

# Are dual-purpose hens less fearful than conventional layer hybrids?

Mona Franziska Giersberg ,<sup>1,2</sup> Birgit Spindler,<sup>3</sup> Nicole Kemper<sup>3</sup>

## Abstract

**Background** Excessive fear in farm animals can lead to chronic stress and thus impair animal welfare. In laying hens, fear responses in several behavioural tests have also been associated with the occurrence of feather pecking. The aim of the present study was to comparatively assess fear-related responses of conventional layer hybrids (Lohmann Brown plus, LB+) and dual-purpose hens (Lohmann Dual, LD), which seem to be less prone to injurious pecking.

**Methods** A novel object (NO) and an avoidance distance (AD) test were carried out in both hybrids at a group level and at different ages during the laying period in order to measure their fear-related responses.

**Results** On most study days, more LD hens approached the NO and they approached it sooner than the LB+ hens. Similarly, the LD hens retreated at smaller distances from a human being in the AD test.

**Conclusion** The results indicate that dual-purpose hens act less fearful in the performed behavioural tests compared with conventional layer hybrids. Therefore, dual-purpose hens might experience less stress during daily management routines, which would affect animal welfare positively.

Fear enables wild animals to avoid dangers, such as predators, and can therefore promote their fitness. However, in captivity, for instance on indoor farms, excessive fear of people or management procedures can lead to chronic stress. To measure fear responses in farm animals, several behavioural tests have been developed and validated.<sup>1</sup> In laying hens, high fear responses in test situations have been associated with the occurrence of damaging behaviours, such as severe feather pecking.<sup>2,3</sup> In on-farm contexts, excessive fearfulness can lead to panic smothers,<sup>4</sup> or increase the risk of keel bone fractures caused by escape reactions.<sup>5</sup> Dual-purpose hybrids can be kept as an alternative to the killing of male day-old layer chickens.<sup>6</sup> In addition, the hens from these strains seem to be less prone to injurious pecking.<sup>7</sup> However, little is known about

fear-related responses of dual-purpose hens relative to conventional layers.

In the present study, fear responses of conventional layer hybrids (Lohmann Brown plus, LB+) and dual-purpose hens (Lohmann Dual, LD) were investigated comparatively by means of behavioural tests in a semicommercial setting. Three batches of LB+ and LD hens with untrimmed beaks were observed from 21 to 69 (batches 1 and 2) and from 21 to 56 (batch 3) weeks of age, respectively. Both hybrids were reared under the same conditions and moved to the hen house at about 18 weeks. The animals were kept in a total of four compartments (about 900 hens/compartment=experimental unit) of an aviary system, with two replications of each hybrid line per batch. All hens were managed according to standard procedures by the same farm staff.<sup>7,8</sup>

A novel object (NO) test was carried out according to the Welfare Quality Assessment Protocol<sup>9</sup> at seven ages during the laying period. A round plastic stick (50 cm in length, 2.5 cm in diameter) wrapped with coloured tape (green, white, blue, red and yellow) served as the NO. The NO was placed on the ground in two different locations per compartment (littered areas on the right and left side of the aviary). After walking about 3 m away from the NO and waiting for 10 seconds, the observer recorded the number of birds within a distance of less than 25 cm of the NO every 10 seconds for a total test duration of two minutes. The latency for the first

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<sup>1</sup>Adaptation Physiology Group, Wageningen University and Research, Wageningen, The Netherlands

<sup>2</sup>Department Population Health Science, Faculty of Veterinary Medicine, Utrecht University, Utrecht, The Netherlands

<sup>3</sup>Institute for Animal Hygiene, Animal Welfare and Farm Animal Behaviour, University of Veterinary Medicine, Hannover, Germany

E-mail for correspondence: Dr Mona Franziska Giersberg; mona.giersberg@wur.nl

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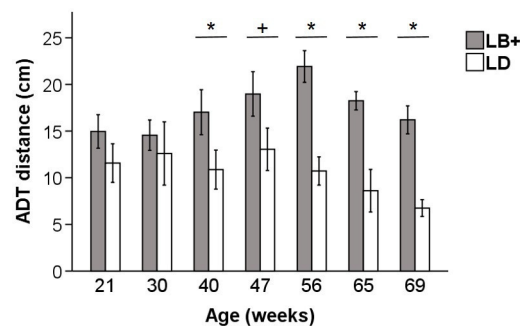
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bird to approach the NO (<25 cm) was also noted. On the same study days, an avoidance distance (AD) test based on the Welfare Quality Assessment Protocol<sup>9</sup> was performed. The experimenter walked, with his hand in a fixed position in front of his abdomen, from the entrance of the compartment parallel to the slatted tier of the aviary. When a bird was sitting on the edge of the tier, the experimenter turned, faced it and walked towards it. When the bird turned away or retreated, that is, both feet stepped aside, the distance between the experimenter's hand and the earlier position of the bird's feet was measured. This procedure was repeated until 21 birds were assessed per compartment. All tests were conducted by the same observer, and testing order on each study day was randomised at the compartment level.

For analysing the NO test, the following sample size was available per hybrid and study day: n=144: 12 recording times x 2 locations/compartment x 2 compartments x 3 batches (on five study days between 21 and 56 weeks of age); and n=96: 12 recording times x 2 locations/compartment x 2 compartments x 2 batches (on two study days at 65 and 69 weeks of age). The sample of the AD test per hybrid and study day was composed of the following: n=126: 21 hens tested x 2 compartments x 3 batches (on five study days between 21 and 56 weeks of age); and n=84: 21 hens tested x 2 compartments (on two study days at 65 and 69 weeks of age). Generalised linear mixed models (SPSS Statistics, V.25, IBM) with log link functions included week as a repeated measure and consisted of the fixed effects of hybrid and age. Compartment within hybrid and batch were added as random effects. All post-hoc pairwise comparisons were adjusted by Bonferroni correction. Differences between the tested parameters were considered to be significant if P values were <0.05. P values between 0.05 and 0.1 were considered to indicate a tendency. All data are presented as mean±standard error of the mean.

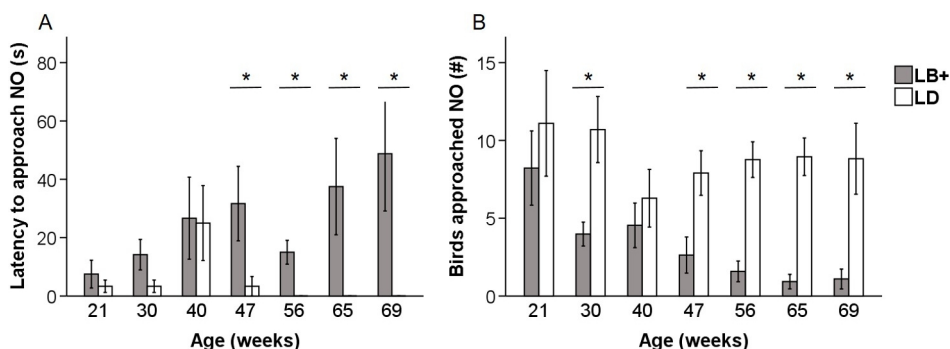
Hybrid effects were found for the latency to approach the NO starting at 47 weeks ( $F_{1,62}=4.30-9.11$ ,  $P<0.05$ ) and for the number of hens near the NO at 30 weeks and from 47 to 69 weeks ( $F_{1,62}=6.41-15.50$ ,  $P<0.05$ )



**Figure 2** Mean distance (±SEM) between a human being and the hen before the bird retreated or turned away in the avoidance distance test (ADT) at 21–69 weeks of age for conventional layer (LB+) and dual-purpose hybrids (LD). n=126 (21–56 weeks) and n=84 (65 and 69 weeks) hens in two compartments per hybrid and week in three (two) consecutive batches. +Denotes tendencies ( $P<0.1$ ) between hybrids. \*Denotes significant differences ( $P<0.05$ ) between hybrids. LB+, Lohmann Brown plus; LD, Lohmann Dual; SEM, standard error of the mean.

(figure 1). A higher number of LD hens were observed near the NO and they approached it sooner compared with the LB+ hens. The responses of the LD hens were associated with less fearfulness.<sup>1</sup> In the AD test, hybrid affected the distance at which the hen retreated from the approaching human being from 40 to 69 weeks ( $F_{1,62}=4.85-17.30$ ,  $P<0.05$ ), except for week 47, for which a tendency was found ( $F_{1,62}=4.85$ ,  $P=0.06$ ) (figure 2). The LD hens retreated at smaller distances than the LB+ hens, which indicated less fear of people.<sup>9</sup> During the first observation times (21/30/40 weeks of age), differences in fear levels between the two hybrids could only be detected at the descriptive level. Differences became significant at 30–47 weeks of age, depending on test and response variable. It is important to note that at a similar age, severe feather pecking occurred in the LB+ but not in the LD flocks.<sup>7</sup> This is in line with previous investigations in commercial layer strains, in which severe feather pecking behaviour or feather damage has been related to high levels of fearfulness.<sup>2,3</sup>

In conclusion, their responses to different behavioural tests suggest that dual-purpose hens (LD) are less fearful than conventional layer hybrids (LB+). Animals which are less fearful may experience less stress during daily management procedures, which can be regarded as a major welfare benefit. However,



**Figure 1** (a) Mean latency (±SEM) of the first hen to approach (<25 cm) the NO and (b) mean number (±SEM) of hens approaching the NO at 21–69 weeks of age for conventional layer (LB+) and dual-purpose hybrids (LD). n=144 (21–56 weeks) and n=96 (65 and 69 weeks) sample points in two compartments per hybrid and week in three (two) consecutive batches. \*Denotes significant differences ( $P<0.05$ ) between hybrids. LB+, Lohmann Brown plus; LD, Lohmann Dual; NO, novel object; SEM, standard error of the mean.

the question whether the dual-purpose hens were less prone to injurious pecking because they were initially less fearful, or whether they were less fearful throughout the laying period because they were not affected by feather pecking, remains to be solved. Future research should disentangle the cause and effect of fearfulness and injurious pecking in these hybrids, for instance by testing and comparing individual birds which were phenotyped as feather peckers, victims or birds that neither give nor receive feather pecks.

### Ethics statement

The experiments comply with the requirements of the ethical guidelines of the International Society for Applied Ethology.<sup>10</sup> All animals were housed according to EU<sup>11</sup> and national law.<sup>12 13</sup> In compliance with European Directive 2010/63/EU Article 1 5.v(f),<sup>14</sup> the present study did not imply any invasive procedure or treatment to the hens.

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**Competing interests** None declared.

**Data availability statement** Data are available upon reasonable request. The data sets for this study are available on request. The raw data supporting the conclusions of this manuscript will be made available by the authors (without undue reservation) to any qualified researcher. Contact: MFG (ORCID 0000-0001-8768-5548).

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### ORCID iD

Mona Franziska Giersberg <http://orcid.org/0000-0001-8768-5548>

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