

629c. Broom, D.M. 2010. Chicken production in relation to animal welfare and disease. In *The Importance of Farm Animal Welfare Science to Sustainable Agriculture, 29-30 March 2008, Beijing*, 256-265. Luxembourg: Office for Official Publications of the European Communities.

## **CHICKEN PRODUCTION IN RELATION TO ANIMAL WELFARE AND DISEASE**

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### **Summary**

During the last 20-40 years, there has been a major change in the chickens kept for meat production. The rate of increase in body weight during growth is several times faster than it formerly was but the development of the legs and some physiological systems have changed much less. The conclusion of a European Union (EU) Scientific Report was that “the major welfare problems in broilers are those which can be regarded as side effects of the intense selection mainly for growth and feed conversion. These include leg disorders, ascites, sudden death syndrome in growing birds and welfare problems in breeding birds such as severe food restriction”. A consequence of leg weakness is that the birds crouch down on the litter and may develop dermatitis evident as hock-burn and breast blisters. These painful conditions are quantifiable in chicken carcasses. One way to address this problem is to change genetic selection criteria to slow growth. Another is to increase space allowance and to stimulate locomotion by having sufficient light and a more complex environment. Injury, walking disability and mortality rates can be monitored so that welfare can be improved. By this means, farms can be checked and payment linked to good welfare.

**Key words:** welfare, broiler, leg-disorders, ascites, genetic selection, stocking density, hock-burn.

## Introduction

The chicken is not often thought of as an individual with a functioning brain. This attitude is partly a consequence of the very large numbers of these animals that are kept in one place, partly to the fact that they are birds and therefore harder for a person to identify with than are the larger mammals, and only slightly because of any real difference in intellectual ability. When individual chickens are put into experimental learning situations that are not frightening to the birds they perform quite well. Their sensory ability is very good and their social organisation is complex, requiring considerable ability in learning and memory in order to maintain it. The chicken is often seen in a situation where its fear of man dominates most of its activities. Hence the average member of the public or chicken farmer is unable to assess adequately its behavioural complexity and awareness of its environment. These attitudes to chickens, and to a lesser extent to other poultry, have had a considerable influence on man's assessment of what conditions these animals need and what treatment they can tolerate. Those who have studied the behaviour of the domestic fowl in detail (1), especially those who have looked at feral fowl (16, 25) acquire much respect for the members of this species. There are few differences in behaviour between the wild Burmese red jungle fowl (*Gallus gallus spadiceus*) and the domestic form (*Gallus gallus domesticus*). The domestic fowl is the most common bird in the world with numbers estimated at 9-10 billion. It is a very successful species, which exploits man very effectively. Where there are welfare problems in this species, enormous numbers of individuals may be affected. Hence the welfare of chickens (24) is a very important subject.

The modern breeds of broilers grow very quickly and most are now slaughtered at 5-7 weeks of age, by which time they have reached a weight of 1.5-2kg. The major fundamental problems of broiler production which result in poor bird welfare are a consequence of selecting birds for a short, very fast growing life. The birds will tend to be too heavy for normal locomotion and to develop leg disorders. Since leg disorders are disabling and often associated with inflammation of joints, hocks and bone, it is clear that their incidence may cause a major welfare problem (23) because lame broiler chickens are in pain when they walk (7, 15, 18). This pain causes them distress from which they seek relief through the self-administration of the analgesic drug Carprofen (7, 17, 18).

A typical broiler house is usually rectangular with a good ventilation and temperature control system. Before birds are put in, the clean floor is covered with litter such as wood shavings or straw to a depth of about 15 cm. Day-old chicks are introduced into the house at a density that will result in a weight of birds at the end of the growing period of about 30-45kg/m<sup>2</sup>. Typical numbers in a house are 10,000-20,000. At the beginning of the rearing period the chickens have plenty of space but at the end of the rearing period they are crowded close together.

There are many birds present and there is little or no facility for inspection so an individual that is weak, injured or sick is often not detected. Most of these individuals die and their bodies remain in the litter. In some cases, weak individuals die because they are trampled on by the other birds, for as the density approaches the final level of 30 or more kg of birds on each m<sup>2</sup> it is essential to be able to stand up in order to survive. Another disadvantage of having very large numbers of birds in a single building arises if the birds are suddenly frightened and hysteria develops. If this happens, many birds may move rapidly to the end of the building where there is a pile-up, under which many individuals may be crushed to death. Hysteria can be minimised by good stockmanship and the effects can be reduced by putting baffles in the house.

The rapid growth rate of a modern broiler is not uniform throughout its body. Muscle grows very quickly but bones, and in particular the leg bones, grow less quickly. As a consequence, a point is reached at which the bird's legs cannot easily support its body. There is then a risk of being trampled, as mentioned above, but there will also be prolonged contact with the litter beneath the bird. The various disease conditions associated with leg weakness in broiler chickens are reviewed by Bradshaw *et al* (3) and Mench (19). These include: bacterial femoral head necrosis, tenosynovitis and arthritis, infectious stunting syndrome, varus valgus disease, tibial dyschondroplasia, rickets, chondro-dystrophy and spondylolisthesis, osteochondrosis, degenerative joint disease, spontaneous rupture of the gastrocnemius tendon and contact dermatitis. The welfare of broilers with leg disorders may be impaired due to pain from the condition, an inability to walk leading to frustration and associated problems of being unable to feed and drink due to immobility. In assessing welfare, the individual broiler should be considered.

The EU Scientific Report on the Welfare of Chickens Reared for Meat Production concluded as follows:

1. It is clear that the major welfare problems in broilers are those which can be regarded as side effects of the intense selection mainly for growth and feed conversion. These include leg disorders, ascites and sudden death syndrome in growing birds and welfare problems in breeding birds such as severe food restriction.
2. It is apparent that the fast growth rate of current broiler strains is not accompanied by a satisfactory level of welfare including health. Breeders should give a considerably higher priority to health variables in the breeding index.
3. Breeding which causes very poor welfare should not be permitted and breeders should be responsible for demonstrating that the standards of welfare in the chickens produced by them are acceptable.
4. Free-range broilers need good housing and should be selected for different qualities from those of indoor birds.

In a broiler house, the litter is covered with faeces well before the end of the growing period. The faeces and their breakdown products have a corrosive effect on skin so birds which have to sit on the soiled litter for long periods get breast-blisters, hock-burns and footpad lesions. The dermatitis lesions can develop in less than a week (9). These can be widespread in a broiler unit and the first two are visible to the customer buying a chicken. One consequence of this is that legs are often cut short on carcasses so that hock-burns cannot be seen. Another consequence is that many carcasses are downgraded further so that they can only be used for chicken pieces. Broom and Reefmann (5) investigated the extent of 15 kinds of visible lesions in Grade 'A' broiler carcasses. Six lesions were analysed histopathologically and this showed that hock-burn would have occurred several days pre-mortem, and would have been painful. Many broiler carcasses in the supermarkets had dermal lesions and 82% had detectable hock-burns. Of these, 18% were more than 0.3 cm<sup>2</sup> in area, e.g. 6 mm x 5 mm. 'Organic' chickens had half as many hock-burns as conventionally reared broilers, perhaps because of differences in litter quality or leg strength. The Grade 'A' chickens observed exclude birds with obvious visible defects because these birds would have had the blemishes removed and the carcass would have been portioned. Hence the frequencies of lesions in farmed birds would be higher than those reported. Serious skin abrasions and blisters

cause considerable pain and discomfort to the birds so the system of housing, or the breed itself, should be modified so as to avoid pododermatitis, hock-burns and breast blisters.

Leg disorders in broiler chicken became worse as the birds get older and heavier (19). Kestin *et al* (15) reported that 90% of broiler chickens had some walking ability impairment in the last week before slaughter and 26% had a severe impairment. Sanotra (20) studying a broiler strain used in many countries found that 30% of birds on commercial farms had severe walking difficulties by market age. It is widely known that birds with weak legs sit on litter and when the litter quality is not good many chickens, as a consequence, have contact dermatitis visible on carcasses as breast or hock-burn. A comparison of 1957 and 1991 strains of broilers showed that growth rates and, hence, leg problems have an origin that is much more a consequence of genetics than of food quality (12).

Key issues for the good design of accommodation for broilers are that the physical conditions should be good enough, there should be stimulation of locomotion with a complex enough environment and sufficient space for movement. When broiler houses become very crowded, as is typical in the days leading up to thinning, i.e. reduction in numbers, or to slaughter, locomotion is reduced. This reduced exercise makes leg problems worse. The complexity of the environment also has an effect on the extent to which broiler chickens exercise as greater complexity leads to more activity. The introduction of more interesting food and materials to investigate, manipulate and climb on will increase activity and hence leg strength. Low light level is associated with low activity (2) and with a greater frequency of leg disorders (10). The published effects of light level on the welfare of broilers are: below 1 lux there are eye abnormalities and chicks may not find food; below 5-6 lux there are lower activity levels, more breast blisters and more mortality; below 20 lux birds are more fearful; below 50 lux there is lower activity, scratching and dust-bathing; whilst above 50 lux, no problems are reported.

High temperature, especially with high humidity, kills broilers and welfare is poor before death of over-heated birds. The concept of apparent equivalent temperature, taking account of humidity, is useful in determining limits for broilers. Panting is a clear sign of over-heating.

Ascites is another pathological condition associated with fast growth in broiler chickens and is a major cause of poor welfare and mortality. It is also known as pulmonary hypertension syndrome and results in fluid from the blood leaking into abdominal cavities. It affects 5% of young broilers and 15-20% of the larger birds and whilst it can kill, it certainly weakens the birds and results in carcass condemnation. Although originally described as occurring especially at high altitudes it is now widespread at all altitudes. The main cause of ascites is failure of heart function associated with lack of oxygen supply to tissues. It is extremely rare in old strains of broilers and results from failure of the cardiovascular and pulmonary systems to grow fast enough to keep pace with the demands from the muscles and gut.

As stocking density of broilers increases, the extent and frequency of poor welfare tends to increase. For example, there are various reports of growth rate declining at high stocking densities and mortality increased when stocking densities over a range from 5kg/m<sup>2</sup>-45kg/m<sup>2</sup> were compared (21). Locomotor activity and locomotor problems are generally found to increase (15) and the extent of wet litter and hock-burn usually increases (11) at higher densities. Üner *et al* (22) compared broiler communal systems stocked at 24kg/m<sup>2</sup>-36kg/m<sup>2</sup> and found that at the higher stocking densities there was less walking, running, preening, total activity and calm behaviour and more time concentrated around the feeders. There is less possibility for environment and enrichment at high stocking densities. Dawkins *et al* (8) claimed that stocking density was less important to broiler chicken welfare than other management factors and there is no doubt that litter management and ventilation in the building are important in their efforts on hock-burn. However, since the Dawkins *et al.* study did not consider stocking densities lower than 30kg/m<sup>2</sup>, did find that locomotor problems were twice as high at 46kg/m<sup>2</sup> as at 30kg/m<sup>2</sup>, and lumped all other variables to compare with stocking density, their results do not allow the conclusion that stocking density is unimportant. Stocking density should be limited to 30kg/m<sup>2</sup> in well-controlled environments and to lower stocking densities in less well-controlled environments.

The poor welfare, which occurs in broiler chickens as they near the age of slaughter, affects a very large number of individuals and must be the most serious animal welfare problem in the world today. However,

the problems are soluble. Birds can be bred for stronger legs but some slowing of growth by genetic selection or management is essential for a real solution. Leg problems can be reduced if food intake is limited for a period during growth (6). Some problems are exacerbated by high stocking density so this should be limited to a maximum of 25 or perhaps 30kg/m<sup>2</sup>. Breeding should encourage better leg development or less muscle development. Birds should not be kept on faeces-covered litter. If higher stocking densities are to be allowed, the criteria which can be used when allowing are: training and staff quality; good ventilation and other environmental control efficiency; good management procedures; adequate recording and monitoring; and low levels of poor welfare. It is important to monitor mortality rate on the farm throughout the growth period i.e.: the number which die plus the number culled by staff. The number which die can also be assessed by the number put into the building less the number sent to slaughter. It is also possible to do spot checks on walking ability and to withdraw permission to exceed the standard maximum level if more than a certain number of birds could not walk easily.

Broiler breeders are often beak-trimmed but are usually kept in quite good conditions. A significant cause of poor welfare is that they are prevented from becoming too heavy by restricting their diet. As a consequence, they may be hungry for a substantial part of their lives. The degree of hunger can be assessed by measuring how much they will eat when given the opportunity and how hard they will work for food (13). This is a problem which cannot be solved in its entirety.

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