SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

Action number: CA15224
STSM title: The effect of keel bone fractures on individual mobility and expression of group behaviours in laying hens
STSM start and end date: 12/01/2019 to 11/04/2019
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PURPOSE OF THE STSM:

(max.200 words)

Keel bone fracures (KBFs) are a major welfare issue in laying hens and are increased dramatically in aviaries (Rodenburg et al., 2008). Previous studies show that KBFs may be experienced as painful (Nasr et al., 2015, 2013, 2012) and alter the mobility of laying hens (Rufener et al., submitted). Therefore, the effect of KBFs on individual movement patterns of Lohman Selected Leghorn (LSL) hens and the expression of dustbathing and piling was examined in an aviary system.

It was investigated whether hens with KBFs, compared to hens without; 1) transition more over multiple tiers with a downward direction during dusk, which could be an indication of falling; 2) spend more time at the top tier and less time in the litter, in line with findings from Rufener et al. (submitted) and 3) spend less time on dustbathing and/or piling when in the litter, which could be a behavioural indication of KBFs causing pain. Furthermore, dustbathing is an essential natural behaviour and a decrease caused by KBFs has major welfare implications. Using an infrared tracking system, the movement between and durations at specific levels was measured for 80 LSL hens. Additionally, piling and dustbathing behaviours of 48 hens were observed live.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

(max.500 words)

Mobility and behavioural data were simultaneously collected using two separate measures: the infrared tracking system and live observations. For both data collections, palpation methods were used to establish the keel bone status, before and after each trial. Before starting the project, the experimenter was trained in palpation. Eighty LSL laying hens were selected for data collection on mobility and group housed with a total of 225 hens in a multi-layered system, composed of a litter level and three stacked tiers. From these subjects, 48 animals were observed over the course of the study.

In order to track individual birds, a previously described and validated tracking system (Rufener et al., 2018) was used, consisting of infrared emitters and receivers. The emitters were placed at the four tiers of the aviary and generated different IR signals for each level. Each level-specific signal was recorded by the receivers when passing through the beam and a new signal was recorded whenever the animal transitioned to a different level. Therefore, the IR system was capable of recording transitions and durations at each tier. All subjects were tracked during the first trial for 4 weeks. From these, 40 were randomly selected and tracked during the second trial for 3 weeks. The effect of KBF on the number of transitions and levels crossed during dusk (between 16:45-17:00h) will be analysed, as well as the duration at each levels.

Additionally, the expression of dustbathing (DB) and piling in relation to KBFs was studied. After conducting a pilot study, it was chosen to observe for three, 1h sessions per day, between 08:00-11:30, for 4-6 days per trial. Note that both behaviours could still have occurred before and after the sessions. Twelve focals were observed per trial and a total of four trials was conducted. In order to recognize focals, hens were blindly fitted with numbered vests. Six hens without KBFs (-KBF) and six hens with major fractures (+KBF) were selected during the first three out of four observation trials. For the last trial, only four –KBF hens were selected, since all other -KBF hens were already used as focals. Thus, a total of 22 –KBF hens and 26 +KBF hens were observed over the course of the study. Two observers would monitor the litter from the front and back of the pen and alternate between sides each session and the start of each session was synchronized between observers. The behaviour of the focals would only be scored when they were at the litter. Using an ethogram, the presence in the litter would be noted, as well as the duration and number of DB and piling bouts. BD was defined as the manipulation of substrate with wings, feet, tail, and/or beak while lying in the litter area with some or all feathers fluffed. Piling was defined as a cluster of several quiescent-looking laying hens in closest possible proximity, with their heads pointing towards the same spot.

(General) Linear mixed model ANOVA's were carried out for statistical analysis using R studio.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

(max.500 words)

The data collected on individual movement patterns is currently being analysed.

Since the behavioral observations were carried out for 4-6 days, some focals were observed for a longer time period. Therefore, the time spent at the litter was corrected for the time the focals were studied (at litter ratio). Furthermore, hens with fractures were previously found to spent less time at the litter, therefore automatically decreasing the chance on time spent on DB and piling. Hence, the durations measured for DB and Piling were corrected for the time they were seen at the litter (DB ratio; Piling ratio). Of the 22 –KBF hens, one was excluded and of the 26 +KBF hens, 4 were exluded from the analyses on DB and piling behaviour, since they had spent ≤10% at the litter from the total time they were observed. However, all hens were included for the analysis of the at litter ratio.

Linear mixed models have been carried out on the duration measures, whereas general linear mixed models have been used for the number of piles and dustbathes, since the data was Poisson distributed. HenID nested in Period was chosen as the random effect structure, since more complicated structures did not additionally explain variance in the data. The continuous palpation scores before and after the trial were transformed into binary scores (fractures present: yes or no), in accordance with Casey-Trott et al. (2015). These binary palpation scores and their interaction together were chosen as fixed effects, as well as the date.

It was found that +KBF hens spent significantly less time at the litter than hens without fractures,

which is in line with recent findings (Rufener et al., submitted). More specifically, the at litter ratio was lower for hens that were fractured when palpated after the observation trial (KBF after: $F_{(1,41)}$= 6.216, P=0.0168). Since hens could get fractured during the observation period, they could change from –KBF status to +KBF. Thus, hens that had a +KBF score after the observations spent less time at the litter than –KBF hens, wheras the time spent at the litter was not significantly correlated to the palpation score before the observations.

For both the time spent on DB and piling, no effect of KBF was found. Additionally, hens with and without fractures did not significantly differ in the number of DB and piling bouts. Therefore, although there are physiological indications of KBFs causing pain in laying hens (Nasr et al., 2015, 2013, 2012), hens do not seem to alter their DB and piling behaviour due to fractures. This implicates that the important behavioural need of DB can still be equally well fulfilled, despite keel fractures being present.

FUTURE COLLABORATIONS (if applicable)

 Not applicable.

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