negative welfare consequences of uncontrolled injurious pecking would be greater than those caused by routine beak-trimming. Consequently, there is a pressing need to identify other effective methods for controlling injurious pecking on commercial farms (Lambton *et al* 2013).

The shift from the routine physical intervention of beak-trimming to practical flock management solutions raises two particular challenges. First, those responsible for flock health and welfare must be able to recognise and assess the relative levels and prevalence of injurious pecking in order to take appropriate action. Moreover, such assessments should be normalised, that is to say broadly comparable across different farms and systems if management solutions are to be coherently effective. Second, farmers faced with a range of possible management strategies need to be able to make confident and informed choices about which strategies to adopt.

There is a growing body of scientific literature identifying housing conditions, litter quality, and diet (reviewed by Nicol *et al* 2013; Rodenburg *et al* 2013) as primary risk factors for injurious pecking amongst flocks. Consequently, it has become clear that management actions are, especially in the absence of beak-trimming, increasingly important in reducing injurious pecking. Here, the factors that influence farmers in their understanding of the issue and in the selection of their management strategies (what we might term secondary risk factors; Whay 2007) become equally critical. Drawing upon qualitative social science methodologies, this paper first explores farmer perception and recognition of different levels of plumage damage amongst laying-hen flocks and, second, examines how their own attitudes to and understanding of injurious pecking and its causes impact upon the choice of management strategies they adopt to address the issue.

In the study of which this paper is a part, Lambton *et al* (2013) developed a range of 46 management strategies which were used in 100 commercial free-range (ie with daytime access to pasture) flocks most of which were beak-trimmed. They found that the more strategies deployed the greater the protective effect against severe feather-pecking and plumage damage. Nonetheless, a mean of 84.1% birds per flock still displayed some degree of plumage damage at 40 weeks. Despite having one-to-one support and encouragement to adopt extra strategies relevant for each flock in 53 'treatment' flocks, on average, only about half of the 46 strategies were employed on any one farm. Thus, it appears that further research is needed to identify the causal factors for injurious pecking and develop more effective means (including genetic) of reducing the risks in commercial flocks, as farmers remain generally reluctant to adopt additional management strategies to reduce injurious pecking.

Farmers' attitudes towards health and welfare problems and related intervention programmes, such as those to reduce injurious pecking, have become an important area of research (Boivin *et al* 2003; Kauppinen *et al* 2010; Kielland *et al* 2010). A greater understanding of farmer attitudes is widely held as a necessary prerequisite for the subsequent understanding of farmer behaviour, itself a critical prerequisite for promoting behavioural change to achieve improved levels of farm animal welfare (Whay 2007). Specific methodologies have been developed to understand and predict farmer attitudes and behaviour in general, originally with respect to innovation adoption, but more recently with respect to engagement in pro-environmental and pro-welfare behaviour and practices (Escobar & Buller 2014). Although much of this has been wrapped up into forms of predictive behavioural modelling (for example, Ajzen 1991, 1998; Ellis-Iversen *et al* 2010), understanding the social and individual drivers for attitudinal and behavioural change has become an important component in our understanding of how evidence-based knowledge and experimental experience can be enrolled into practical and durable changes in livestock management. Contemporary behavioural research acknowledges that rational economic calculation sits alongside a multitude of other considerations in the determination of behaviours and practices. Drawing, in part, on the language of the Theory of Planned Behaviour (Ajzen 1991), these might include intrinsic factors, such as perception of social norms, peer pressure, attitudes towards the sources, forms and flows of information, assessments of personal capacity and agency, past experience, values and others (Vaarst *et al* 2002) as well as the more extrinsic factors relating to access to informational, economic and social resources. Collectively, these increasingly numerous and complex elements become recognised as actual or potential determinants of individual behaviour and therefore key sites for addressing the possibility of behavioural change and to achieve desired policy outcomes.

Researchers in the social sciences have more recently suggested that the routine performance of social practices (which include system design, material arrangements, social relations, sector rules and knowledge flows) plays a much larger role in determining actions than the focus on individual attitudes, values and beliefs might imply (Hargreaves 2011). Hence, a growing emphasis is being placed on how such practices develop, are normalised and are reinforced through unchallenged repetition. Change, if it is to be sought and achieved, derives from a re-positioning and development of those practices rather than solely from individual behaviour. With this in mind, the current study begins by considering how certain levels of injurious pecking become normalised while others might be considered unacceptable. Drawing upon farmer interviews, the study investigates how management practices for addressing the issue of injurious pecking are developed and enacted, looking at the relative influence of intrinsic and extrinsic individual behavioural factors. The paper addresses the need for more information on barriers to uptake of knowledge on-farm by interviewing a proportion of the farmers involved in the study described by Lambton *et al* (2013).

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Table 1 A summary of flock characteristics and implementation of suggested management strategies for farmers interviewed for this study.

Farmer code	Uptake of MS‡	% uptake of strategies suggested by project team (total number suggested)	Number of MS employed at the end of the study‡	Flock type (beak-trim status)^	Flock size (000s)	Average levels of injurious pecking GFP*	SFP**	VP**	Average plumage score***	% birds affected by PD****
A	CH	n/a (0)	20	FR (BT)	4.6	2.35	0.82	0.03	2.23	79.1
B	CL	n/a (0)	12	FR (BT)	2.8	0.86	2.52	0.07	3.39	77.0
C	CM	n/a (0)	17	FR (BT)	11.8	3.21	1.51	0	0.81	47.6
D	TH	70 (10)	34	FR (BT)	15.4	1.72	0.62	0.15	2.68	67.3
E	TH	70 (10)	28	O (BT)	3.0	0.97	1.5	0.16	2.69	69.6
F	TH	75 (12)	32	FR (BT)	3.7	0.8	0.15	0	1.61	72.2
G	TL	33.3 (6)	26	FR (BT)	7.9	0.83	0.07	0	0.68	59.0
H	TL	20 (5)	16	FR (BT)	13.0	2.33	0.36	0	1.79	67.5
I	TL	18.2 (22)	16	O (BT)	3.9	0.8	1.33	0.07	3.21	80.2
J	TM	50 (6)	21	FR (BT)	12.4	0.04	0	0	0.50	38.6
K	TM	57.1 (7)	29	FR (IB)	4.2	0.06	0	0	0.07	6.8
L	TM	55.6 (9)	28	O (IB)	3.0	0.17	0.03	0	0.66	53.2

Individual farmers are identified by letters A to L and their uptake representing treatment and control flocks from high, medium and low management strategy-uptake groups. The number used from a potential 46 management strategies is shown alongside the plumage score, proportion of birds affected by plumage damage and levels of injurious pecking behaviours as a mean of values recorded at approximately 20, 30 and 40 weeks by Lambton *et al* (2013) rather than in the subsequent flocks present at the time of the interview.

‡ MS: Management strategies; T: Treatment flock; C: Control flock; H: High uptake group (59–78% [T], 39–54% [C]); M: Medium uptake group (46–58% [T], 36–39% [C]); L: Low uptake group (18–45% [T], 24–35% [C]).

^ FR: Free-range; O: Free-range organic; BT: Beak-trimmed; IB: Intact beak.

* Gentle feather-pecking (pecks directed at the tips of the feathers of a conspecific) measured as bouts per bird per h (series of pecks not separated by any other behaviour or by pause longer than 5 s).

** Severe feather-pecking (pulling at the feathers of a conspecific)/vent-pecking (cannibalistic pecking directed at the cloaca) measured as number of individual pecks per bird per h.

*** Score ranging from 0 (best) to 16 (worst).

**** Average proportion of birds which received a plumage damage score of > 0 across three visits.

Materials and methods

The study reported here was conceived as an adjunct to the research by Lambton *et al* (2013), the aim of which was first to identify practical, evidence-based 'management strategies' to control injurious pecking and, second, to monitor the cumulative effectiveness of these strategies when implemented in 100 commercial flocks of laying hens kept in free-range housing systems. As part of this process, 53 so-called 'treatment' flocks were provided with bespoke advice and encouraged to adopt more management strategies. Levels of uptake were then monitored alongside the impact on their flock performance and welfare (levels of plumage damage, injurious pecking behaviour, production, mortality etc). By way of comparison, 47 'control' flocks, for which no advice was given, were merely monitored. All these flocks were kept on 63 farms throughout Great Britain and all were already using a varied number of the management strategies at the start of the study. At the end of the primary study all the farmers received a management booklet including suggested management strategies and research findings and this, together with other sources of evidence-based knowledge, now provide farmers with tested information (available from www.featherwel.org). As all had restocked with another flock by the time of interview, they could have read and adopted some of this information, particularly if they had managed a 'control' flock for the main study.

Participants and interviews

In order to select 12 potential participants for interview all the farmers who had participated in the main study (Lambton *et al* 2013) were ordered separately, according to the number of management strategies they had employed (regardless of whether or not the strategies were suggested by the project team), into three categories 'high', 'medium' and 'low' adopters. 'Treatment' and 'control' groups were ordered separately. As treatment flocks generally adopted more management strategies (likely due to suggestions made by the project team), the proportion of the 46 potential strategies used by 'high' adopters was in the range 59–78%; 'medium' and

'low' adopters used 46–58% and 18–45%, respectively. For control flocks, 39–54% was considered high adoption, 36–39% medium, and 24–35% low adoption.

From all 63 farms, three farmers directly responsible for flock management were randomly selected for face-to-face interview from each of the 'high', 'medium' and 'low' levels of management strategy adoption for treatment flocks and one farmer for each level from control flocks (summary data are shown in Table 1). Of the 12 farmers selected for interview, three had run organic flocks of which one had intact beak birds: the second intact beak flock was not organic. The farmers also varied in age, experience and gender. Mean flock size was 7,145 (range 2,808–15,400) with a range of five breeds in those sampled. One of four researchers visited each farm and interviewed the farm owner or stockperson (hereafter referred to as 'the farmer'). The recorded, semi-structured interview was based on a set of open-ended questions that explored the farmer's perception of injurious pecking, management strategies, advice and advisors, and issues regarding implementation. These researchers were all involved in drawing up the questionnaire and had discussed together how to carry out the interview with the guidance of an experienced sociologist.

The sample of 12 farmers was intentionally small. The aim was to undertake an in-depth study of farmer perception, motivation and action through individual interviewed cases. In line with an earlier study (Horseman *et al* 2014), no claim is made here that the findings can be generalised to wider populations of poultry farmers. A recognised point of data saturation (Morse 1995) was reached in the current study with the emergence of a number of key themes. This is consistent with other studies that have found that the key elements for meta-themes (Bazeley 2009) may emerge from relatively small, yet sufficient, numbers of in-depth interviews.

Ranking of photographs of plumage damage

Drawing on visual research methodologies developed, particularly, in environmental and conservation planning (for example, Manning & Freimund 2004), and adapting them to the current research objective of determining the normalisation of certain levels of injurious pecking, a set of nine photographs of flocks of birds, each with different degrees of feather cover, was presented to each farmer in a random order. The farmer was told that flocks were all in the same age range (30–40 weeks) and was asked to order the photographs from best to worst plumage condition; equal ranks were not allowed within the photoset, so no two photographs received the same rank from one farmer. The farmer was also asked to identify the point at which they would consider the level of plumage damage (indicative of injurious pecking) to be unacceptable. The research group agreed upon a 'gold standard' for the rank order of the photographs and this gave the photographs an additional label from A (best) to I (worst feather cover) to compare with the farmer rankings. The research group were all experienced in feather-scoring on-farm using standardised scoring systems such as those used in Lambton *et al* (2013) or in the LayWel project (Blokhuis *et al* 2007), thus there was a systematic basis for the 'gold standard' ranking.

Statistical analysis was carried out on the photo rankings using IBM SPSS Statistics 19 (IBM Corp, Armonk, NY, USA). Inter-rater agreement was calculated by computing kappa for all rater-pairs and using the mean of the estimates to provide an overall index of agreement (Hallgren 2012) between farmers. The mean kappa value was also calculated to compare each farmer ranking with the 'gold standard' commonly agreed upon by the research group. The level of agreement indicated by the kappa values was interpreted as 'poor' (0.00–0.4), 'moderate' (0.41–0.60), 'substantial' (0.61–0.80) or 'excellent' (> 0.81); these values were based on the benchmarks provided by Landis and Koch (1977) and Fleiss *et al* (2003). The point at which the farmers viewed the plumage damage as unacceptable was qualitatively examined to identify reasons for their decision. This 'tipping point' was analysed in terms of rank position and the first photo with unacceptable plumage damage.

Interviews

Audio recordings of the interviews were manually transcribed. Subsequent themes emerging from the interview transcripts were identified using scrutiny techniques; searching for repetitions within and between interviews and highlighting similarities and differences between texts, as suggested by Ryan and Bernard (2003). A processing technique of 'cutting and sorting' (Ryan & Bernard 2003) was used to group similar themes together and identify the most relevant for analysis. Specifically, each transcript was read and relevant dialogue was highlighted. The highlighted sections were collectively grouped into meta-themes relating to: the perception of injurious pecking; attitudes towards management strategies; barriers to management strategy uptake; and knowledge transfer.

Results

Normalisation of plumage damage

The results of the photographic survey were available for eight of the 12 farmers interviewed and reveal a 'moderate' level of agreement between farmers (mean kappa 0.500; total rater-pairs, 28; range 0.125–1.000) and 'substantial' agreement between farmers and the agreed gold standard (mean kappa 0.719; total rater-pairs, 8; range 0.500–1.000) as shown in Figure 1. For technical reasons the full data were not available for farmers E, F, H and J. Farmers were clearly able to identify the progressively worse levels of plumage damage.

Nonetheless, the level at which they would become concerned varied. Data were available for ten of the 12 farmers interviewed (missing data from K and J). As shown in Figure 2, most farmers considered only 3–4 flocks had unacceptable levels of plumage damage, whereas three felt most photographs were unacceptable, considering only 3–4 flocks to have good feather cover. The farmers who were more tolerant of plumage damage had flocks of various sizes, with evidence of injurious pecking and plumage damage whereas the farmers 'drawing the line' earlier had relatively small flocks (< 5000) and two were organic.

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Figure 1

Comparative ranking of photographs with varying levels of flock plumage damage between producers and researchers. The flock photographs are ordered according to the 'gold standard' rank order agreed on by the research group (A best plumage condition to I worst plumage condition). Tallies of the rank that each photograph received from eight farmers are presented. The modal ranking given by farmers (dark shading) agrees with the gold standard but the lighter shading indicates variation in the ranks attributed to the flock photographs.

	Tallies of farmer rankings								
'Gold standard'	1	2	3	4	5	6	7	8	9
A	6	1	1	0	0	0	0	0	0
B	2	6	0	0	0	0	0	0	0
C	0	1	6	1	0	0	0	0	0
D	0	0	1	6	1	0	0	0	0
E	0	0	0	1	6	0	1	0	0
F	0	0	0	0	1	5	1	1	0
G	0	0	0	0	0	2	5	1	0
H	0	0	0	0	0	1	1	6	0
I	0	0	0	0	0	0	0	0	8

Figure 2

Ten farmers' ranking of plumage damage showing where each 'drew the line' of acceptable levels of feather cover. Nine photographs depicting varying levels of flock plumage damage were ordered from best to worst (1–9, respectively) by each rater, who then identified the point at which they would consider flock plumage damage to be unacceptable. Flock photos are lettered according to the 'gold standard' agreed upon by the research group from 'A' (best plumage condition) to 'I' (worst plumage condition).

Farmer code	F	E	D	L	I	G	H	A	C	B
	A		A			A	A	A		
	B	A	B			B	B	B	B	
	C	B	C	A	A	C	C	C	C	
	D	C	D	B	B	D	D	E	A	B
	E	D	E	C	D	E	E	D	D	A
Acceptable	F	E	F	D	C	F	F	G	E	C
Unacceptable	G	F	H	E	F	G	G	F	F	D
	H	G	G	H	G	H	H	H	G	E
	I	H	I	G	E	I	I	I	H	F
		I		F	H				I	G
				I	I					H
										I

Perception of injurious pecking from interview analysis

Qualitative analysis of the interviews showed that farmers expected flocks to show some level of plumage damage by the end of lay; Farmer C maintained that: "just by the nature of all that output, the hens are not going to look perfect at 72 weeks". One-quarter of all interviewed farmers said they would be unconcerned if a small proportion of the flock experienced feather loss, but would consider the same level of plumage damage to be unacceptable if the majority of birds were affected. Moreover, feather loss was sometimes associated with specific breeds: "we did have birds nearly as bad as that… but I reckon it was because they were (Breed X) and they were renowned for losing their feathers" (Farmer G).

Three of the participating farmers (K, G and B) did not perceive injurious pecking to be a problem amongst their flocks. Farmer K's perception was substantiated, since they implemented the third highest number of management strategies by the end of the Lambton *et al* (2013) study and had the lowest measured injurious pecking and plumage damage levels. Farmer G, who found only the worst three flocks in the photoset to show unacceptable levels of plumage damage, said "I don't find [injurious pecking to be] an important issue, I don't have a problem with pecking" (though researchers found evidence of injurious pecking occurring in their flocks). This suggests Farmer G's normative frame of reference allows the presence of injurious pecking to be tolerated and accepted. Although Farmer B did not perceive a problem with injurious pecking in their current flock, they were aware of the problem in their previous flock (which provided data for Table 1) and had since implemented further measures. As many as half the farmers interviewed considered injurious pecking to be only a 'moderate' problem despite reporting that they had certainly had recent problems with injurious pecking in these beak-trimmed flocks of up to 15,000 birds. That injurious pecking is harder to manage in birds with intact beaks was confirmed by two organic farmers (E, who at the time of interview housed organic flocks with intact beaks, and L who thought injurious pecking was an important issue) and were currently experiencing injurious pecking issues in their flocks, "[injurious pecking is] definitely one of the most important issues... it's very noticeable... I seem to have struggled with the last few flocks that I've had" (Farmer L).

Seven farmers linked injurious pecking to both welfare and financial implications. Farmer L told us: "if I have poor welfare, then I have a poor financial return, so the two are interlinked… the driver is I don't like seeing birds which are being picked on… but we're all in here to make money".

Between the two areas of concern, four of these deemed welfare to be most important, though a further two identified injurious pecking as primarily a financial issue.

The majority (9/12) believed injurious pecking to be indicative of problems relating to farm management, environment and the health of the birds. Farmer F argued: "I think that feather cover usually is an indication of the overall health of the bird as much as other measures you are putting in… If they are feeling stressed, because of health issues or management, then that is expressed in feather-pecking".

Two-thirds of farmers relied on their own judgement to identify an injurious pecking problem on their farm and perceived having a well-feathered flock as important for reasons of job satisfaction and professional identity, for example, Farmer C maintained: "you've got to work with them every day, so you don't really want a bunch of straggly, horrible-looking chickens". This might include pride in having a good-looking flock and the need to give visitors a good impression: "It's just the overall perception of good animal health and husbandry really, for those who come to see the chickens, whether it be customers or other, auditors or whoever" (Farmer F). Ten of our respondent farmers believed the public was essentially ignorant of the issue, and the problem, of injurious pecking; a view substantiated by Bennett *et al* (2016; this issue) who recently surveyed the attitudes of UK consumers to injurious pecking.

Virtually all of the farmers interviewed accepted some responsibility for injurious pecking occurring in their flocks. Farmer B stated: "the old flock… came from exactly the same rearer, they were reared in exactly the same way, they've both been on the same feed, same breed… points to management… I'll have to confess, really." When asked who else should be doing something about injurious pecking, two-thirds said that breeding companies should be working towards producing birds for free-range and organic systems rather than focusing on caged birds. Three farmers wanted more research to be done, especially before the proposed UK ban on beak-trimming is enforced and comments like "you can't introduce a ban on this beak tipping… until you have a suitable answer for (injurious pecking)" (Farmer C) were frequently made. Two-thirds of farmers said it was important to prevent injurious pecking from starting at rear, before the pullets reach the laying farm. Three were simply more fatalistic: "I don't think there is anything anyone can do, it is just down to the flock" (Farmer D), which also suggests a perceived lack of control over the occurrence of injurious pecking at a personal level.

Attitudes towards management strategies

All of the participant farmers, with a single exception, were keen to take on additional measures to address injurious pecking and especially so if injurious pecking was perceived as an ongoing problem on the farm. A typical example was given by Farmer A: "I would say [I am] broadly keen [to employ measures], because they are generally simple things that one can do to put it right so I'd be very happy to". The only participant not to engage with additional measures was already implementing many strategies and was not keen to do more than he was already doing (Farmer J).

All respondents considered the general management of flocks to be important in controlling injurious pecking, such as controlling ventilation, temperature and light intensity in the building; adopting disease control measures and water sanitation; managing litter condition and hens' diet. Farmer C noted that: "There's other fundamentals that you've got to get right before hanging a toy [will improve injurious pecking]… If you've got an issue with lighting, or ventilation, then a bit of string or toys aren't going to make any difference really." One-third of farmers also believed that spending time around the birds was important in order to notice changes or deal with any problems.

The most popular management strategies were those with numerous benefits and a clear strategic purpose; for example, to give birds activities to reduce boredom. Nine of the farmers approved of management strategies aimed at promoting foraging behaviour using what one of them described as 'distraction techniques' such as scattering whole wheat and grit on the litter, or providing objects for birds to peck at such as straw bales, hanging objects and hard blocks to peck at. Farmer D stated: "I think the best [management strategies] were getting them out early and some good litter, because if they are busy on the litter then they are not feather-pecking, they are busy doing something else". Three-quarters of our respondents were also keen to implement measures designed to increase range use (thereby also decreasing stocking density within the shed), usually mentioning providing more shelter. For example, Farmer A said they would put in place "anything to make the range more interesting, so I think more shelters comes into that category".

However, interviewees also identified a number of unpopular management strategies which they had found to be ineffective or to cause other problems. For example, allowing access to range within two weeks of placement on the laying farm was implemented by only three farmers as it was commonly believed to cause an increase in eggs laid outside nest-boxes. Farmer K claimed: "You really want [the hens] to get used to the nest-boxes and if you let them out [on the range] too early they tend to want to lay their eggs outside… Once they start laying outside you'll *never* get them to change… We've tried it before and it was a disaster: we got quite a lot of eggs outside, we were collecting more outside just about as what we were collecting inside".

Though all but one farmer said that floor eggs were not a big problem, the fear of creating a problem prevented them from allowing early access to the range, and in some cases to the litter; farmers generally wanted to train the birds to use the nest-boxes, so would wait until a high proportion of the flock were laying before allowing them outside. A practical solution to this adoption barrier is the option of allowing the hens to have access to litter or range in the afternoons only, which is a successful strategy that many farmers now adopt. A farmer (RM) not interviewed in this study, reported that "I would never lock the birds up on the slats again at placement. I've got a better, calmer flock by giving access straight away" (Featherwel 2013).

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Barriers to the uptake of management strategies

Farmers consistently showed a strong reluctance to adopt management strategies they felt were beyond their capacity to control. Most notable and frequent reasons included the lack of consistent identifiable causes of injurious pecking and there being no guarantee that the adoption of particular management strategies would be reliably effective in controlling injurious pecking. "There is no such thing as a blueprint that you've got to follow and you say… you do that every time, you won't get a pecking issue" argued one respondent (Farmer L) with three-quarters of the other interviewees making similar statements.

Lack of control over the weather was also an important barrier for certain management strategies (promoting access to the range, maintaining friable litter) and was mentioned by three-quarters of farmers. For example, Farmer H reported: "This year because we've had the wettest time ever... we've had trouble with [litter] capping and sticking and I've been throwing sawdust at it... to get [good litter quality] at this time of year, you'll spend all your time throwing litter at it."

As implied earlier, the genetics of the birds was also specifically mentioned by seven farmers as a major factor influencing injurious pecking that lies outside their control. One farmer with an organic flock believed that: "the majority of their breeders are for caged birds, aren't they? They breed them for the cage environment, not free-range, not organic" (Farmer I). The rearing environment was also considered by half of respondent farmers in this study to be out of their control.

Part of the problem is that managing injurious pecking on farms requires time in what are perceived as already intense schedules of work. Adopting additional strategies only increases that pressure on time and non-essential tasks become postponed. Injurious pecking management strategies may be difficult to fit into the established routine and, thus, be overlooked: "I think we made a conscious effort to get them out earlier than usual [ie than previously practised] and we just haven't done it on this occasion. Not by any particular management decision, it's just slipped… fallen back into the old routine" (Farmer F).

Although all of the farmers stated that financial implications needed to be considered before implementing management strategies (one claiming: "I will look at anything to improve the birds' welfare, but it has to be financially viable to do it" [Farmer G]), seven actively downplayed the financial implications of instigating management strategies suggesting they were 'pretty cheap' and maintaining they would regain the initial cost by increasing production and reducing problems.

Knowledge transfer

Interviewed farmers thought that good, independent advice about injurious pecking was difficult to obtain: one claiming "I wouldn't say it's easy — clear, concise advice is more difficult to come by" (Farmer L) and another that "there's not many independents out there. Whoever's going to tell you something has got a motive for telling you… or something to sell" (Farmer G). Poultry trade magazines were not a popular information source, with only a few farmers mentioning that some magazines were more helpful than others in terms of including relevant articles though subscription fees had become expensive. The internet, as a source of useful information, was only used by three farmers with just four others recognising others might find it valuable but not themselves: "you can go on the internet if you are that way inclined, but I'm not too good on the internet, I never seem to get what I want off" (Farmer I).

As one might expect, the interviewed farmers sought advice from people they considered knowledgeable about poultry farming, such as veterinarians and feed company representatives. Two-thirds of farmers valued the opinions of other egg producers; with six suggesting that organised producer meetings and/or training courses would be beneficial. Nine specifically valued the input and expertise of the University of Bristol research group, Farmer A typifying their views: "the vet has been in the game a very long time and he would probably have some comments to make on [injurious pecking], but as I said before, now we know who you are and what you're doing, it's obvious that we'd come to you [the research group]". Though these comments may have been exaggerated since farmers were reporting to the Bristol team, a key finding of the study was that the majority of farmers valued evidence-based knowledge and advice. Over half of the participant farmers said that taking part in the main study had increased their awareness of injurious pecking: "I think [the project] has made me more aware of [injurious pecking, sooner] than I might have been in the past, because I know now what to look for… like pecking around the vent area or pulling tail feathers" (Farmer E) while five said they would interpret advice based on their own experience to judge what was most applicable on their farm.

Discussion

With the growing human population it is becoming a priority that farmers adopt the latest techniques to improve sustainability, productivity and animal health and welfare. Indeed, this is a priority area for EU funding (http://ec.europa.eu/agriculture/research-innovation/index_en.htm). To be effective, knowledge transfer programmes should, first, aim to both shift perceived norms and attitudes so that issues become recognised, and, second, lead to actions that move towards their resolution. The intervention study (Lambton *et al* 2013) which preceded the interviews described here was reported by participating farmers to increase their awareness of injurious pecking and their ability to identify it in their flocks thus, theoretically, meeting the first premise. In this current study, the exercise in which farmers ranked photographs of flocks with various levels of feather loss nonetheless indicated that there remained a range of perceptions as to what constitutes an acceptable level of injurious pecking. Smaller producers are, we would suggest, more sensitive to the occurrence of injurious pecking, perhaps because plumage damage is more obvious sooner in a smaller flock, or because the farmers are more aware of individual bird behaviour within smaller flocks. Farmer I, though interviewed based on their organic study flock, also had conventional free-range flocks and

expressed concern at different levels of plumage damage depending on the housing system implying that different systems evoke different levels of concern. Organic assurance schemes tend to specify that hens be kept without beak-trimming so it is likely that farmers with intact beak flocks are more aware of injurious pecking, since the potential consequences of an outbreak are greater in intact beak flocks.

Since farmers determine whether they have a problem with injurious pecking based on their own normative frame of reference (Jansen *et al* 2009), consistently high levels of injurious pecking can result in such levels being considered normal, and therefore acceptable. This appeared to be the case in half the farmers interviewed in this study, who considered injurious pecking to be only a 'moderate' problem. Moreover, as farmers rely largely on their own judgement to identify injurious pecking in their own flocks and when to intervene, facilitating an understanding of the many reasons why injurious pecking is a problem and embedding awareness of the early signs of injurious pecking in their flocks may enable them to identify and take early action against an injurious pecking problem.

Providing standardised criteria (eg photographs of example flocks) to assist identification of an injurious pecking problem, rather than simply relying on their past experiences, may encourage action against injurious pecking to be taken sooner. Moreover, they may extend and re-qualify an individual's normative frame of reference. There is evidence from the AssureWel project (www.assurewel.org) that a combination of information regarding the control of injurious pecking and the encouragement of farmers to plumage score their own birds has led to significantly decreased levels of mortality and plumage damage (Mullan *et al* 2016; in press). Lambton *et al* (2013) also stimulated adoption of strategies which, overall, achieved the desired outcomes. In this study we have revealed some of the factors underlying the range of uptake between farms.

Whether or not individual farmers sought to adopt additional strategies to manage injurious pecking was strongly influenced by their perception of the benefits of such strategies and the risks they might pose in terms of time and finance. This is entirely consistent with Coleman *et al*'s (1998) observation that intrinsic factors, in the form of individual attitudes towards relevant behaviours, are important in determining whether or not they are adopted. The principal barriers to uptake were a lack of time and lack of control over external factors according to the farmers interviewed. Similarly, dairy farmers identified lack of time and labour availability as principal constraints in treating mastitis (Horseman *et al* 2014). Thus, finding management strategies which are easily incorporated into the existing routines, potentially associating a 'non-essential' measure with 'essential' maintenance could reduce the perception of adding another task to a full work schedule. There is also scope for innovation to ease the workload of producers, such as developing less labour-intensive methods of litter management to prevent litter capping during wet weather or of adding objects for hens to peck at.

A further indicator that intrinsic factors were important was the fact that farmers, in general, did not see a financial barrier to adopting additional measures, regarding many of them as being relatively cheap and cost-effective. Personal values, such as professional pride and job satisfaction, were greater incentives for change than public opinion. However, a frequently cited reason for not adopting measures to reduce the risk of injurious pecking was the lack of a 'blueprint' of measures proven to be consistently effective, which may be viewed as a combination of intrinsic (perceived helplessness) and extrinsic influences.

Extrinsic factors highlighted as providing barriers to change were those such as the genetics of the birds or the weather over which farmers had none or very limited control. In support of this view, scientists have also recognised the need for greater emphasis to be placed on selecting genotypes with reduced damaging feather-pecking tendencies for use in alternative laying-hen housing systems (Nicol *et al* 2013, the LayWel project [www.laywel.eu]). Farmers were especially resistant to adopting strategies, such as early access to litter or range, which they perceived to have associated downsides, such as mislaid eggs. Here, the key to driving change is altering perception and providing evidence that the actual outcome may be different to that perceived. Lambton *et al* (2013) and Featherwel (2013) provide farmers with evidence that others have acceptable outcomes from not restricting access, and also that a compromise state whereby birds have access in the afternoons, after the main egg-laying period may be achieved, thus shifting perceptions from an 'all or nothing' viewpoint. Shifting attitude to a proactive mindset that finds solutions by asking 'how can we achieve the desired outcome?' and 'can we do this another way?' appears to be very important in facilitating change and uptake of interventions and knowledge on-farm.

Animal welfare implications

Farmers' attitudes towards health and welfare problems and related intervention programmes, such as those to reduce injurious pecking in hens, directly influence the welfare of animals in their care. This study has shown that their perception of an injurious pecking problem may rely on their normative frame of reference and has identified intrinsic factors as the principal barriers to change. Thus, schemes aimed at improving animal welfare on-farm should not only provide independent, evidence-based knowledge but also consider techniques, such as providing photographs, to inform and shift perceived 'norms' and to promote farmer-led innovative solutions.

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References

Ajzen I 1991 The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes 50*: 179-211. http://dx.doi.org/10.1016/0749-5978(91)90020-T

Ajzen I 1998 Models of human social behaviour and their application to health psychology. *Psychology and Health 13*: 735-739. http://dx.doi.org/10.1080/08870449808407426

Bazeley P 2009 Analysing qualitative data: More than 'identifying themes'. *The Malaysian Journal of Qualitative Research 2*: 6-22

Bennett RM, Jones PJ, Nicol CJ, Tranter RB and Weeks CA 2016 Consumer attitudes to injurious pecking in free range egg production. *Animal Welfare 25*: 91-100. http://dx.doi.org/10.7120/09627286.25.1.091

Bestman M, Koene P and Wagenaar JP 2009 Influence of farm factors on the occurrence of feather pecking in organic reared hens and their predictability for feather pecking in the laying period. *Applied Animal Behaviour Science 121*: 120-125. http://dx.doi.org/10.1016/j.applanim.2009.09.007

Blokhuis HJ, Fiks van Niekerk T, Bessei W, Elson A, Guemene JB, Kjaer JB, Maria Levrino GA, Nicol CJ, Tauson R, Weeks CA and Van De Weerd H 2007 The LayWel project: welfare implications of changes in production systems for laying hens. *World's Poultry Science Journal 63*: 101-114. http://dx.doi.org/10.1017/S0043933907001328

Boivin X, Lensink J, Tailet C and Vessier I 2003 Stockmanship and farm animal welfare. *Animal Welfare 12*: 479-492

CEC 1999 Council Directive 1999/74/EC laying down minimum standards for the protection of laying hens. *Official Journal of the European Communities 203*: 53-57

Coleman GJ, Hemsworth PH and Hay M 1998 Predicting stockperson behaviour towards pigs from attitudinal and job-related variables and empathy. *Applied Animal Behaviour Science 58*: 63-75. http://dx.doi.org/10.1016/S0168-1591(96)01168-9

Ellis-Iversen J, Cook AJC, Watson E, Nielen M, Larkin L, Wooldridge M and Hogeveen H 2010 Perceptions, circumstances and motivators hat influence implementation of zoonotic control programs on cattle farms. *Preventive Veterinary Medicine 93*: 276-285. http://dx.doi.org/10.1016/j.prevetmed.2009.11.005

Escobar MP and Buller H 2014 Projecting Social Science into Defra's Animal Welfare Evidence Base: A Review of current research and evidence base on the issue of farmer behaviour. *A Report to the Department for Environment, Food and Rural Affairs*. Defra: London, UK

FAWC 2007 *Opinion on Beak Trimming of Laying Hens. Government Report*. http://www.fawc.org.uk/pdf/beak-trimming.pdf

FAWC 2009 *Beak trimming of laying hens. Letter to Ministers*. http://www.fawc.org.uk/pdf/beaktrimming.pdf

Featherwel 2013 Improving Feather Cover. *A guide to reducing the risk of injurious pecking occurring in non-cage laying hens*. www.featherwel.org

Fleiss JL, Levin B and Paik MC 2003 *Statistical Methods for Rates and Proportions, Third Edition*. Wiley & Sons: New York, USA. http://dx.doi.org/10.1002/0471445428

Hallgren KA 2012 Computing inter-rater reliability for observational data: an overview and tutorial. *Tutorials in Quantitative Methods for Psychology 8*: 23-34

Hargreaves T 2011 Practice-ing behaviour change: Applying social practice theory to pro-environmental behaviour change. *Journal of Consumer Culture 11*: 79-99. http://dx.doi.org/10.1177/1469540510390500

Horseman SV, Roe EJ, Huxley JN, Bell NJ, Mason CS and Whay HR 2014 The use of in-depth interviews to understand the process of treating lame dairy cows from the farmers' perspective. *Animal Welfare 23*: 157-165. http://dx.doi.org/10.7120/09627286.23.2.157

House of Commons Library 2012 *Battery Hens. Standard Note: SN/SC/1367*. http://www.parliament.uk/briefing-papers/SN01367/battery-hens

Huber-Eicher B and Sebö F 2001 The prevalence of feather pecking and development in commercial flocks of laying hens. *Applied Animal Behaviour Science 74*: 223-231. http://dx.doi.org/10.1016/S0168-1591(01)00173-3

Jansen J, van den Borne BHP, Renes RJ, van Schaik G, Lam TJGM and Leeuwis C 2009 Explaining mastitis incidence in Dutch dairy farming: The influence of farmers' attitudes and behaviour. *Preventive Veterinary Medicine 92*: 210-223. http://dx.doi.org/10.1016/j.prevetmed.2009.08.015

Kauppinen T, Vainio A, Valros A, Rita H and Vesala KM 2010 Improving animal welfare: qualitative and quantitative methodology in the study of farmers' attitudes. *Animal Welfare 19*: 523-536

Kielland C, Skjerve E, Osteras O and Zanella A 2010 Dairy farmer attitudes and empathy toward animals are associated with animal welfare indicators. *Journal of Dairy Science 93*: 2998-3006. http://dx.doi.org/10.3168/jds.2009-2899

Lambton SL, Knowles TG, Yorke C and Nicol CJ 2010 The risk factors affecting the development of gentle and severe feather pecking in loose housed laying hens. *Applied Animal Behaviour Science 123*: 32-42. http://dx.doi.org/10.1016/j.applanim.2009.12.010

Lambton SL, Nicol CJ, Friel M, Main DCJ, McKinstry JL, Sherwin CM, Walton J and Weeks CA 2013 A bespoke management package can reduce levels of injurious pecking in loose-housed laying hen flocks. *Veterinary Record* 172: 423-429. http://dx.doi.org/10.1136/vr.101067

Landis JR and Koch GG 1977 The measurement of observer agreement for categorical data. *Biometrics* 33: 159-174. http://dx.doi.org/10.2307/2529310

Manning RE and Freimund WA 2004 Use of visual research methods to measure standards of quality for parks and outdoor recreation. *Journal of Leisure Research 36*: 557-579

Morse JM 1995 The significance of saturation. *Qualitative Health Research 5*: 147-149. http://dx.doi.org/10.1177/104973239500500201

Mullan S, Szmaragd C, Cooper MD, Wrathall JHM, Jamieson J, Bond A, Atkinson C and Main DCJ 2016 Animal welfare initiatives improve feather cover of cage-free laying hens in the UK. *Animal Welfare*, in press

Nicol CJ, Bestman M, Gilani A-M, de Haas EN, de Jong IC, Lambton S, Wagenaar JP, Weeks CA and Rodenburg TB 2013 The prevention and control of feather pecking: application to commercial systems. *World's Poultry Science Journal 69*: 775-787. http://dx.doi.org/10.1017/S0043933913000809

Pötzch CJ, Lewis K, Nicol CJ and Green LE 2001 A cross-sectional study of the prevalence of vent pecking in laying hens in alternative systems and its associations with feather pecking, management and disease. *Applied Animal Behaviour Science 71*: 259-272. http://dx.doi.org/10.1016/S0168-1591(01)00167-8

Ryan GW and Bernard HR 2003 Techniques to identify themes. *Field Methods 15*: 85-109. http://dx.doi.org/10.1177/1525822X02239569

Rodenburg TB, van Krimpen MM, de Jong IC, de Haas EN, Kops MS, Riedstra BJ, Nordquist RE, Wagenaar JP, Bestman M and Nicol CJ 2013 The prevention and control of feather pecking in laying hens: identifying the underlying priciples. *World's Poultry Science Journal 69(2)*: 361-374. http://dx.doi.org /10.1017/S0043933913000354

Vaarst M, Paarup-Laursen B, Houe H, Fossing C and Andersen HJ 2002 Farmers' choice of medical treatment of mastitis in Danish dairy herds based on qualitative research interviews. *Journal of Dairy Science 85*: 992-1001. http://dx.doi.org/ 10.3168/jds.S0022-0302(02)74159-3

Weeks CA and Nicol CJ 2006 Behavioural needs, priorities and preferences of laying hens. *World's Poultry Science Journal 62*: 296-307. http://dx.doi.org/10.1079/WPS200598

Whay HR 2007 The journey to animal welfare improvement. *Animal Welfare 16*: 117-122

Yngvesson J, Keeling LJ and Newberry RC 2004 Individual production differences do not explain cannibalistic behaviour in laying hens. *British Poultry Science 45*: 453-462. http://dx.doi.org /10.1080/00071660412331286163

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