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A lameness control strategy for broiler chicken (*Gallus gallus domesticus*)

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Leg health problems are to be found globally in the production of modern broilers (Bessei 2006; Bokkers & Koene 2004; De Jong et al 2013; Dawkins et al 2004). Studies in Denmark, Sweden and the UK have found high levels of leg health problems in broiler chicken flocks (Sanotra et al 2003; Knowles et al 2008). These authors found levels of birds with gait score of over 3 to be 30.1% in Denmark, for Ross 208 birds, and 14.1% and 26.1% in Ross 208 and Cobb birds, respectively, in Sweden. The bird strains used in Europe are used globally.

This report identifies some husbandry changes which might be used to address this problem, and to make decisions on management, biosecurity, hygiene, feeding and medical treatment programmes to reduce broiler lameness. The assessment methods described in this paper can be found in more detail in Welfare Quality (2009) - Welfare Quality assessment protocol for poultry (broilers, laying hens). The use of these measures in animal welfare is discussed by Veisier et al 2008 and Butterworth et al 2008. The use of animal focused assessment methods in broiler chickens has now been incorporated into EU legislation (European Union 2007) as part of the Broiler Directive (2007/43/EC).

Table 1 Locomotor disorders in broilers

Clinical signs	Histopathology	Likely cause	Contributory factors	Diagnosis
Loss of motor and upper motor neurone responses in hind limbs	Deformity of thoracic spine causing spinal cord compression. Infection of thoracic spine.	Spondylolisthesis. Scoliosis.	Genetic.	Histopathology
Loss of motor function and lower motor neurone responses in hind limbs	Demyelination of the sciatic nerve.	Infectious spondylopathy.	Infection Staphylococci Fungi	Histopathology Bacteriology Mycology
Severely lame, difficulty in rising, wing tips may be used for support.	Disintegration of the proximal femur or tibia, confirmation by histology.	Riboflavin deficiency. Marek's disease.	Infection Staphylococci <i>E. coli</i> , Reovirus ?	Histopathology Bacteriology Virology
Severely lame. Hot swollen joints / tendons.	Synovitis / tenosynovitis. Infected hocks.	Inflammation of tendon / ligament and sheaths.	Infection Staphylococci Reovirus, Mycoplasma	Histology Bacteriology Virology
Bone deformity in the absence of growth plate thickening, +/- displacement of the gastrocnemius tendon.	Valgus (lateral) or varus (medial) and / or torsional deformity, frequently of the tibiotarsus or tarsometatarsus in the absence of growth plate	Long bone deformity.	Exercise Diet Growth rate Unknown	Measurement of torsion and angulation

	abnormality.			
Bone deformity with thickened growth plates.	Thickening of the growth plate in the proximal tibiotarsus / tarsometatarsus, accumulation of non-mineralized cartilage.	Dyschondroplasia.	Marginal Hypocalcaemia Genetic	Histology
Long bone deformity with shortening and thickening of growth plates.	Tibiotarsus and tarsometatarsus shortened with no effect on growth plate mineralization.	Chondrodystrophy.	Manganese, Choline, Vit E, Biotin, FolicAcid Mycoplasma ?	Bone ash analysis. Histology.

From Table 1, It is clear that there is a range of causes of lameness in broiler chickens, and that no single 'fix' or set of recommendations which will result in a reduction in lameness in all farms and in all systems. The clinical and commercial finding is that individual broiler sheds, and individual crops of birds, can suffer fluctuating levels of lameness. Many poultry farmers (and their veterinarians) find the 'fluctuating' and unpredictable nature of broiler lameness frustrating and non-rewarding to 'treat'. The occurrence of lameness is not predictable, and hence not susceptible to 'cure' by, for example, through routine use of antibiotics at a particular point in the growth cycle. For these reasons, many experienced people in the poultry industry consider lameness a 'disease' which is an inevitable periodic irritant.

The impact of lameness and foot pad problems, and the use of scoring and assessment systems for these conditions, has been discussed in detail in a number of publications (Botreau et al 2007; Butterworth 2009; Butterworth et al 2013; SCAHAW 2000; Shepherd & Fairchild 2010).

To achieve an impact on lameness, the company could identify and target the following objectives;

Lameness assessment

A method for measuring the prevalence of lameness (or walking ability) in broilers flocks was developed by Kestin et al (1992) using a six point scale [0-5], known as the Bristol Gate Scoring System. Figures 1 & 2 show the penning of birds and scoring on paper recording charts. Six gait score categories are summarised as follows;

Gait score 0 - *The bird walked normally with no detectable abnormality with the foot typically being picked up and put down smoothly and each foot being brought under the birds centre of gravity.*

Gait Score 1 - *The bird had a slight defect which was difficult to define precisely, but would have precluded its use for breeding.*

Gait Score 2 - *The bird had a definite and identifiable defect in its gait but not of sufficient severity to hinder it from competing for resources.*

Gait Score 3 - *The bird had an obvious gait score defect which affects its ability to move about.*

Gait Score 4 - *The bird has a severe gait defect. It is still capable of walking, but only with difficulty, often using the wing tips for additional balance*

Gait Score 5 - *The bird is incapable of sustained walking.*



Figure 1. *Handling and Penning of birds. Pen approximately 25 birds in an area of the house.*

- *Birds should not be herded into the pen*
- *The pen should be placed quietly around a group of birds with minimal disturbance*
- *If birds show any signs of distress or overheating, they should be released and a new group penned*

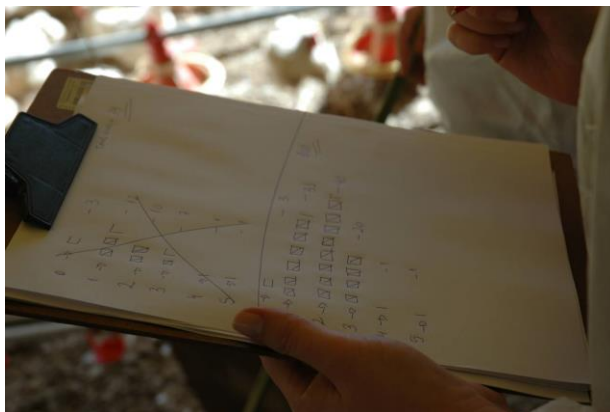


Figure 2. *Paper based recording of lameness and foot pad score. Score birds for lameness BEFORE picking them up to assess foot pad scores.*

- *Pick up individual birds carefully and score them – place them outside of the pen.*
- *Create a simple tabulation of the numbers of birds scored in each foot pad category.*

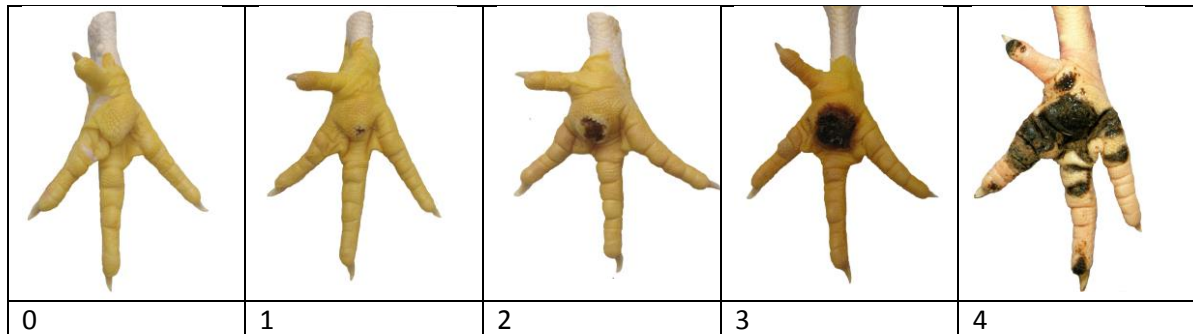
Foot pad dermatitis

Foot pad dermatitis (or pododermatitis) is a contact dermatitis found on the skin of the foot, most commonly on the central pad, but sometimes also on the toes. The skin is turned dark by contact with litter and deep skin lesions can result. The scoring scale (Figure 3) allows an assessment of the severity of these lesions. About 150 broiler chicken per flock should be assessed: 10 birds taken from 10 areas of the house including 2 areas located

near to drinkers, 2 located areas near to feeders, 3 areas located near a wall, 3 areas located away from drinkers and feeders (resting area).

At the slaughter plant it is possible to score a large number of feet as the birds pass on the slaughter line. If the line speed is 120 birds per minute, then observing for 10 minutes will enable scoring of 1200 birds using the same scoring scale as used on farm.

Figure 3. Scoring scale for pododermatitis (foot pad disease) in broiler chicken.



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On-farm assessment of lameness and foot pad dermatitis consists of three main stages:

- a) Complete a farm questionnaire or standard inspection report with the assistance of a representative of the farm, which provides a description of the farm, house and flock. Broiler breeder information including genotype/strain, broiler breeder history and age. Hatchery information including hatchery, distance/time transported and hatchery vaccination programme for chicks.

General information including number and weight of chicks placed, sex, time of year, age at assessment and slaughter.

Specific husbandry practices including stocking density and thinning practice, brooding conditions, nutritional profile (detailed), vitamin/mineral levels, litter substrate, feeder and drinker design/type, lighting programme, age of house, construction details, target ventilation profile, diseases and medication history, coccidiostats used, vaccination programme and water source. Performance information including growth profile from weekly weighings, weekly mortality pattern, weekly leg cull pattern, other culls weekly pattern.

Processing plant information including foot burn levels.

Background information about the management including: stock person ratios, age of stock people and training/qualifications.

Background information about the site/company including size of houses, number of birds on site and biosecurity measures.

- b) Carry out *Post mortem* examination of ten (10) birds selected preferentially from high gait score individuals within the flock.

- c) Assess of the gait score and foot pad score of 150 birds, using the methods described. Create FAG 'flock average gait score' and FAP 'flock average foot pad' scores for the farm. These scores can be compared between farms, and used as the

metric of performance to assess whether improvement actions by the farmer result in improved foot pad and gait score results.

Use this information to;

- 1) Find out the prevalence and severity of leg disorders in the flocks within the company. Include in this an assessment of the economic impact of small birds, moribund birds and culled birds which result from lameness. In general, significant improvements in profitability can be made if lameness is tackled within a company, as well as an improvement in overall bird welfare – inspection bodies in some countries are now beginning to focus on leg health issues as a marker for company welfare performance.
- 2) Make comparisons between ‘good’ and ‘poor’ farms (with respect to lameness) within the company to help identify management, house environment, feeding, medication, stockmanship and genotype factors which differ between these farms.
- 3) Investigate the use of water in different farms – farms with increased water use per bird (in equal weather conditions) may have systematic problems with leaking drinkers. Small amounts of water leaked chronically into the litter can severely damage the management of litter and impact on leg health.
- 4) Carry out an investigation of the bacteriological pathologies linked with lameness and identify whether these bacteria can originate in the hatchery, the transportation or by lapses in farm biosecurity.
- 5) Carry out an analysis of the skeletal components of lameness. These are most likely to be linked with nutrition and genotype – and differences between flocks and farms on different diets, or with different mixes of Ross / Cobb / other genotype birds may reveal (within the company) which of these factors has an effect on the incidence of overall lameness of birds – and the economic and welfare performance which results from this.

Use the data to promote improvement

Bring together this data to find out what it is that good farms are doing, and the farms with higher lameness, foot pad and hock problems are doing. Get the producers from the ‘good farms’ to mentor and provide training and experience to the ‘worse farms’. Within companies, we have found this approach of sharing ‘best practice’ has been very effective in improving litter quality, foot and hock lesions, and levels of broiler lameness.

The farmer can be informed about the extent of foot pad dermatitis and lameness on his farm, and, with time, and after analysis, a pattern of risk factors may emerge which allow him to make decisions which can reduce this. Factors which, in real farm experience, have been shown to be risk factors for lameness include; Growth rate, the age of the birds at slaughter, the use of whole cereals in the diet, the type of feed, the quality of biosecurity measures, litter condition (an important factor), the genotype of the birds. Also, the gender of the birds, levels of feed restriction, the lighting pattern and light intensity, bird activity levels and the stocking density have, in real examples of farms, been altered or manipulated

to control levels of lameness and foot pad dermatitis in the chickens.

In summary

Step 1, Measure (gait score and foot pad score) → Step 2, Analyse risk factors → Step 3, Inform (producer, purchaser) → Step 4, Support management decisions to create improvements in welfare

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