

Welfare and acute phase proteins in laying hens kept in different housing systems

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The aim of this study was to investigate whether the exposure of laying hens to different housing systems was associated with changes over time in serum alpha-1-acid glycoprotein (AGP) and in serum albumin concentration. Recently some studies have highlighted a linkage between acute phase proteins (APPs) response and non-inflammatory psychophysical stress, suggesting that this response is inducible also by stressful events to which domestic animals are exposed during daily management (Murata, 2007). Levels and response profiles of APPs differ among species and their concentrations may increase (positive APPs) or decrease (negative APPs) in response to a challenge. AGP is a positive APP in chicken, while albumin behaves as a negative APP in all species studied, chicken included. ISA brown laying hens at the age of 18 weeks were randomly assigned to one of 3 different housing systems: 14 hens in battery cages (BC); 14 hens in furnished cages (FC), 14 hens in free range (FR). In each housing system layers were kept in the same ground area, had identical feeding and care management. All the animals were identified and they were bled from brachial vein after 15 days (T1), 2 months (T2) and 4 months (T3) upon arrival at the new accommodation. Serum AGP was assayed using a commercially available radial immunodiffusion tray. Serum albumin was measured using an automatic chemistry analyzer. Data were analyzed using ANOVA with housing system and time of sampling as main factors. On sampling T1, BC and FC groups showed similar high values of AGP (1214 ± 508 and $1160 \pm 651 \mu\text{g/ml}$) while on T2 and on T3 they showed significantly lower values than T1 (T2: 322 ± 208 and $371 \pm 231 \mu\text{g/ml}$; T3: 277 ± 80 and $376 \pm 140 \mu\text{g/ml}$ respectively). An opposite trend occurred in group FR: sampling T1 and T2 were similar (345 ± 132 and $279 \pm 58 \mu\text{g/ml}$), while AGP concentrations on T3 was significantly higher ($700 \pm 487 \mu\text{g/ml}$). Albumin mean concentrations for BC ($1.91 \pm 0.26 \text{ g/dl}$) were significantly different from FC and FR (1.74 ± 0.3 and $1.62 \pm 0.25 \text{ g/dl}$). AGP concentrations of BC and FC groups appeared similar; it was not found welfare benefit from FC and high AGP values on T1 might be due to intensive stressful interactions between cage mates in restricted spaces. ISA Brown has been selected as a cage-adapted hen for over 30 years and this could explain why FR group had the lowest mean albumin concentration and why AGP values increased over time.

Keywords: laying hen welfare, housing system, acute phase protein, AGP, albumin