

Evaluation of tonic immobility in common pheasant hens kept in different housing systems during laying period

Petra Hrabcakova, Iveta Bedanova, Eva Voslarova, Vladimira Pistekova and Vladimir Vecerek

Department of Veterinary Public Health and Toxicology, Faculty of Veterinary Hygiene and Ecology, University of Veterinary and Pharmaceutical Sciences Brno, Czech Republic

Abstract

Common pheasant (*Phasianus colchicus*) hens kept in different housing systems during laying period were exposed to a tonic immobility test. At the end of the laying period, the shortest duration of the tonic immobility, and thus the lowest fear level, was found in birds kept in enriched cages, i.e. cages equipped with 2 perches and a hiding place. The duration of the tonic immobility in hens kept in enriched cages was significantly lower ($P < 0.05$) than in hens kept in conventional cages where other measures against feather pecking were used (beak-trimming and using spectacles, respectively).

Keywords: pheasant, tonic immobility, cage, enrichment, fear

Introduction

In Europe, the majority of driven pheasant shooting is supported by the release of captive-reared pheasants to increase numbers of birds available to hunters (Draycott *et al.* 2002, 2005). Furthermore, increasing numbers of pheasants are raised commercially to be slaughtered for meat (Kuzniacka & Adamski 2010, Kokoszynski *et al.* 2011). A substantial number of raised breeding pheasants in the breeding season is housed in cage systems (Zapletal *et al.* 2010). Keeling & Gonyou (2001) have reported that the housing of domestic hens in conventional cages with higher stocking densities is associated with decreased egg production, higher mortality rate, more cases of feather pecking and cannibalism, and increased fearfulness. When pheasants are housed in conventional cage systems, the situation is similar in some respects. Such pheasants may show behavioural disorders that often result in various forms of aggression and cannibalism, seldom causing significant deterioration of health status or even death (Zapletal *et al.* 2010).

An appropriate environmental design is considered fundamental to ensure bird welfare (Campo & Prieto 2009). Animal well-being can be improved by housing the animals in species-specific natural or near-to-natural environments. An enriched environment, e.g. the presence of perches may improve the welfare of chickens (Duncan *et al.* 1992, Pohle & Cheng 2009). Enriched cages in laying hens have resulted in better bone quality, which may have been brought about from increased activity (Tactacan 2009). The issue of enriched cages and their influence on aggression levels, lower body weight and feather pecking has also been addressed by Jendral *et al.* (2005) and Pavlik *et al.* (2008). Olsson & Keeling (2002) suggested that hens should be housed in systems with perches. The use of perches (Swan 1983) and

lower stocking densities (Cain *et al.* 1984, Kjaer 2004) have been suggested as potential management prescriptions for reducing the levels of feather pecking also in pheasant pens.

Fehlberg *et al.* (1993) and Kjaer (1997) describe methods used in pheasants as prevention against injuring one another, particularly beak cauterisation or beak trimming when up to a third of the beak is removed and using various types of bits that are applied to the beak. Plastic or metal rings are clipped into the birds' nostrils to prevent the beak from closing. Some birds are forced to wear spectacles. Spectacles are used to reduce feather pecking, cannibalism and egg eating by pheasants in laying pens. These are plastic devices which are usually fitted onto the bird's beak and are designed to reduce feather pecking in pheasants by blocking their forward vision (Anonymous 2012). Spectacles can improve feather and skin condition in pheasants but they can cause damage to the bill and nostrils (Butler & Davis 2010). Swarbrick (1985) suggested that bits might cause welfare issues, including increased mortality.

Evaluation of a pheasant rearing environment from the welfare viewpoint may be based on the fear level in birds. For evaluating the level of fear a tonic immobility test has become widely used (Jones & Mills 1983, Mills & Faure 1986). Tonic immobility (TI) is a fear-potentiated response induced by physical restraint (Jones & Faure 1981) and is defined as generalised hypotonia caused by a short period of limitation of physical activity (Gallup 1977, Jones 1990). The TI test is based on a natural defensive reaction used by birds living in the wild when escaping a predator (anti-predator behaviour). The principle of this defence strategy is to remain completely motionless to dissuade the predator from attacking. The TI response is, therefore, an adaptive behavioural strategy. Its duration is considered to be positively related to the antecedent fear state, i.e. the more frightened the bird is when TI is being induced, the longer it will remain immobile when released (Gallup 1979, Jones 1986b, Jones 1987, Jones 1992). The close associations found between TI reactions and estimated fear scores in a variety of tests support its use as an index of general underlying fearfulness and not just stimulus-specific fears (Jones & Mills 1983, Jones 1987, Jones *et al.* 1991). The TI reaction is sensitive to a variety of social, genetic and environmental factors (Jones 1986a). Also relationships between TI and the habitat in which birds live have been studied (Bilčík *et al.* 1998, Hansen *et al.* 1993).

The aim of this study was to assess fear reactions of common pheasant hens housed during laying period in different housing systems.

Material and methods

Birds and their treatment

The TI test was performed on common pheasant (*Phasianus colchicus*) hens housed from the beginning of their laying period in a two-tiered cage battery. There was one breeding group consisting of 1 male and 5 hens in each cage. Each laying cage was equipped with a wire-floor, five automatic nipple drinkers and a trough feeder located before the cage's front wall with manual administration of feedings. The dimensions of the cage were as follows: 200 cm length, 85 cm depth, 58 cm back height and 70 cm front height. The floor had a slope towards the cage's front wall to enable the collection of laid eggs. The pheasants were fed with the pelleted feeding mixture BZN (ADW AGRO, a.s., Okříšky, Czech Republic). Lighting was only provided by daylight.

When stocking the cages, the pheasants were split in the following housing systems:

Group 1: conventional cage (no perches, laying nests, claw-shortening devices or material for dust-bathing). Before being placed into a cage thermal cauterisation of one third of the upper part of the beak was performed on the pheasants.

Group 2: conventional cage (no perches, laying nests, claw-shortening devices or material for dust-bathing). Before being placed into a cage, as a protection against pecking one another, the pheasants were provided with commercially sold clip-on spectacles (Clip-On Specs, Agrigame, Great Britain) which did not harm the tissue and were applied on with pressure only.

Group 3: enriched cage (cage enriched with two perches and a place to hide created by strips of cloth hung in one corner of the cage, separating this corner from the rest of the cage). Neither cauterisation nor clip-on spectacles were used in this group.

Tonic immobility tests

A total of 45 pheasant hens (15 birds per test group) were used for testing for the duration of TI. At the end of the laying period 15 birds from each group were individually carried to a separate room and subjected to TI measurements according to a modified Benoff & Siegel (1976) procedure. TI was induced by laying the bird down on its right side and gently restraining it by hand for 15 s. The hand was then removed and the researcher retreated for approximately 1 min out of sight of the bird and remained silent. The time was measured from the removal of the hand until the bird straightened up. If the bird straightened up in less than 10 s, it was restrained repeatedly. If TI was not induced after three attempts, the duration of TI was considered 0 s. If the bird did not straighten up within 10 min, it was removed and given the maximum duration of 600 s. The number of inductions required to attain TI was also recorded for each bird.

Statistical analysis

The results were analysed using statistical software Unistat 5.1. (Unistat Ltd., London, UK). Before analysis, the data were checked for normality and homogeneity of variances (Shapiro-Wilk test and Bartlett-Box test), and because of their lack of fulfilment, data were then analysed by means of the non-parametric Kruskal-Wallis one-way analysis of variance. Subsequently, the differences between all possible pairs of groups were evaluated using the non-parametric Tukey-type multiple comparisons test with ranked sums (Zar 1999).

Results and discussion

Fear level, or more precisely stress level, is an important indicator of birds' welfare in commercial breeding. TI durations as a measure of fear can be influenced by the habitat in which birds live (Bilčík *et al.* 1998). Monitoring fear levels in our study was a part of the evaluation of the welfare of pheasants kept in various housing systems. Table 1 shows the mean duration of tonic immobility and the number of attempts to induce TI in common pheasant hens housed in different housing systems during laying period.

Table 1

Mean (\pm SEM) duration of tonic immobility and number of attempts to induce tonic immobility in common pheasant hens housed in conventional cages (hens treated by beak-trimming or spectacles) and in enriched cages (no beak treatment in hens) during laying period

Treatment (Housing system)	Number of birds, n	Tonic Immobility	
		Duration, s	Attempts of Induction
Beak-trimming, conventional cages	15	244.80 \pm 31.59 ^a	1.40 \pm 0.16 ^a
Spectacles, conventional cages	15	361.63 \pm 40.61 ^a	1.00 \pm 0.00 ^a
Intact beak, enriched cages	15	111.40 \pm 21.41 ^b	1.20 \pm 0.11 ^a

Means within a column lacking a common letter of superscript, ^{a,b}differ significantly ($P < 0.05$).

It follows from the table that the longest duration of TI (361.63 \pm 40.61 s) was found in pheasant hens fitted with spectacles as a protection against feather pecking and kept in conventional cages during laying period. Shorter duration of TI (244.80 \pm 31.59 s) was found in debeaked pheasant hens. However, there was no statistically significant difference between debeaked hens and hens fitted with spectacles. The shortest mean duration of tonic immobility (111.40 \pm 21.41 s) was seen in pheasant hens housed in enriched cages during laying period. The duration of TI in hens housed in enriched cages was statistically significantly shorter in comparison with hens housed in conventional cages. No statistically significant differences were found in the number of attempts to induce TI between groups of hens housed in different housing systems.

The relationship between housing systems and fear reaction was investigated particularly in laying hens. Bilčík *et al.* (1998) suggest that, although the ultimate function of TI is to reduce predation, the social environment is a proximate factor affecting TI duration in domestic hens. The duration of TI is usually longer in hens housed in cages than in hens kept on a deep litter system, which can be interpreted as higher level of fear in caged hens and, therefore, lower welfare of poultry in cage systems (e.g. Jones & Faure 1981, Kujiyat *et al.* 1983, Hansen *et al.* 1993 and others). Accordingly, Boissy (1995) states that chronically stressed animals have prolonged duration of TI. Given that nowadays a substantial number of pheasants in the breeding season is housed in cage systems in many countries (Zapletal *et al.* 2010), it is increasingly important to ensure the welfare of caged pheasants. Campo & Prieto (2009) suggest that the well-being of birds can be improved with perches. Correspondingly, the use of perches (Swan 1983) has been suggested as potential management prescriptions for reducing the levels of feather pecking in pheasant pens. In our experiment, pheasant hens kept in enriched cages where perches were available during laying period showed a shorter duration of TI than hens kept in conventional cages. Environmental enrichment in our experimentally enriched cages included also the presence of a simple hideout in each cage. Deeming *et al.* (2011) investigated the effects of providing sight barriers in breeding pens on pheasant mortality, feather damage and behaviour. The authors suggest that barriers may improve pheasant welfare by reducing potentially harmful aggressive interactions, without affecting activity patterns or reproductive behaviour. According to our results, the presence of perches and hideouts may be associated with the well-being or fear levels of pheasant hens, as indicated by the TI duration. It may be concluded from our research that pheasants kept in conventional cages which exhibited longer duration of TI were more stressed and fearful than pheasants kept in enriched cages during the laying period.

However, common means of cage enrichment to increase the welfare of pheasants breeding in captivity and to make better use of their natural behaviour, thereby decreasing the likelihood of undesirable behaviour, is unfortunately not a widespread practice. Instead of cage enrichment, beak cauterisation and various types of bits applied to the pheasants' beaks are used to prevent the pheasants from injuring one another (Fehlberg *et al.* 1993, Kjaer 1997). Despite its widespread use, the effect of bits and spectacles on the welfare of pheasants has received little attention. Butler & Davis (2010) found bits to be an effective way to prevent problems caused by feather pecking and cannibalism. They did, however, cause inflammation of the nostrils and crossed mandibles in some birds. Birds fitted with bits were observed shaking and scratching their heads more than non-bitted pheasants, particularly during the first weeks. Also Swarbrick (1985) suggested that bits applied to the beak might cause welfare issues, including increased mortality. The disadvantages of beak trimming include short-term and perhaps long-term pain, and short-term stress following beak trimming (Hester & Shea-Moore 2003). Thus, beak trimming itself and the use of bits, despite their widespread use, can be seen as the cause of significant stress in pheasants. In our experiment, no difference was found between debeaked hens and hens fitted with spectacles in TI duration at the end of the laying period, suggesting that both methods induce a similar level of fear. The painful experience of beak trimming did not disappear and once debeaked hens showed the same level of fear at the end of the laying period as hens wearing spectacles for the entire laying period. No matter what anti-pecking measure was taken the duration of TI in pheasant hens housed in conventional cages was significantly longer than that of hens equipped with enriched cages.

In conclusion, our results show that relatively easy and inexpensive enrichment of the cage environment (two perches, a simple hideout) where breeding groups of common pheasants are housed during laying period can significantly contribute to reduced stress/fear levels and increased welfare of pheasants kept in captivity.

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Corresponding author:

Petra Hrabcakova
email: petra.hrabcakova@gmail.com

Department of Veterinary Public Health and Toxicology, Faculty of Veterinary Hygiene and Ecology, University of Veterinary and Pharmaceutical Sciences Brno, Czech Republic
