

## Development of on-farm methods to assess the animal-human relationship in laying hens kept in non-cage systems

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### Abstract

The aim of this study was to develop a set of tests to assess the reaction of laying hens towards humans in non-cage systems and to investigate the repeatability within and between days.

Based on a literature survey six tests were developed or modified, which were examined for practicability and adapted in a first phase. Reactions of hens were recorded directly or with a video camera. These included the reaction towards a stationary person: stockperson (SPs); experimenter (SPe); a moving person: (moving through flock [MP]; approaching individual hens measuring avoidance distance [AD]) and a complex test including stationary and moving elements: (arm moving to touch hens [touch test] in the litter [TI] and on the slatted area [Ts]). Six flocks of five farms were visited twice, one week apart. At each visit the six tests were performed during morning and afternoon hours. The order of the tests differed between farms.

Repeatability of flock reactions within as well as between days was high for SPs, AD and TI. SPe and especially MP showed slightly reduced correlations. Touching hens at the droppings pit (Ts) was less repeatable than in the litter area (TI).

To sum up, first experiences show that most tests can be practically used in groups of hens in non-cage systems and seem to have good repeatability.

**Keywords:** animal welfare, human-animal relationship, laying hen, non-cage systems, on-farm assessment, repeatability

### Introduction

The laying hens' relationship to humans, reflected by their reactions towards them ranging from approach and close contact to violent escape behaviour, can be considered as an important factor affecting animal welfare on farm (Waiblinger *et al* 2006). Measuring the reactions as a way of describing the hens' relationship to humans has been the focus of a number of studies in recent years. Nevertheless, until now most of these studies on hen-human relationship were carried out on hens housed in cage systems (eg Hemsworth *et al* 1993; Barnett & Hemsworth 1994; Keer-Keer *et al* 1996) and used test equipment to evaluate reactions of hens to a human experimenter.

Therefore we developed a set of tests, which could be used in hens housed in non-cage systems, require a minimum of intervention (ie by leaving the hens in their environment and not catching them), are quick to perform and easily standardised. Finally, tests should assess different types of interaction (motionless person, approaching person, handling). The aim of this study was to investigate, whether the tests are repeatable within and between days.

### Materials and methods

The study was conducted in six flocks with brown hybrids on five farms from October to December 2004. All hens

were kept in a deep litter system with a droppings pit and had access to a free-range area. Flock size was between 770 and 6120 hens.

Each flock was tested four times. Tests were performed twice on two days, separated by one week and each day during the same time period, morning and afternoon. The sequence of tests was randomised.

Based on a literature review and first experiences during a pre-trial phase, six tests (see Table 1 for details) were developed or modified. These included reactions of hens towards the following: a stationary person ie the stockperson (SPs) or an experimenter (SPe); a moving/stationary person ([MP], moving through flock) and a moving person approaching individual hens measuring avoidance distance (AD). Additionally, a complex touch test including stationary and moving elements (approaching a group of hens, squatting stationary, and arm moving to touch hens) performed in the litter area (TI) and at the slatted area/droppings pit (Ts) was used. Except for SPs, tests were performed by the same experimenter for all flocks and visits. The experimenter wore green overalls and dark shoes with a plastic cover. For the stationary person test SPs stockpersons were asked to wear their usual clothing and trained before performing the test to standardise with the experimenter. Reactions of hens were recorded in SP and

**Table 1** Description of tests used.

Test	Position of test person	Description	Sampling strategy	Parameter
Stationary person (SPe/SPs)	Standing in litter area with back to a wall	Two distant locations; experimenter (e) or stockperson (s) standing 2 min at each location; holding video camera	Scan sampling from video every 10 sec	Average number of hens in a 1 × 0.8 m (length × breadth) rectangle directly in front of the experimenter (video camera)
Moving person (MP)	Walking and stopping (standing) in litter area	Moving phase: 6 steps, 10 sec; stationary phase: 20 sec; repeated 6 times (total 3 min); experimenter holds video camera	Moving phase: scan every 3 sec stationary phase: scan every 5 sec; from video	As previous
Avoidance distance (AD)	Approaches single hens standing on slatted area	Starting at a distance of 1.5 m; testing of 21 hens	Direct observation	Median of distance at which hens show withdrawal
Touch test (TI/Ts)	Approaches a group of 3 or more hens in litter area (TI) or on slatted area (Ts)	Person squats (TI) or stands (Ts) motionless for 10 sec; counts number of hens in reach (0-3) and tries to touch 3 hens; repeated until 21 hens have been touched or 21 trials have been performed	Direct observation	Number of trials (7-21), number of hens in reach (0-23) number of hens touched (0-23)

**Table 2** Spearman rank correlation coefficients of reactions towards a human within and between days (n = 6 flocks).

Test	Parameter	M1/A1 <sup>1</sup>	M2/A2 <sup>1</sup>	M1/M2 <sup>1</sup>	A1/A2 <sup>1</sup>
SPs	Average number of hens	0.94**	1.00***	0.94**	0.83*
SPe	Average number of hens	0.77 <sup>†</sup>	0.83*	0.77 <sup>†</sup>	0.83*
MP	Average number of hens	0.83*	0.89*	0.77 <sup>†</sup>	0.49
AD	Median of distance	0.81*	0.99***	0.81*	0.94**
TI	Number of trials	0.99***	1.00***	0.81*	0.88*
	Number of hens in reach	0.94**	1.00***	0.84*	0.84*
	Touched hens/number of hens in reach	1.00***	0.96**	0.83*	0.81*
	Touched hens/ trial	0.94**	0.96**	0.83*	0.87*
Ts	Number of trials	0.41	0.83*	0.3	0.87*
	Number of hens in reach	0.65	-0.29	0.46	0.12
	Touched hens/number of hens in reach	0.99***	0.49	0.75	0.54
	Touched hens/trial	0.93**	0.82*	0.89*	0.94**

<sup>†</sup>  $P \leq 0.1$ ; \*  $P \leq 0.05$ ; \*\*  $P \leq 0.01$ ; \*\*\*  $P \leq 0.001$ .

<sup>1</sup> M = morning; A = afternoon; <sup>1,2</sup> Day 1, Day 2.

MP with a video camera held by the test person and analysed later by scan sampling. Before starting the tests the experimenter stood still for five minutes and presented the camera.

### Statistical analysis

Repeatability of test results between morning and afternoon hours and between days (test-retest reliability) were analysed by calculating Spearman rank correlation coefficients ( $r_s$ ) with SPSS 11.5.

### Results

As shown in Table 2 high ( $r_s > 0.8$ ) and significant correlations within days and between days could be found for some tests. Measuring the avoidance distance (AD) of hens situated on the droppings pit showed high repeatability as

well as the complex touch test, when performed in the litter area (TI). Assessing reactions of hens to an unfamiliar stationary human was less repeatable than to a familiar human, but correlations between both tests were consistently high (all four test sessions:  $r_s > 0.80$ ,  $P < 0.05$ ). The moving person test (MP) showed a good repeatability within days but poor correlations between days. In contrast to the results of the touch test performed on hens in the litter area (TI), the touch test on hens located at the droppings pit (Ts) showed generally poorer repeatability except the parameter 'touched hens per trial'.

### Discussion

Although not all tests used in this study were highly repeatable all except the test involving the stockperson seem

feasible to be used on-farm in non-cage systems. It seems possible that further standardisation of the data collection protocol could enhance repeatability. This is especially true for the moving person test, which has been used in broilers so far (eg stroll test; Cransberg *et al* 2000) and where the positioning of the video camera was more difficult to standardise. Nevertheless, good repeatability within days but not between days could also point to an habituation of the hens, which might be more relevant: 1) for this test including an unfamiliar human moving in an unusual manner through the flock and 2) for flocks with a higher level of fear of humans where the potential for reduced avoidance is higher. The same effect could be an explanation for the findings regarding the stationary person test with an unfamiliar person. It might be that hens reacted differently when the test was performed for the first time during the morning of day 1 (M1) due to the novelty of the test person. In fact, in four out of the six flocks the value of M1 was lowest (results not shown). Using the familiar stock person in the stationary person test would avoid this, and, in effect, repeatability was high. However, it took considerable effort to train the stockperson to keep the video camera in a defined position. Therefore for practical reasons, using an unfamiliar person seems more advisable, which is supported by the high correlation between both tests. These correlations also support earlier findings that hens both generalise their former experience with one human to other humans (Jones 1994) and are able to discriminate between different people (Davies & Taylor 2001).

Performing the touch test on hens located in the litter or on the droppings pit led to different repeatability. The results suggest that selection of parameters is important when measuring the reaction of hens to humans. It is possible that hens react differently to an approaching human when being located in the litter or on the droppings pit, eg hens on the droppings pit could generally avoid approaching humans to a greater extent. Therefore, the number of hens in reach on the slatted area, which could potentially be touched, seems to fluctuate to a large degree. As the avoidance distance test also measures if hens can be touched on the droppings pit (avoidance distance = 0), the Ts may not give much additional information and seems not to be recommendable for future use.

## Conclusion and animal welfare implications

First experiences show that all tests can be used in practice in farms with laying hens housed in non-cage systems. It seems that the most promising means to assess the hen-human relationship in these farms would be a set of two tests; the avoidance distance test, performed on hens located on the slatted area, and the touch test, performed on hens located in the litter area. Nevertheless future research is needed in respect of validity and other aspects of reliability (inter- and intra-observer reliability).

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