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Does nest size matter to laying hens?

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ABSTRACT

Laying hens in loose housing systems have access to group-nests which provide space for several hens at a time to lay their eggs. They are thus rather large and the trend in the industry is to further increase the size of these nests. Though practicality is important for the producer, group-nests should also cater to the egg-laying behaviour of hens to promote good welfare. One of the factors playing a role in the attractiveness of a nest is the amount of enclosure: hens prefer more enclosure when having a choice between different nest types. The aim of this study was to investigate if hens prefer smaller group-nests to lay their eggs given that they may seem more enclosed than larger nests.

The relative preference of groups of laying hens for two nest sizes – 0.43 m^2 vs. 0.86 m^2 – was tested in a free-access choice test. The experiment was conducted in two consecutive trials with 100 hens each. They were housed from 18 to 36 weeks of age in five groups of 20 animals and had access to two commercial group-nests differing in internal size only. We counted eggs daily as a measure of nest preference. At 28 and 36 weeks of age, videos were taken of the pens and inside the nests on one day during the first 5 h of lights-on. The nest videos were used to record the number of hens per nest and their behaviour with a 10 min scan sampling interval. The pen videos were observed continuously to count the total number of nest visits per nest and to calculate the duration of nest visits of five focal hens per pen.

We found a relative preference for the small nest as more eggs, fewer nest visits per egg and longer nest visit durations were recorded for that nest. In addition, more hens – including more sitting hens – were in the small nests during the main egg-laying period, while the number of standing hens did not differ. These observations indicate that even though both nests may have been explored to a similar extent, the hens preferred the small nest for egg-laying.

1. Introduction

Humans feel safer in spaces perceived as having more enclosure, which is the degree to which spaces are visually defined by surrounding surfaces (Alkhresheh, 2007;

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Stamps, 2005). And small spaces give a greater feeling of enclosure compared with large spaces (Alkhresheh, 2007). Similarly, in laying hens, a smaller nest may provide a greater sense of protection than a larger one given that the main purpose of a nest is to provide the hens with an isolated and safe place to lay their eggs (Duncan, 1978). Hens are also more motivated to gain access to enclosed nest sites compared with open nest sites (Appleby and McRae, 1986; Zupan et al., 2008). However, the current trend in the industry is to increase the size of group-nests (for example through removal of side walls) as these are cheaper to build (E. Fröhlich, personal communication).

Commercial rollaway group-nests used in free-run housing systems range in floor surface area from approximately 0.5 to 1.8 m^2, with a relatively constant depth of 0.5 to 0.6 m and a width of up to 3 m. Legal requirements exist for group-nests in a few countries but they only pertain to the maximum number of hens allowed per m^2 of nest surface area: 100 hens per m^2 in Switzerland (Animal Welfare Ordinance, 2008) and 120 hens per m^2 in the EU and New Zealand (CEC, 1999; NAWAC, 2012). In Switzerland, commercial farm animal housing systems or equipment, including nests for laying hens, must be approved by the Federal Veterinary Office before they can be sold to producers (Wechsler, 2005). Therefore, various nest properties have recently been examined experimentally (Buchwalder and Fröhlich, 2011; Kruschwitz et al., 2008; Stämpfli et al., 2011, 2012). Buchwalder and Fröhlich (2011) used preference tests to compare commercial group-nests with simple wooden rollaway group-nests (with only a thin plastic mat on the nest floor) and found smaller nests often preferred by the hens for egg-laying. Similarly, Holcman et al. (2007) reported that broiler breeder hens laid more eggs in smaller individual nests than larger group-nests. In captive-reared partridges given a choice between three nest types, a preference was shown for nests providing the least amount of internal space and resembling natural conditions the most (Robles et al., 2001). However, the results from the previous three studies are confounded as many characteristics differed between the nest types; it is unclear whether nest size affected the choice of the hens. The relationship between nest size and nest use, predation rate and reproductive characteristics has been investigated in studies of wild birds (ex: Lambrechts et al., 2011; Soler et al., 1998; Weidinger, 2004). But it is difficult to draw relevant conclusions from these studies for domestic laying hens as they are held in artificial conditions, are provided with formed nests and do not reproduce.

Our aim was to test the hypothesis that hens prefer smaller over larger group-nests as a site to lay their eggs. Commercial group-nests were used and hens were tested in groups to mimic commercial housing systems. Thus, groups of hens were given a free choice between two identical group-nests that differed in size only. We expected that hens would lay more eggs, show fewer nest visits per egg, spend more time, and sit more in the smaller nests given that such effects are characteristic for preferred nests (Kruschwitz et al., 2008; Struelens et al., 2008).

2. Materials and methods

2.1. Animals and housing

The relative preference for nest size was assessed in two consecutive trials, each with a different batch of a commercial strain of laying hens (Lohmann Selected Leghorns) in the winter of 2011/2012 and in the spring of 2012. For each trial, non-beak trimmed day-old chicks were purchased from a commercial hatchery. They were reared in a pen (18 m^2) until 9 weeks of age at which time they were split into two groups of 120 animals (2 pens of 18 m^2) with unrestricted access to water, commercial feed, perches and sawdust bedding. At 18 weeks of age, 100 hens were randomly chosen from the 240 animals, moved to the experimental barn and assigned to five pens in groups of 20.

The experimental pens were of identical size ($3 \times 3 \times 2$ m, length × width × height) and arranged in two rows (Fig. 1a). The hens had access to sawdust bedding, three perches (0.3 m apart horizontally; at 0.6, 1.3 and 1.6 m high), ad libitum commercial layer mash feed from a round feeder and water from eight nipple drinkers. There were visual barriers up to a height of 1.6 m between the pens. Two group-nests differing in internal size only were placed opposite each other on either side of the door in each pen (Fig. 1a). Their position was counterbalanced across pen and trial. The hens had access to both nests at all times.

The group-nests were of a rollaway type commercially available in Switzerland. The large nest was the unmodified version with internal dimensions of 0.60×1.44 m and the floor of the small nest was half of this size with internal dimensions of 0.60×0.72 m (Fig. 1a). The small nest was modified by adding two internal walls and closing off the front edges of the nest. The walls of both nests were made up of plywood which was painted black. Both nests looked identical from the outside and were closed on three sides with a roof, two red curtains in the front (0.60×0.45 m, width × height) with an entry of 0.25 m in the middle and a platform to access the nest made up of a metal grid (0.30×1.44 m, width × length). They had a floor covered in brown AstroTurf® and divided in two with both parts slanting towards the middle (Fig. 1b). The front floor was higher than the rear to allow eggs to roll onto the egg collection belt. The light intensity on the floor in the rear of the nest was 0.7 ± 0.1 lx in the large nest and 0.6 ± 0.1 lx in the small nest in both trials.

From the first day of age until the end of the experiment, artificial light was used to prevent seasonal effects of natural daylight on egg-laying behaviour. The photoperiod followed standard commercial practice. At 18 weeks of age, the hens had 10 h of light from 6:30 to 16:30 h with a 15 min twilight phase at the beginning and end of the day. Light exposure was then gradually increased by 30 min each week until 15 h of light was reached in week 28 of age (1:30 to 16:30 h); the photoperiod then remained constant until the end of the study. In the experimental barn the average light intensity at bird height on the pen floors was 7.8 ± 1.0 lx and temperature was