Duration of tonic immobility in laying hens affected by different housing systems

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Birds that are frightened can be put into catatonic state known as tonic immobility (TI). The aim of this work was to establish whether birds housed in different types of cages or free-range show different TI responses. Laying hens (brown layers Shaver 579) were kept in four different housing systems: A) battery-cages with 5 hens per cage with a density of 500 cm² per bird; B) battery-cages with 5 hens per cage with a density of 650 cm² per bird; C) hens kept in modified cages, in small compartments with perch's, a nest box and a scratch tray with 60 hens per compartment with a density 750 cm² per bird and over 600 cm² useable floor space; D) Intensive free range combined with a floor system and a density of 4 birds per one m² of poultry house and 2 bird per m² of a range. Twenty birds from each housing system were chosen at random for TI examination at the age of 35 weeks. Before statistical analyses the data were normalized using a logarithmic transformation. Birds from conventional cages (group A) remained in TI for shorter periods (1.82) than birds from modified cages and free range (2.0 for group B, 1.99 for group C and 2.06 for group D). The average number of attempts required to place birds into TI was identical for all the birds housed in cages (groups A, B and C) – 1.7, and somewhat higher for free-range birds – 1.9.

Key words: welfare; hen; cages; free-range; fearfulness

Introduction

In recent decades animal welfare has become one of the major issues of the livestock industry. This is very important for poultry industry too, especially for laying hens kept in cages. Egg producers have been under the great pressure to provide environmental conditions that are beneficial for the welfare of laying hens. Animal welfare committees from both North America and Europe (European Commission, 1997; Farm Animal Welfare Council, 1997) have recommended more research to develop housing systems that provide adequate environmental conditions to the birds. As a consequence, different housing systems are present on the farms and many studies have been focused on the stress and fear response of hens (Bell and Adams, 1998; Tauson *et al*., 1999).

Birds that are frightened can be put into catatonic state known as tonic immobility (TI). This can be used as a method of estimating fearfulness, as it is considered to be positively related to fear (Jones and Faure, 1981; Jones, 1982, Hansen *et al.,* 1993; Campo and Redondo, 1996). Duration of TI can be influenced by handling, management, transport, strain or housing system (Scott *et al.,* 1998; Zulkifli *et al.*, 2000; Altan *et al.,* 2002). Birds housed in different systems have been shown to have different levels of fear when placed into TI. In general, the duration of TI is shorter for birds housed in pens than in cages and birds kept in cages exhibit greater fear responses when exposed to novel objects (Jones and Faure, 1981; Kujiyat *et al.,* 1983). Some of the experiments showed that experience of an outdoor environment *per se* does not necessarily reduce the duration of TI (Grigor *et al.,* 1995).

The aim of this work was to establish whether birds housed in different types of cages or free-range show different TI responses.

Materials and methods

This experiment was performed using 520 laying hens - brown layers Shaver 579. The birds were kept in four different housing systems:

A) conventional three floor battery-cages with 5 hens per cage; stocking density was 500 cm² floor space per bird;
B) battery-cages with 5 hens per cage with a density of 650 cm² per bird;
C) modified cages with compartments for 60 birds; with perch's, a nest box and a scratch tray; stocking density was 750 cm² of floor space per bird and over 600 cm² useable floor space;
D) Intensive free range combined with a floor system and a density of 4 birds per one m² of poultry house and 2 birds per m² of a range.

Twenty birds from each housing system were chosen at random for TI examination at the age of 35 weeks. Each bird was inverted into a TI tray and lightly held for a period of about 15 seconds. If the bird was not put into TI in that period, it was TI re-induced. The number of inductions needed and TI duration were recorded for each bird. Before statistical analyses the data for duration of TI were normalized using a logarithmic transformation. An ANOVA followed by Duncan's post-hoc test (Statistica 7) was carried out to asses the effect of housing system on the TI duration.

Results and discussion

The results of this work showed that birds from conventional cages (group A) remained in TI for shorter periods than birds from modified cages *(Table 1)*. The longest duration of TI was established for birds housed in intensive free-range system (2.06). The obtained differences were not statistically significant.

Table 1. Mean $\log_{10}$ duration of tonic immobility for birds from different housing systems

Housing system	Duration of TI ($\log_{10}$)	
	Average	SE
Conventional cage (500cm^3/bird)	1.82	0.08
Conventional cage (650cm^3/bird)	2.00	0.12
Modified cage	1.99	0.11
Free range	2.06	0.09

These results are in line with the results reported by Tauson *et al.* (1999) who revealed no significant differences in TI duration between housing systems of birds. Anderson and Adams (1994) established that floor reared White Leghorn birds had longer duration of TI than their cage-reared counterparts. Experiments reported by Grigor *et al.*,(1995) showed that experience of an outdoor environment *per se* does not necessarily reduce the duration of TI.

However, this is in contrast to reports by Jones and Faure (1981), Hansen *et al*. (1993) and Scott *et al.* (1998) who found that birds in cages had longer duration of TI than birds in pens.

The average number of attempts required to place birds into TI was identical for all the birds housed in cages (groups A, B and C) – 1.7, and somewhat higher for free-range birds – 1.9 *(Table 2).*

Table 2. Average number of induction needed to put birds in tonic immobility

Housing system	Number of induction	
	Average	SE
Conventional cage (500cm^3/bird)	1.7	0.21
Conventional cage (650cm^3/bird)	1.7	0.15
Modified cage	1.7	0.26
Free range	1.9	0.40

Tauson *et al.* (1999) reported the same value (1.7) for the birds kept in cages and a little higher value for the birds reared in traditional floor pens (1.8). Scott *et al.* (1998) stated that more free-range birds required two or three inductions to be put into TI compared to those from cages. This is in line with the results obtained in this paper, showing that birds from cages can be put into TI easier than free-range birds.

The results of this work showed that there were no differences between duration of TI in birds reared in different housing systems, indicating that fearfulness of the birds was not affected by housing system.

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