Welfare Assessment of Birds in Houses Three and Four at Old Hill Farm, Ross on Wye, HR9 7TF. 29 April 2008

Dr Sue M Haslam BVSc PhD DWEL MRCVS

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Executive Summary

A visit was made to Old Hill Farm, Ross on Wye on 29th April 2008. A welfare assessment of birds in houses 3 and 4 was made by Dr S M Haslam BVSc PhD DWEL MRCVS, using the current draft of the EU Welfare Quality® broiler chicken welfare assessment protocol: this ptotocol is under development. The welfare of each flock was also assessed by calculating the Unitary Welfare Index score, a published, weighted, integrated score. The birds were 39 days on the day of the visit. House 4 was fitted with a ***Mini-FLOCKMAN*** device, which alters lighting patterns and controls feed by meal feeding. House 3 had a standard four hour dark period with no dawn-dusk dimming and was fed *ad libitum.*

The number of flocks assessed for this exercise was too small to demonstrate any statistically significant differences between birds in the experimental and control houses. The differences seen could have been due to parent age, chick quality or the experimental intervention.

The experimental house had considerably lower mortality, either including or excluding culled birds, than the control house. Mortality including culls was over 26% lower in the experimental than in the control house and mortality, excluding culls, was over 39% lower. The walking ability of birds in the experimental house was markedly better than that of birds in the control house, with average bird gait score 0.19 lower in the experimental house. There were over 4 times (4.25) the percentage of birds sampled with a gait score of over 2 in the control than in the experimental house. Poor walking ability severely reduces the welfare state of birds, as it affects bird welfare in terms of most of the Five Freedoms, developed by the UK Farm Animal Welfare Council, which are widely used in welfare assessment.

The birds in the experimental house were cleaner and had a lower prevalence of Hock Bum than those in the control house. The higher prevalence of Foot Pad Dermatitis found in the experimental house is likely to have reflected the better leg health of birds in the experimental house. During the visit one hundred birds were examined for clinical pathology: 7% of the birds examined in the control house had ascites while no birds were found with this condition in the experimental house.

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Fearfulness in broilers is difficult to assess, as results of reliable and valid tests developed to assess fear in hens are confounded by leg health and stocking density in broiler chickens. Birds in the control house showed episodes of 'alarm' behaviour, consisting of considerable flapping and vigorous escape attempts, as the house was walked, in contrast to the birds in the experimental house in which no alarm responses were seen.

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Professional Resume - Sue M Haslam BVSc PhD DWEL MRCVS: March 2008

Between graduating from the University of Bristol in 1980, with a Batchelor of Veterinary Science, and October 1999, I held positions at a number general practices and companion animal practices in the UK; the list of my appointments and chief responsibilities for each post is attached at Annex B. In 1993 I held a post as a Senior Veterinary Surgeon, responsible for supervision of all surgical procedures at Kippax Veterinary Hospital in Canberra, Australia.

I completed the Royal College of Veterinary Surgeons (RCVS) Certificate in Welfare, Ethics and Law (AWSEL) in 1996 and the Diploma in AWSEL during 2000. My Diploma thesis was entitled 'Welfare Assessment Systems: need, design criteria and implementation'. I was awarded a Doctor of Philosophy in Veterinary Science from the University of Bristol, in 2003; my Doctoral thesis was entitled 'The development of a Unitary Welfare Index for the assessment of welfare in broiler chicken'. My Doctoral studies were sponsored by the Royal Society for the Protection of Animals (RSPCA).

I currently run an independent animal welfare consultancy, since 1996. In this capacity, I have written welfare training curricula and programmes and teaching material, including computer-based presentations, for welfare charities and the food industry, including 'the World Society for the Protection of Animals (WSP A) and the Northern Ireland Beef Accreditation Scheme (NIBAS). I have regularly carried out audits of retail supply base companies, both on farm and at processing plants, for Tesco PLC. In 2000 I wrote McDonald UK and McDonald EU welfare policies, welfare standards and welfare audit documents for five farmed species. I have acted, or been consulted, as an expert witness for a number of welfare related legal cases

As part of my consultancy work, I also act as a *locum tenens* on a regular basis for several companion animal practices in the Bristol area. I acted regularly as a *locum tenens* for the British Army, in The Western Sovereign Base Area, Cyprus, with sole responsibility for the health and welfare of Military Working Dogs, and for animals presented at the base private clinic, in 2003, 2004 and 2005.

Between 1997 and 1999 I worked as an Official Veterinary Surgeon (OVS) for the UK Meat

Hygiene Service as a subcontractor for a practice based in Lincolnshire. As such I was the Responsible OVS at Bernard Mathews in Spalding, The City Abattoir in Lincoln and St Merryn Meats near Lincoln as well as for a number of small butchers' shops and cutting plants.

I hold a part time post as a Research Fellow at the School of Veterinary Science at the University of Bristol. My duties include work on Work Packages 2 and 4 of the EU Welfare Quality® project to design and field test EU wide welfare assessment systems for poultry, pigs and cattle, including an intervention study to improve welfare for broiler chickens. I also lecture and examine in Welfare Science, Ethics, Law, Welfare and Veterinary Public Health, at both undergraduate and postgraduate levels. I have run broiler welfare training courses in Bristol (University of Bristol), Brazil (Sadia), Brussels (University of Gent) and Chile (University of Santiago).

I sat on the EU Communication in Science and Technology (COST) group; this group has produced three reviews of welfare assessment parameters for publication in scientific journals.

I was an examiner for the RCVS Certificate in Animal Welfare Science, Ethics and Law (AWSEL) between 2000 and 2003 and the chief examiner in 2003. I am currently an examiner for the AWSEL Diploma examination. I was a member of the RCVS AWSEL board from November 1999 to November 2002.

I am a member of the Animal Welfare Science, Ethics and Law Veterinary Association (AWSEL VA) Committee, I have been the editor of the AWSEL VA newsletter since 1996 and I currently hold the position of Vice Chair. I am a Member of the British Small Animal Veterinary Association (BSAVA), British Veterinary Association (BVA), the Veterinary Association for Arbitration and Jurisprudence (VAAJ) and the British Poultry Veterinary Association (BVPA).

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Welfare Assessment of Birds in Houses Three and Four at Old Hill Farm, Ross on Wye 29 April 2008

1. Background and Remit

I received a request from Mr David Filmer of David Filmer Limited, Wascelyn, 48 Brent Street, Brent Knoll, Somerset, TA9 4DT, United Kingdom to make a visit to Old Hill Farm, Ross on Wye, HR9 7TF on 29 April 2008 to make a welfare assessment of the birds in two of the houses on Old Hill Farm. Old Hill Farm is owned by Mr Eric Drummond and managed by Mr Keith Bullock. Mr Filmer and Mr Bullock assisted me with the welfare assessment.

1.1 I understood that one ofthe subject houses was fitted with a ***Mini-FLOCKMAN*** device, which controls lighting to give a minimum of four hours of darkness, not including dawn and dusk dimming periods, throughout a twenty four hour cycle and controls feed supplied in the early part of the flock cycle by feeding in meals.

1.2 The protocol used to make the welfare assessment was that currently used for the EU Welfare Quality® project for broiler chickens. Welfare Quality® is an EU funded project which aims to integrate animal welfare into the food quality chain. The Welfare Quality® broiler welfare assessment protocol is still under development and so is not yet available for general use. However, the overall aims and methodology for development of the protocol may be seen at http://www.welfarequality.net/everyone

1.3 The measures taken included those necessary to assign a Unitary Welfare Index (UWI) score, which is an integrated, overall welfare score, which includes weighted welfare indices calculated from data collected for the welfare assessment, described by Haslam and Kestin (2004).

2. Methodology

The principle measures made for the Welfare Quality® broiler welfare assessment protocol have been published (Butterworth *et al.* 2007). The measures taken included: a questionnaire; several tests designed to assess fear; assessment of bird walking ability; clinical assessments; resource measures and a Quality Behavioural Assessment (QBA). During the visit to Old Hill Farm of29

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April, the protocol was first carried out in house 4, commencing at 09:30 and then in house 3, commencing at 14:30

2.1 The farm questionnaire covered the background to the flock, including parent flock ages, vaccination programmes, cleaning and disinfection protocols, number and consistency of stockmen, emergency provision, lighting programmes, thinning frequency, age and weight at thinning, litter type, method of euthanasia and feed and water withdrawal periods prior to depopulation.

2.2 The resource measures made included light levels, assessment of atmospheric ammonia and dust, bio-security provision, information necessary to calculate bird to feeder and drinker ratios and stocking density, enrichment provision and litter quality assessment.

2.2.1 Light levels were measured at 6 sites along 3 axes (X, Y and Z) using a luxometer. Ammonia was assessed subjectively on a scale of 1 = 'none detected' to 5 = 'very unpleasant, coughing, difficulty breathing'. Information to calculate bird stocking density was taken from house records (number of nipples, number of feeders, floor area). Litter quality was assessed using the Gleadthorpe litter assessment system, described by Tucker and Walker (1992), on a scale of from 1 = 'dry and crumbly' to 5 = 'capped and wet' , at 10 randomly selected sites.

2.3 Three different tests to assess fear were carried out, including a novel object test (3 sites), an avoidance distance test (21 birds), and touch test (36 sites), described for use in non-caged laying hens by Raubek *et al.* (2007). The use and interpretation of results from these tests in broiler chickens may be controversial, discussed at paragraph 4.2 below.

2.3.1 For the novel object test, the object is placed on the litter, the observer steps back 3 meters and counts the number of birds within 1 bird's length of the object at 30 second intervals.

2.3.2 For the avoidance distance test, a bird is identified which is standing under the drinker line, which does not appear to be lame and which has space to move away from the observer. The observer then walks towards the bird in a standardised manner, at 90 degrees to the drinker line,

until the bird shows avoidance behaviour. The distance between the observer and the drinker line is measured.

2.3.3 For the touch test, the observer walks along the house and crouches down, The number of birds within touching distance is then counted. The observer then attempts to touch each of the birds identified and records the number he/she is able to touch.

2.4 Approximately 250 birds were assessed for walking ability at 10 randomly selected, computer-generated locations, as described by Kestin *et al.* (1992) and Knowles *et al.* (2008). Using this system, a bird with a perfect gait scores 0 while a bird which is unable to walk on its legs scores 5. The mean gait score was calculated by weighting each bird assessed by its gait score, finding the total of the weighted scores and dividing by the total number of birds assessed. Thus a flock in which all birds have gait score 0 would have a mean gait score of 0 and a flock in which all birds have gait score 5 would score 5.

2.5 One hundred birds were clinically assessed at each of the 10 randomly selected sites, for cleanliness, contact dermatitis and pathologies.

2.5.1 Standardised assessment of bird cleanliness was made using the Welfare Quality® scale, which is based on the system described by Wilkins *et al.* (2003), from 1 = 'very clean' to 4= 'very dirty, all of the ventral side of the bird is thickly covered in dirt'.

2.5.2 Standardised assessments of foot pad dermatitis, hock burn, and breast burn were made, using the systems described by Haslam *et al.* (2007). Using this system, food pad lesions are compared to a standard photographic scale of from 0 = no lesion to 4 = the most severe lesion covering most of the foot pad. Hock burn was assessed on a similar scale, breast burn was assessed as either absent or present. Mean cleanliness, foot pad dermatitis and hock burn scores were calculated by weighting each bird assessed by the score, finding the total of the scores and dividing by the number assessed. The number of birds with breast burn was expressed as a percentage of the toatal number of birds examined.

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2.5.3 In addition to these contact dermatitis measures, any abnormality of the eyes, nares and crop were recorded as well as birds with spinal lesions (having a characteristic posture, sitting back on hocks), ascites and evidence of diarrhoea (soiling of the feathers around the vent).

2.6 Records of bird mortality and culls, by cause of cull, were taken from the house records.

2.7. The birds in the house being assessed were observed for a period of 10 minute in order to assess, 'body language' using a Qualitative Behaviour Assessment (QBA), by the method described by Wemelsfelder (2007). For this assessment, various descriptive aspects of the flock, such as 'fearful', 'inquisitive' and 'playful' were assessed subjectively on a Visual Analogue Scale. This method is currently being validated for broiler chicken welfare assessment and tested for reliability of recording between observers (Wemelsfelder *et al.* In Prep 2008).

2.8 The UWI score was calculated using the method described by Haslam (2003) and Haslam and Kestin (2004). The UWI is a composite score, which includes weighted indices of mortality, gait score, foot pad dermatitis, stocking density, enrichment and emergency provision, feather pecking, thinning and feed restriction. During the development of the UWI, Welfare Indices had been weighted by a panel of broiler experts including poultry research scientists and Veterinary Surgeons with post graduate qualifications in Poultry Medicine and Production and Animal Welfare Science Ethics and Law. In one study, which included organic, free range and traditional intensive flocks, the UWI score ranged from 33 to 57, of a maximum score of 100 and a minimum of 0 (Haslam 2003)(Haslam and Kestin 2004).

3. **Results**

As the principle aim of the assessment was to compare the welfare state of the birds in the two houses assessed, factors which did not differ between houses are not described in detail in this report. Clearly, as the number of houses assessed for the treatment and control houses was 1, no statistically significant differences were found between the two houses. This report therefore presents only simple descriptive statistics.

3.1 The only differences in the background to houses 3 and 4, found in completing the questionnaire, were the ages of the parent flocks and the lighting and feeding programmes. The age

of the parent flocks supplying birds for house 3 were 54,56 and 58 weeks (mean 56 weeks), those for house 4 were 39 and 47 weeks (mean 43 weeks). The lighting period in house 3 was 4 hours of darkness commencing at 03:00 hours, with no dawn or dusk period, that in house 4 was at least four hours of darkness, not including dawn and dusk periods, which were in place. Birds in house 3 were fed *ad libitum* whereas those in house 4 were fed in meals. The lighting and feeding programmes in house 4 were controlled by the ***Mini-FLOCKMAN*** device, which is subject to copyright restrictions: details of these programmes were therefore not provided.

3.2 The results of resource measures, including mortality and cull records, in houses 3 and 4 are presented in Table 1.

Resource measure	House 3	House 4
Stocking density immediately prior to slaughter	39.56	39.44
Feeder space/ bird at inspection	1.82	1.80
Bird:drinker ratio at inspection	8.9	9
Mean light levels	4.72 lux	5.78 lux
Ammonia score (1 - low - 5 - v high)	1	1
Dust score (1 = low - 5 = v high)	2	2
Mean Litter score (1 = dry - 5 = v wet)	2.7	3.1
Mortality plus culls %	4.63%	3.41%
Mortality excluding culls %	2.17%	1.32%
Total culls %	2.45%	2.09%
Leg culls %	0.35%	0.32%
Small/ emaciated birds ('runts')%	1.53%	1.16%

Table 1. Resource measures in houses 3 and 4

3.3 The results of the 'fear tests' in houses 3 and 4 are presented in Table 2.

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Test	Total number of birds within 30 ern of the novel object	Total number of birds in reach (BR)	Number of birds touched (BT)	Ratio BT/BR	Mean Avoidance Distance (m
House 3	8	168	137	0.82	3.14
House 4	12	77	61	0.79	45.43

Table 2. 'Fear test' results in houses 3 and 4.

Thus, the total number of birds within 30 em ofthe novel object during 6 minutes of recording at 3 sites was 8 for house 3 and 12 for house 4. The total number of bird in reach in house 3 was 168, that in house 4 was 77, the total number touched was 137 and 61 in house 3 and house 4 respectively and the ratio of birds touched to birds in reach was 0.82 and 0.79 for house 3 and house 4 respectively. Thirty six touch tests were made in total in each house. The mean avoidance distance for 21 tests in each house was 3.14 ern and 45.43 cm in house 3 and house 4 respectively.

3.4 Three hundred and thirty four birds were gait scored in house 3 and 254 in house 4. The mean gait score in house 3 was 1.69, that in house 4 was 1.50. The percentage of sampled birds with gait score of over 3 was 10.2% in house 3 and 2.4% in house 4.

3.5 The mean cleanliness score, mean Foot Pad Dermatitis score, mean Hock Burn score, percentage of birds with breast burn and frequency of pathologies for houses 3 and 4 are shown in Table 3.

	Mean cleanliness score	Mean Foot Pad Dermatitis score	Mean Hock burn score	Percentage of birds with breast burn	Pathology
House 3	3.27	0.88	1.07	0	17% Diarrhoea 7% Ascites 2% Eve oathologv
House 4	3.00	2.12	0.88	0	20% Diarrhoea 1% Eye pathology

Table 3. Mean cleanliness score, mean Foot Pad Dermatitis score, mean Hock Burn score, percentage of birds with breast burn and frequency of pathologies for houses 3 and 4.

Thus birds in house 3 tended to be dirtier than in house 4, to have less foot pad lesions and more hock burn lesions. No breast burn was seen in either house. In both houses approximately one fifth

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of birds examined had diarrhoea and 7% of birds in house 3 had ascites. None of the birds in house 4 had ascites.

3.6 The results of the QBA are presented in Table 4.

Descriptor	House 3	House 4
Active	38	23
Relaxed	53	72
Helpless	15	8
Comfortable	29	52
Fearful	10	16
Agitated	57	15
Confident	70	49
Depressed	8	73
Calm	57	81
Content	62	73
Tense	9	9
Inquisitive	16	4
Unsure	5	7
Energetic	32	34
Frustrated	42	52
Bored	18	32
Friendly	43	5
Positively Occupied	64	31
Scared	66	8
Drowsy	43	72
Playful	30	3
Nervous	75	4
Distressed	22	4

Table 4. Qualitative Behavioural Assessment (QBA) scores for Broiler QBA descriptors: 0 = not at all; 100 = the maximum possible.

Thus there were considerable differences in the behaviour of the birds in houses 3 and 4. The greatest differences were perceived to be that the birds in house 4 tended to be more relaxed, comfortable, calm and drowsy than birds in house 3: they also appeared to be less agitated, less scared, less nervous and less distressed. At the time of inspection, the birds in house 4 also

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appeared to be less playful, less friendly, less positively occupied less confident and more depressed than those in house 3. The limitations of the QBA are discussed in paragraph 4.6 below.

3.7 The UWI scores for house 3 and 4 were 43 and 46 respectively. No measures fell into the 'fail' category of the UWI assessment, but house 3 fell into the' action necessary' sections for mortality level, enrichment, thinning, Foot Pad Dermatitis and stocking density and house 4 for enrichment, thinning, Foot Pad Dermatitis and stocking density.

4. **Discussion**

As discussed earlier, no statistically significant differences in the welfare state of the flocks was identified as there the number of flocks examined was too small.

4.1 Although the resource measures provided for the birds were mostly very similar or identical, including site and orientation of the building, stockmen, feed composition, litter type, vaccination programme etc, there were some differences between the flocks, of which the parent flocks, and more specifically the age of the parent flocks was that most likely to have an effect on the welfare indicators measured during this visit. Parent flock, and age of parent flock is known in the industry to affect chick quality and so health and welfare measures during the flock cycle in terms of pathogens carried by chicks, immunocompetence and liveability.

4.2 The 'fear tests' included in the Welfare Quality® protocol were developed in laying hens and have not been tested for validity as welfare assessment measures or for reliability between observers in broiler chickens. In my opinion, in broilers, these tests are very strongly affected by the walking ability of the birds and the stocking density, as birds which have difficulty walking or are restricted by other birds are unable to move away when approached by a recorder.

4.2.1 The increased mobility of birds in house 4, in comparison to those in house 3, is reflected by the finding that considerably fewer birds were within reach for the touch test discussed in paragraph 3.3 above. However, the ratio of birds touched to birds in reach was similar in both houses, which suggests that bird fearfulness may have been similar in the two flocks. This is supported by the fairly similar number of birds recorded as being close to the novel object recorded during the Novel Object test.

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4.2.2 The increased mobility of birds in house 4 is also reflected by the considerably greater mean avoidance distance test in this house in comparison to that in house 3 (45.43 and 3.14 cm respectively).

4.3 Mortality, including culls, in house 4 was over 26% lower than in House 3. Mortality, excluding culls, was over 39% lower in house 4 than in house 3. Mortality is a very important welfare assessment measure and is most heavily weighted in the UWI (at 0.26, where total weighting of all measures was 1 (Haslam and Kestin 2004) .

4.4 The sample of birds assessed for walking ability was 0.89% of birds placed in the house and has been shown to be sufficient to reflect levels of walking ability in a house, to the 95% confidence level (Kestin and Knowles 2004). The walking ability of birds in house 4 was markedly better than that of birds in house 3, with average bird gait score 0.19 lower in house 4. In addition, there were over 4 times (4.25) the percentage of birds sampled with a gait score of over 2 in house 3 than in house 4. Lameness was weighted as the second most important welfare assessment measure in the UWI (0.24) (Haslam and Kestin 2004). Lameness affects the welfare of the bird in many aspects and is relevant to each of the Five Freedoms, developed in the UK by the Farm Animal Welfare Council. Thus, birds with poor walking ability are more likely to suffer from hunger of thirst if they are unable to access feeders and drinkers (Weeks 2000) and to be in discomfort: they are also unable to perform many normal behaviours, including walking and running. In addition many lame birds are likely to be suffering from pain, injury and/or disease.

4.5 The sample of birds examined clinically was small, representing only 0.35% of the birds placed in the house, and the findings may not accurately reflect the prevalence of the conditions recorded in the entire flock. The principle finding of the clinical examinations was that both houses had a considerable proportion of birds with diarrhoea and that 7% of birds in house 3 of the sample assessed had ascites, while no cases of ascites were found in the birds sampled in house 4.

4.5.1 The prevalence of Foot Pad Dermatitis in birds in house 4 was over twice that in house 3 in the sample assessed. This is likely to reflect the poor litter quality in both houses (score 2.7 and 3.1 in house 3 and 4 respectively) which was probably due to the high levels of birds with diarrhoea in

both houses (17% and 20% in houses 3 and 4 respectively). However, where litter quality is poor, birds which are more mobile and so stand with their weight pressed onto the litter for a greater proportion of the time tend to have higher levels of Foot Pad Dermatitis but lower levels of Hock Bum, whereas birds with poorer walking ability tend to have a lower prevalence of Foot Pad Dermatitis but higher levels of Hock Burn, as found by Haslam *et al.* (2007b). In this case the birds sampled in house 3 did indeed have a higher prevalence of Hock Burn than the birds sampled in house 4 (mean Hock Burn score 1.07 and 0.88 in houses 3 and 4 respectively).

4.5.2 The birds in house 4 were considerably cleaner than birds in house 3 (mean cleanliness score 3.27 and 3.00 in houses 3 and 4 respectively), in spite of similar litter scores. This probably reflected the increased mobility in house 4 and resultant reduced lying time when contamination of the breast area occurs.

4.6 The QBA is usually used experimentally and is analysed using Principle Component Analysis (PCA), which is a type of factor analysis which attempts to identify underlying variables, or factors, that explain the pattern of correlations within a set of observed variables. For this set of data, there are only 2 cases, which is insufficient to provide enough variance within each variable to allow correlation coefficients to be computed for all pairs of variables and so for a PCA to be carried out. This analysis would have eliminated overlap between the different terms in the QBA which are underpinned by a similar concept, such as the underlying attitude to factors such as 'calm', 'relaxed', and 'content', in terms of its relationship to bird welfare.

4.6.1 The QBA is a snapshot of bird behaviour taken at the time of observation of the birds. In the case of house 4, according to Mr Filmer, the QBA was carried out at a period when it would normally have been dark, which is probably why the birds in this house appeared to be more drowsy, less playful, less positively occupied less confident and more depressed than those in house 3.

4.6.2 The scores for 'fearful' and 'scared' and 'nervous' for house 3 may at first appear to be anomalous as these terms might be expected to co-vary (house 3 has a low score for 'fearful' but a high score for 'scared' and 'nervous'). This is because these birds did not react to the approach of people (see the very low score for Avoidance Distance Test, discussed in paragraph 4.2 above) but

did react in a very alarmed manner, with considerable flapping and vigorous escape attempts, as the house was walked, in contrast to the birds in house 4, which had a longer mean ADT score but did not show alarm responses.

4.7 The UWI score for house 4 was higher than that for house 3 but the score for both houses was below 50, ofamaximum of 100. This is because both houses scored poorly for enrichment, thinning, Foot Pad Dermatitis and stocking density. Thinning was heavily weighted by the panel consulted for the UWI weighting exercise, one thinning resulting in a penalty of 12 UWI points. Most flocks which are Campylobacter *sp.* negative prior to thinning are positive after thinning and there is recent work showing that infection with Campylobacter *sp.* is associated with higher flock mortality and contact dermatitis levels, contrary to previous belief (Rushton In press 2008). Campylobacter *sp.* status of a flock was found to be strongly and very significantly correlated with UWI score in another study (Haslam 2004).

5. **Summary**

5.1 The number of flocks assessed for this exercise was too small to demonstrate any statistically significant differences between birds in the experimental and control house. The differences seen between the to houses could have been due to parent age, chick quality or the experimental intervention (the ***Mini-FLOCKMAN*** device).

5.2 However, the experimental house had considerably lower mortality, either including or excluding culled birds, than the control house. Mortality including culls was over 26% lower in the experimental than in the control house and mortality, excluding culls, was over 39% lower in the experimental house.

5.3 The walking ability of birds in the experimental house was markedly better than that of birds in the control house, with average bird gait score 0.19 lower in the experimental house. In addition, there were over 4 times (4.25) the percentage of birds sampled with a gait score of over 2 in the control than in the experimental house. Poor walking ability severely reduces the welfare state of birds, as it affects most of the Five Freedoms.

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5.4 The birds in the experimental house were cleaner and had a lower prevalence of Hock Burn than those in the control house. The higher prevalence of Foot Pad Dermatitis found in the experimental house may, in part, have reflected the slightly poorer litter quality in the experimental house (mean litter score 2.7 and 3.2 for control and experimental house respectively) but is also likely to reflect the better leg health (detailed in paragraph 4.4) of birds in the experimental house.

5.5 Although the bird sample size was low (100 birds), 7% of the birds examined in the control house had ascites while no birds were found with this condition in the experimental house.

5.6 Fearfulness in broilers is difficult to assess as results of reliable and valid tests developed to assess fear in hens are confounded by leg health and stocking density in broiler chickens. For the visit to Old Hill farm, this was a particular problem due to the marked difference in walking ability between the experimental and control house, discussed at paragraph 4.4 above. Subjectively, birds in the control house showed episodes of 'alarm' behaviour, consisting of considerable flapping and vigorous escape attempts, as the house was walked, in contrast to the birds in the experimental house in which no alarm responses were seen.

5.7 The UWI score, a weighted, composite score of overall welfare, for the experimental house was 46, that for the control house was 43.

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Annex A: List of Appointments

ENWLOYERSNAME,ADDRESS AND TYPE OF BUSINESS	DATE FROM	DATE TO	POSITION HELD AND NATURE OF ~ RESPONSIBILITY
University of Bristol Senate House Tyndall Avenue Bristol BS 8lTU Tel 01179289000	OCT 2005	To date	Research Fellow Behaviour and Welfare Group School of Veterinary Science (Part time post: 60%)
S M Haslam BVSc DWEL MRCVS Welfare Advisory Service Theaked Stones Harmby Leyburn North Yorks DL85PD Tel 0771238080 e-mail hasran@cytanet.com.cy	SEP96	To Date	Independent animal welfare advisor: commissions have included the development of animal welfare policy, standards and audit check lists for McDonalds (UK and EU); supply base auditing for Tesco (UK) in Europe; veterinary training packages for the Northern Ireland Beef Accreditation Scheme; writing modules for the WSP A veterinary undergraduate welfare programme for veterinary surgeons;' and, consultant to M&S on alternatives to mulesina (ongoing).
University of Bristol Senate House Tyndall Avenue Bristol BS 81TU Tel 01179289000	MAY 2003	SEPT 2005	Project Coordinator: Associations between abattoir data and leg health and welfare of chickens (part time post)
University of Bristol Division of Food Animal Science School of Clinical Veterinary Science Langford Bristol BS40 5DU (Advisor: Dr P D Warris and S C Kestin Tel 0117 928 9280 Mobile 07768 457621 (Mr S C Kestin)	OCT 99	OCT 03	PhD student (full time) Sponsor: RSPCA

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EMPLOYERS NAME, ADDRESS AND TYPE OF BUSINESS	DATE FROM	DATE TO	POSITION HELD AND NATURE OF RESPONSIBILITY
Mr J Lawrence BVSc (Massy) CeltPH MRCVS Lawrence Veterinary Surgeons Navenby Manor Navenby Lincoln Mobile 0585040199	APR 96	AUG 99	Official Veterinary Surgeon (part time subcontractor 80%)
Mr J Callaghan BVetMed CertVR MRCVS 8 Grove Street West Boston Lines Tel 01205 363073 Fax 01205353469	APR 96	AUG 99	Veterinary Practitioner *(locum tenens* 96-98; part time employee 98-99)
Mr P M Bird BVSc MRCVS Greenwood Veterinary Clinic 90 Swakeleys Road Ickenham Middlesex UBlO 8BB Tel: 01895673993	FEB 94	MAR 96	Veterinary clinician for Companion animal group of clinics. Sole responsibility for Branch clinics in the absence of colleagues.
Mr J Aspley-Davis BVetMed DipAH MRCVS Kippax Veterinary Hospital 82 Hardwick Cres Holt ACT 2615 Australia Companion animal hospital.	FEB 93	DEC 93	Senior veterinary surgeon. Supervision of all surgical procedures at the Hospital.
Mr John H Boyd BVM&S MRCVS Smith & Boyd Veterinary Surgeons Maryfield 85 Milton Road Kirkcaldy Fife KYIITP Tel: 01592265758 General practice - mixed.	OCT 91	NOV 92	General practitioner.
Ms S Hall BVM&S MRCVS Equipet Veterinary Centre 24 Nicol Street Kirkcaldy Fife KYIIRP General practice.	AUG 90	MAR 91	Veterinary clinician.

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EMPLOYERS NAME, ADDRESS AND TYPE OF BUSINESS	DATE FROM	DATE TO	POSITION HELD AND NATURE OF RESPONSIBILITY
Mr Paul A Roger, BSc, MSc, BVetMed, CertWeL DSHP, MRCVS Victoria Cottage Reeth Richmond North Yorkshire DL116SZ Tel: 01748884777 General practice - mixed.	AUG 89	AUG 90	General practitioner.
Mr T T Farrell BVSc MRCVS 113 Chiswick High Road Chiswick London W42EQ Companion animal clinic	AUG 87	AUG 89	Veterinary clinician.
Mr G A Smith BVetMed MRCVS Broadway Veterinary Hospital 158 Broadway Peterborough Cambs PE14DG Small animal clinic	MAR 85	SEP 86	Veterinary clinician.
Orr, Duff & Howatt Redriggs Ceres Cupar Fife KY155LZ General practice - mixed	FEB 84	OCT 84	General practitioner.
Mr A L McF Govan BVMS MRCVS Golf Veterinary Centre East Links Montrose Angus DDlO 8SW General practice - mixed	SEP 80	FEB 84	General practitioner.

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