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Reducing The Prevalence and Severity Of Injurious Pecking in Laying Hens Without Beak Trimming

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Abstract: Injurious pecking is a general term used to describe feather pecking, vent pecking, cannibalism and toe-pecking in laying hens. The severity of injurious pecking varies enormously, ranging from limited feather removal to cannibalism and death. Alternative housing systems for laying hens such as barn, free-range and aviary systems show much higher incidences of injurious pecking than with those birds housed in conventional caged system. From a welfare perspective injurious pecking can cause pain, stress, injuries, increased susceptibility to diseases, fear and death. Any major outbreak of injurious feather pecking can result in serious economic loss for the industry through decrease in egg production and feed efficiency. At present the egg industry uses both beak trimming of the birds and dim lighting methods to help reduce injurious pecking. However, both of these are being cricitised from a welfare point of view. In fact a general ban on beak trimming already exists in some European Union countries, with other countries considering a ban by 2011. Moreover, The EU ban on conventional laying cages (2012), when combined with a ban on beak-trimming, will increase the risk of injurious feather pecking and cannibalism. It is therefore important for future to consider other ways of controlling injurious pecking. Injurious pecking is a multi-factorial problem, which can be caused by environmental, genetic or nutritional factors and can be largely prevented by the use of a combination of environmental and husbandry management programs. This paper is intended to give a general overview of the potential risk factors and possible control measures associated with injurious pecking in laying hens, and in particular those flocks housed in non-cage systems.

Key Words: Injurious pecking, risk factors, preventive measures, laying hens.

Yumurtacı Tavuklarda Gaga Kesimi Yapılmaksızın Yaralayıcı Gagalamaların Görülme Şiddeti ve Yaygınlığının Azaltılması

Özet: Yumurtacı tavuklarda tüyler, kloaka ve kanibalistik gagalama ile kuyruk tüyü çekme davranışlarını tanımlamak için kullanılan yaralayıcı gagalamaların şiddeti çok hafif birkaç tüy çekiminden kanibalizm ve ölüme yol açacak kadar önemli olabilir. Kafeste yetiştirilen tavuklarda görülse de, kanibalizm ve buna bağlı ölümler derin altlık, ızgara altlık gibi kapalı sistemler ile kuşluklu ve serbest dolaşımlı-free range gibi alternatif sistemlerde daha fazla karşılaşılmaktadır. Kötü huylu yaralayıcı gagalama davranışları acı, ağrı, stres ve yaralanmalara yol açıp hastalıklara yakalanma riskini artırmaktadır. Aynı zamanda yumurta verimi ve yemden yararlanma yeteneğini düşürdüğünden yaralayıcı gagalamalar hayvan refahı ve üretim ekonomisini olumsuz yönde etkilemektedir. Günümüz yumurta üretiminde tavuklarda tüy çekme ve gagalamayı önlemek için gaga kesimi ve düşük aydınlatma yoğunluğu yaygın olarak kullanılsa da her iki yöntemde hayvan refahına uygun olmadıkları için eleştirilmektedir. Gaga kesimi bazı Avrupa ülkelerinde hali hazırda yasak olup, diğerlerinde ise 2011 yılında yasaklanması beklenmektedir. Gaga kesimi yasağı ve 2012 yılında başlayacak kafeste yumurta üretimi yasağı ile birlikte tavukçulukta yaralayıcı tüy çekme ve kanibalizm vakalarında önemli bir artış beklenmektedir. Bundan dolayı

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tavuklarda yaralayıcı gagalama vakalarını önlemek acilen alternatif yöntemlerin geliştirilmesi gerekmektedir. Genetik yapı, çevre, besleme gibi çok sayıda risk faktörünün etkilediği bu kötü huylu davranış, çok sayıda faktörün kombine olarak bir arada yer aldığı bakım-yönetim programları ile önlenebilir. Bu derleme makale özellikle kafese alternatif sistemlerde yetiştirilen yumurtacı tavuklarda kötü huylu yaralayıcı gagalamalara yol açan muhtemel risk faktörleri ve kontrolü konusunda genel bir bilgi vermek amacıyla hazırlanmıştır.

Anahtar Kelimeler: Yaralayıcı gagalamalar, risk faktörleri, önleyici tedbirler, yumurtacı tavuk.

1. Introduction

Injurious pecking is a common term used to describe severe feather pecking, vent pecking, cannibalism and toe-pecking in laying hens. It is a serious welfare concern because pulling out feathers causes pain, stress, injuries, increased susceptibility to disease (Gentle and Hunter, 1990), and damaged birds may be then subjected to bouts of cannibalism (McAdie & Keeling, 2000; Pötzsch et al., 2001). Injurious feather pecking is also of great economic concern to the producer; as it can lead to lower egg production and the pecked hens compensate for the reduced insulation by eating more feed and as a consequence higher feed costs (Johnsen et al. 1998). It is generally accepted that the development of feather pecking is usually regarded as redirected foraging behaviour (Blokhuis, 1989; Jensen et al. 2006) or dust-bathing behaviour (Vestergaard et al., 1993). The redirected foraging behaviour hypothesis is today the more widely accepted held view.

Alternative housing systems for laying hens such as free-range and aviary systems show much higher incidences of injurious pecking then with those birds housed in conventional caged system (McAdie and Keeling, 2000; Tauson et al., 2005). It has been reported that gentle feather pecking was observed 89.2% and 73% of flocks at 25 and 40 weeks respectively, in UK free-range and organic farms (Lambton et al., 2010). Farm-level factors examined in Dutch organic flocks showed moderate plumage damage in 19% of flocks and severe damage in 52% of flocks (Bestman and Wagenaar, 2003). As the bans of battery cages (EC Directive, 1999) and beak trimming (FAWC, 2007) increases the risk of injurious pecking, the need for research on the potential causes and alternative control measures of injurious pecking becomes more pressing. This paper intented to give an overview of severity of feather pecking, risk factors influence the propetency of pecking behavior, monitoring and controlling of injurious pecking in laying hens, and in particular those flocks housed in non-cage systems.

2. Types of the injurious pecking

The severity of pecking varies enormously, ranging from gentle feather pecking to cannibalism and death. Five different types of bird-to-bird pecking can be distinguished, based on both cause and its effect (Savory, 1995). These are:

1. gentle feather pecking without removal of feathers,
2. severe feather pecking leading to feather loss,
3. tissue pecking in denuded areas (cannibalism),
4. aggressive pecking,
5. vent pecking.

Gentle feather pecking is pecking that result in little or no feather damage and produces no or only a mild response in the recipient bird (McAdie and Keeling, 2000). Severe feather pecking, or feather pulling, is probably the most prevalent form of injurious pecking and characterised by forceful pecking at or pulling out of feathers, to which the victim usually reacts (Gentle and Hunter, 1990). McAdie and Keeling (2000) suggested that severe feather pecking can develop from gentle feather pecking, either by increased severity or increased intensity of pecks. Multiple feather damage can lead to naked areas on the skin of the bird. These naked areas may attract further tissue pecking, which can result in wounding, eventually to cannibalism and the death of the victim bird (Blokhuis and van der Haar, 1992; Savory and Mann, 1997; McAdie & Keeling, 2000; Pötzsch et al., 2001). Aggressive pecking among chickens is used to establish a stable dominance hierarchy. It may lead to some damage to the head and neck region, but should not be confused with feather pecking behaviour. Vent pecking may start as investigative pecking, but it can also lead to cannibalism when the oviduct is damaged or the internal organs are pulled out. There is a direct association between increased vent pecking and increased flock mortality. The distinction between gentle feather pecking, severe feather pecking and tissue pecking is not always

clear and the different pecking forms may transform into each other (Savory, 1995). Cannibalistic pecks are directed to the skin or underlying tissues of another bird. Those directed to the body (but not the vent) are usually a consequence of feather pecking and bleeding from the pulling out of a feather. In general, severe feather pecking is more often seen at a later age (Huber Eicher and Sebo, 2001). Although feather pecking can occur in hens that are kept in cages, cannibalism is of greatest concern when hens are housed in barn, perchery, or free-range systems.

3. Possible risk factors that influence the propensity for injurious pecking

The causes of injurious pecking are complicated and multi-factorial. Such factors are related either to internal factors like the genetic nature or the physiological status of the birds, or to external factors like management of the birds, environment or nutritional factors or to a combination of these factors (Green et al., 2000; Nicol et al., 2003; Sedlackova et al., 2004). Some of the predisposing factors are overcrowding, excessive light and temperature, insufficient or improperly placed feeder or drinking space, nutritional imbalances including mineral deficiencies, feeding of only pelleted or concentrated feed, feeding high energy diets heavy in corn or low in fibre, and injuries. The nature of environmental conditions given to young birds also plays an important role in the development or occurrence of feather pecking later in life (Blokhuis and Van der Haar, 1992; Huber Eicher and Wechsler, 1998).

3.1. Bird - Related factors

A large variation in the level of feather pecking behaviour exists between strains of laying hens. Some studies have indicated the possibility that selective breeding programmes will reduce feather-pecking problems in future flocks (Sørensen and Christiansen, 1997). Increasing group size (Bilcik and Keeling, 1999) and increasing stocking density (Appleby *et al.*, 1988; Savory and Mann, 1999; Nicol *et al.*, 1999) have also been linked to an increase in feather pecking behaviour. Uniformity of the flock is an essential indicator of quality and is equally as important as achieving the average target live weight. Flocks with large variations in body weights tend to be more prone to feather pecking. Observations in an open-field test show that laying hens that were more fearful and less social as young pullets showed higher levels of feather pecking as adult hens (Vestergaard *et al.*, 1993; Lindberg and Nicol, 1994; Zeltner *et al.*, 2003; Rodenburg *et al.*, 2004, McAdie et al., 2005).

3.2. Housing Design and Management Conditions

Injurious feather pecking is more likely to take place while the birds are in the house rather than when the birds are out on the range. Birds housed on more extensive systems can be more prone to injurious feather pecking than those housed intensively. This may be due to the housing design and the difficulties in controlling envirnomental conditions ie. lighting levels. Recent research suggests that the (early) rearing period plays a key-role in the development of pecking behaviuor. It has been suggested that stress in the parent stock as well as suboptimal conditions during brooding and early rearing have a major impact on behavioural development (Rodenburg et al. 2004). Practical experience has shown that if birds come into lay too early, they may be more prone to feather pecking. In a survey on turkey farms in UK revealed that poor litter quality increased non-agressive pecking, shallow boxes and higher brooder temperatures increased pecking deaths, and no diet change and certain bird suppliers increased aggressive pecking (Morris, 2007). In non-cage systems, feather pecking usually takes place when birds are on the floor or on perches. In particular, the following were associated with feather pecking and vent pecking as housing and management conditions (Lindberg and Nicol, 1994; Pötzsch *et al.,* 2001):

1. fewer than 50% hens using the outdoor area;
2. no loose litter left by the end of lay;
3. more than 3 diet changes during lay;
4. house temperature<20^0C;
5. light levels raised to inspect birds;
6. use of lights in nest boxes;
7. one person inspecting the flock.
8. use of bell drinkers,
9. birds came into lay at <20 weeks of age.

3.3. In-sufficient biosecurity

Birds challenged by a disease outbreak may be more prone to pecking behaviour. The presence of large numbers of red mite, mouse and rat infestations can lead to disease and in-

creased stress levels in flocks leaving the hens susceptible to injurious pecking behaviour. The risk of predators disturbing the flock are a further potential factor that can lead to an outbreak of feather pecking (SAC 2003). Green et al. (2000) reported that feather pecking also associated with the occurrence of egg peritonitis and infectious bronchitis.

3.4. Light Environment

Variations in light levels around the house in non-cage systems and the contrast in the intensity of light can be a significant trigger to injurious pecking. This can often be observed when beams of bright sunlight enter into a darker shed from open doors or large popholes. Kjaer and Vesterguard (1999) found that increasing light intensity from 3 lux to 30 lux seems to increase the level of severe feather pecking.

3.5. Nutritional Factors

Nutritional factors can have positive and negative effects on feather pecking behaviour in laying hens. Severe feather pecking has been demonstrated in birds that were fed diets with either; a too low mineral level in the diet, a too low protein level or a too low amino acid level (methionine, arginine, tryphtophane). There is also a link between sodium deficiency and the onset of feather pecking. Increased levels of feather pecking were observed when layers were fed diets with mainly vegetable sources of protein as compared with diets with protein from animal origin. High levels of wheat in layer diets led to increased plumage damage due to feather pecking compared with diets based on barley (Abrahamson et al. 1996). An increase in feather pecking may also occur when the birds are fed with pellets as opposed to mash diets (Van Krimpen et al. 2005). Frequent diet change (more than three) has also been identified as a risk factor for feather pecking in commercial flocks (Dixon and Nicol, 2008).

4. Controlling feather pecking & cannibalism

Beak trimming and dim lighting are still the most effective husbandry practice used by the poultry industry and has long been employed to help reduce the deleterious effects of feather pecking and subsequent cannibalism. However, both these themselves are being criticised on from the welfare point of view. A general ban on the use of the hot-blade technique for beak trimming can be expected by 2011 in several EU countries. In fact some countries have already banned the technique. The ban may also include the use of the Infra-Red technique to beak trim, but at present more research is required to examine the technique and any possible concerns. Although there are a great number of scientific studies hi-lighting the factors associated with the reduction of feather pecking, however, very little of this information is used in practise as the research in question is often published in scientific literature to which the average producer has no access. Scientific evidence suggests that feather pecking and cannibalism can be largely prevented by the use of appropriate husbandry techniques without the use of beak trimming.

4.1.Genetic Stock

An important factor to help reduce the risk the outbreak of injurious feather pecking in a laying flock is to start a production cycle with good quality, healthy pullets from suitable genetic stock. Therefore, genetic selection for strains with a lower propensity for injurious pecking might be a strategy for the future (Su et al., 2005). In experimental studies birds with white plumage have less plumage damage due to feather pecking than pigmented birds (Kjaer and Sorensen, 2002; Bright 2007). Replacing brown breeds with whites ones, such as Amberlink, may be advantageous to reduce the injurious pecking in layer chickens (Anonymous 2009).

4.2. Housing design and equipment layout

Good housing design and layout of equipment, perches and other management practices play a vital role in minimising stress levels on the bird (Savory 1995). The bird must be able to reach the nesting areas easily without moving through a maze of feeders, drinkers and perches that could cause frustration and stress. Providing foraging materials, maintaining good litter and air quality, warmer air temperatures, using nipple drinkers in rearing and the laying period, using non-plastic floors and do not having lights in nest boxes should have useful to reduce injuriıous pecking. In addition, the use of enrichment toys and/or features should be provided in both the rearing and laying environments. Consideration should be given to rearing chicks with broody hens to encourage early development of foraging and perching behavior. High perches and refuge areas should be pro-

vided both in the rearing and laying environment and the system should be designed so as to seperate resting and active birds and to allow hens to move between areas without disturbing other birds. Hens should ideally be housed in small groups and partitions should be provided in larger houses to allow birds to form smaller sub-groups. Improving bird temperament by getting birds used to loud noises and staff walking through the flock (without switching lighting levels up) may be beneficial in reducing the risk of feather pecking (Picket 2008).

Field experiences suggest that one of the most important factors in reducing the risk of injurious pecking is the need to ensure that the housing conditions in the rearing phase are as closely matched as possible to those that the bird will experience in the laying phase (Defra, 2005). It is a good practice, for example, for the drinker and feeder systems that are used during rearing to be identical to those used on the laying unit. Similarly, matching the lighting schedules and light source will also minimise the changes between rearing and laying houses. These similarities will help reduce the stress of transition between the two stages.

4.3. Management of the flocks

It is important to recognise that transferring the pullets from their rearing house to their laying house can cause increased stress levels in the birds. Care should be taken before, during and after their transfer to minimise this problem. Therefore the birds should, ideally, be moved during the night and it is important to unload the pullets as quickly and carefully as possible. Provision of litter at early ages substantially reduces feather pecking at later age (Blokhuis and Van der Haar, 1989). This is consistent with the theory that feather pecking is a form of redirected behaviour, developing either from ground pecking (Blokhuis, 1986) or pecking during dust-bathing (Vestergaard et al., 1993). It is essential that hens have access to dry friable and warm litter and that the quality of the litter is maintained in a friable state as best as possible (Huber-Eicher and Wechsler, 1997, 1998). The widely held view is that untreated wood shavings provide the best litter as they are less dusty than chopped straw. Feather pecking has been shown to have a negative correlation with ground pecking, i.e. decreased ground pecking is associated with increased feather pecking (Blokhuis and Arkes, 1984; Blokhuis, 1989; Huber-Eicher and Wechsler, 1997, 1998). One method to increase the amount of ground pecking is to improve the attractiveness of the ground, either by providing litter (Blokhuis and Arkes, 1984; Blokhuis and van der Haar, 1992) or by improving the quality (McAdie et.al, 2005). The incidence of gentle feather pecking tends to be reduced where birds make good use of the ranging areas available (Lambton et. al, 2010). It should therefore be a priority to encourage the birds' natural desire to roam and forage in free-range systems. This can be done in various ways including the use of both natural and artificial shelters on the range and sharing of range with other farms animals i.e. sheep, cattle and lamas.

4.5. Lighting Schedule

Setting the correct lighting intensity and colour in the laying house is crucial in helping reduce feather pecking and social recognition (D' Eath and Stone, 1999). Lighting should not be reduced below 20 lux and should be evenly distributed. In an outbreak of pecking, bright natural light can be reduced by painting windows white. To avoid welfare concern birds should be reared in units with varying light levels, from bright to dim, instead of constant high or low level of intensity (Morris, 2007). The lighting programme in both the rearing house and the production unit should be carefully managed to prevent the birds going into early lay. Poorly positioned or inadequately controlled lights which produce bright spots or areas of shadow can be a precursor to injurious pecking which could be avoided with careful planning during installation. Similarly, avoid suddenly turning the lights up when going into the house to inspect the birds as this can cause additional stress. Blue or green light is preferable to red or white light because it keeps the birds calmer and is chosen by the birds themselves.

4.4. Biosecurity

Outbreaks of disease and illness have been shown to have a negative effect on outbreaks of injurious feather pecking. Therefore it is crucial that all farms adopt a comprehensive and rigid biosecurity and vaccination programme. This programme should match the laying site disease profile (i.e. resistance against coccidiosis and Infectious Bursal Disease) and should be specific to each flock and farm. After depopulation, but before placement of the next flock, there should be a thorough cleaning and disinfection procedure during the turnaround

phase. Once placed, high standards of biosecurity, hygiene and control during the laying period should reduce the risk of bacterial and viral transmission. A multi-factorial approach to pest and parasite control needs to be adopted which include elements of design, proofing, housekeeping, monitoring and treatment.

4.5. Nutrition

Feeding high-fibre and low energy diets, or roughages reduced feather pecking (Hetland *et al* 2004). It may be the case that with nutrients disappearing from the lumen faster, and digesta moving through the gut quicker, birds spend a longer time eating and less time pecking each other. The ability of insoluble fibre to exert these effects is related to particle size as fine grinding diminishes its stimulatory influence on the gizzard. Providing additional grain or straw in the litter during rearing could result in lower levels of feather pecking behaviour. Some of these positive effects on feather pecking seem to be related to the time birds spend on feed intake and foraging (Van Krimpen et al. 2005). Unlike wild birds, poultry are provided with a constant source of feed, and may therefore spend more time feather pecking. This is an important difference in feather pecking between ranging and caged hens. Free-range hens spend time foraging and less time pecking other birds. Organic rations which cannot include synthetic amino acids and so may be deficient will benefit from fishmeal. Lambton et.al (2010) reported that feed should be provided in a form that is time-consuming to eat (feed mash rather than pellet).

5. Monitoring plumage quality in layer chickens

Standard techniques for assessing plumage quality to hens require capture and handling of birds (Bilcik and Keeling, 1999) which is relatively easy in experiemental studies. However, close inspection of birds in a commercial flocks is less feasible due to difficulties of catching birds. Distance scoring system which is more animal friendly and less stressor may be more effective and easier way to determine feather damage. Bright et al.(2006) reported that the correlation between distance scores and the capture scores by using 5 point scale on 5 body regions (neck, back, rump, tail, wing) were high and significant. Distance score may be useful for commercial-scale feather pecking studies, or for farmers who need to assess plumage damage of their flocks with minimal disturbance or stres to birds. Recently a photograpic scoring system has been developed by EU based LayWell Project (Tauson et al.2005). It comprises 6 body parts for plumage condition (neck, breast, cloacae/vent, back, wings and tail), pecking damage to skin of rear body and comb, and bumble foot lesions - all at scores of 1-4. In the present report this new system is described and photographically documented for white as well as for brown genotypes. The higher the score is the better the status of the integument. The system can be used both for comparison of scores for individual body parts (scores 1, 2, 3 or 4) or pooled for the whole body (i.e. scores 6, 7, etc. up to 24). Each score is individually illustrated for each body part by photos showing “target” birds of brown and white genotypes respectively. When feather damage variation within flocks is low, a sample of 100 birds is likley to provide reliable estimates of flock feather damage. When there is large variation within birds of a flock at least 200 birds should be inspected to accurately monitor changes in plumage condition.

6. Conclusion

Injurious feather pecking and cannibalism can have a serious effect on poultry welfare. When searching for an on-farm solution for injurious feather pecking and cannibalism, it is importance to identify the potential risk factors involved in the development of feather pecking on each and every flock. Combined efforts of multidisciplinary research and the integrated application of appropriate husbandry management programs can be very useful in potentially reducing the levels of feather pecking. A more critical factor should be paid to the reduction of the propensity for feather pecking during the rearing phase of layer hens.

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