

Welfare of laying hens kept in cages and in aviaries: physiological indicators of stress and fearfulness

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With the setting of the directive 1999/74/EC, housing systems for laying hens will have to change. Conventional cages will be banned and only furnished cages or alternative systems (floor, aviaries...) will be allowed. The aim of this study was to compare welfare of hens kept in conventional cages after being reared in floor pens, with hens in laying aviaries that were previously reared either in rearing-aviaries (recommended) or in furnished-floor pens (intermediate solution). This paper reports results concerning physiological indicators of stress and fearfulness. Zootechnical parameters, body condition on farm and at slaughter and mortality during transport are presented in two complementary papers (COLSON *et al.*, 2006; MICHEL *et al.*, 2006).

10180 ISA Brown hens were reared from one day old, beak-trimmed at nine days old, transferred from rearing to laying systems at 17 weeks old (W17) and slaughtered at 69 weeks old (W69). They were placed in three housing alternatives: 5060 hens Floor-reared then kept in conventional Cages (FC), 2560 hens Furnished-floor reared (with perches and platforms) then kept in one laying-Aviary (FA) and 2560 hens Aviary-reared then kept in one laying-Aviary (AA). Stress response to transfer in laying system was assessed by Heterophil to Lymphocyte ratio (H:L) measured before and after transfer (W15, W18, W19, W20; n=20 to 30). Stress response to housing conditions was assessed by the H:L at the end of the laying period (W66; n=30) and by the increase of corticosterone level 15 min after injection of a high dose (10µg/kg) of synacthène (W15, W20, W66; n=24 to 30). Plasmatic corticosterone levels were assayed by Radio Immuno Assay (ETCHES, 1976). Fearfulness was assessed by a novel environment (NE) test (W52-59, n=12 groups of 4 hens per treatment). The NE (100 × 100 cm, width × depth) contained water, food and a piece of Astroturf®. We registered during 10 min indicators of mobility, exploration and escape behaviour by focal sampling and indicators of activity by scan sampling.

H:L around transfer differed between treatments only in W18 (FC: 0.8±0.5, FA: 0.9±0.6, AA: 0.5±0.3; p<0.001). We verified that it was not an effect of age, therefore the transfer seemed to stress more FC and FA hens than AA hens (GROSS & SIEGEL, 1983). H:L measured in W66 had a tendency to be higher in FC hens (FC: 1.2±0.6, FA: 1.0±0.6, AA: 0.9±0.6; p=0.071), which could indicate that FC hens were a little bit more stressed by their housing conditions.

After the injection of synacthène, increases of corticosterone level were always high. These increases had a tendency to be lower in AA hens than in FA hens in W20 (FC: 20.1±11.0, FA: 25.5±10.4, AA: 19.3±10.7 ng/mL; p=0.053). AA hens were probably subject to a chronic stress, that decreased their capacity for corticosterone production (KOELKEBECK *et al.*, 1986).

In the NE test, there was a difference between treatments: FC hens were less mobile, less active and explored the NE less than FA and AA hens (p≤0.001); and they showed less escape behaviours (p=0.032). These results indicated a higher fearfulness of hens kept in cages compared to hens kept in aviaries (FAURE, 1975; JONES, 1996), probably because cages are a less enriched housing environment than aviaries (REED *et al.*, 1993).

H:L results indicate that transfer stresses more FC and FA hens, and that FC hens are more stressed at the end of the laying period. H:L results are not confirmed by corticosterone, but they are confirmed by the higher fearfulness of FC hens at the end of the laying period.

So, under the present conditions, global levels of stress seemed to increase between AA, FA and FC hens, and FC hens were more fearful. Both strong stress responses and fearfulness are linked to adaptation difficulties. Therefore, the risk of impaired welfare increases between AA, FA and FC hens.

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