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Lameness scoring and assessment of fitness for transport in dairy cows: Agreement among and between farmers, veterinarians and livestock drivers

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ABSTRACT

Cull dairy cows are transported to slaughter, but may be more vulnerable to transport stress than younger livestock. In order to ensure the welfare of cull cows during transport their fitness for transport must be assessed before transport. Lameness is a common reason for culling dairy cows, and assessing fitness for transport in lame dairy cows is a frequent task for farmers, veterinarians and livestock drivers. The aim of this study was to evaluate the agreement within and between these three groups of professionals in relation to lameness scoring and assessment of fitness for transport. The study used an online questionnaire consisting of 30 video recordings of walking cows. Participants were asked to score lameness for each cow and assess if the cow was fit for transport or not. Weighted and unweighted kappa were used as a measure of interrater agreement within and between groups. The levels of agreement within and between the three professional groups were at best moderate. Farmers agreed less than moderate within their own group as well as compared to veterinarians and livestock drivers when assessing fitness for transport. In general, it raises concern that the level of agreement on fitness for transport was moderate or even lower. These results call for more focus on the assessment of fitness for transport, including research and possibly training of the different professional groups in order to ensure good animal welfare during transport.

1. Introduction

After the production period, cull dairy cows are transported to slaughter. In recent years, the development in international meat production and processing (as discussed by Miranda-De La Lama et al., 2014) has led to a decreased number of slaughterhouses in many regions of Europe and North America and thus to longer distance to the nearest slaughterhouse. This calls for an increased focus on animal welfare during transport.

Cull dairy cows are suggested to be more vulnerable to transport stress than younger livestock (Gonzalez et al., 2012; Nielsen et al., 2011) and may be characterised by diseases or other weaknesses (Beaudeau et al., 2000; Booth et al., 2004; Fetrow et al., 2006), potentially increasing the severity of transport as a stressor. This emphasises the need to be able to assess fitness for transport before loading, in order to ensure an acceptable level of animal welfare. However, to date only very few studies e.g. Vecerek et al. (2006) have included data from transport of this specific group of animals, or has included aspects of fitness for transport.

According to EU legislation EC 1/2005 (Anonymous, 2005) it is the duty of farmer as well as livestock driver to ensure that all cows are fit for the intended journey before loading onto the transport vehicle. Throughout EU, farmer and livestock driver share the legal responsibility for the fitness of the cows. In case of doubt, veterinary assistance must be sought. Thus, farmers, veterinarians and livestock drivers all play vital roles in relation to the assessment of fitness for transport. Based on this important role, the knowledge about, and experience with fitness for transport in dairy cows among cattle livestock drivers as a professional group was examined recently by Herskin et al. (2017).

It is generally agreed that assessment of fitness for transport in livestock is not simple (Grandin, 2016). The EU legislation EC 1/2005 (Anonymous, 2005) clearly states that cows must be fit for transport and that ill or injured cows are not considered fit for transport. Cows that are slightly ill or injured may be considered fit for transport, if the transport will not cause them additional suffering. However, the term animal suffering has no clear scientific definition (Weary, 2014), and has been suggested as for example ‘a wide range of unpleasant emotional states' (Dawkins, 1980). A few studies have described the clinical condition of cull cows arriving at the slaughterhouse, but not in great detail (Gonzalez et al., 2012; Warren et al., 2010) and very little is

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known about risk factors for the development of states of suffering during transport. Thus, at present, the decision of whether a certain transport will cause additional suffering is largely a matter of subjective assessment.

Lameness is a major welfare problem in dairy herds worldwide (Whay et al., 2003), with a mean herd level prevalence of 25–55% (Dippel et al., 2009; Leach et al., 2010; Thomsen et al., 2012; von Keyserlingk et al., 2012). Lameness is a common reason for culling dairy cows (Ahlman et al., 2011; Booth et al., 2004; Chiumia et al., 2013; Esslemont and Kossaibati, 1997). Nevertheless, the occurrence of lameness in cull cows is not known, but probably at least at the same level as in the herds in general. Thus, assessing fitness for transport in lame dairy cows is a frequent task for farmers, veterinarians and livestock drivers. Several lameness scoring systems exist, where lameness is scored based on e.g. head bobbing, back arching and leg placement (Flower and Weary, 2006; Sprecher et al., 1997; Thomsen et al., 2008; Winckler and Willen, 2001). In general, the systems do not require technical equipment and are therefore suitable for on-farm use. However, subjective scoring can result in considerable intra- and interrater variation. A study of veterinarians scoring lameness, hock lesions and cutaneous lesions showed moderate levels of interrater agreement with higher levels of agreement in the most severe cases (Thomsen and Baadsgaard, 2006). Studies of on-farm lameness scoring have found that farmers generally only identify approximately one third of the lame cows in their herds and that they find it easier to identify severely lame cows than moderately lame cows (Alawneh et al., 2012; Espejo et al., 2006; Whay et al., 2003). Garcia et al. (2015) evaluated intra-observer agreement of lameness scorings in groups of farmers and veterinarians. However, to date no studies have evaluated lameness scorings performed by livestock drivers. Nor has there been any focus on the agreement of lameness scoring across these three groups of professionals.

The aim of this study was to evaluate the agreement within and between three groups of professionals - farmers, veterinarians and livestock drivers - in relation to lameness scoring and assessment of fitness for transport in dairy cows.

2. Materials and methods

2.1. Recruitment of participants

The study used an online questionnaire (SurveyExact, Ramboll Management Consulting, Aarhus, Denmark). An invitation to participate was sent to 400 dairy farmers randomly sampled from a mailing list of 2415 Danish dairy farmers provided by the breeding association Viking (Viking Genetics, Assentoft, Denmark) and to 34 veterinary clinics listed on the Danish Veterinary Association's homepage as having at least one veterinarian working in cattle practice. Livestock drivers were contacted via an electronic newsletter from a major Danish transport organisation, DTL (Danish Transport and Logistics Association, Copenhagen, Denmark), sent to 35 trucking companies working with animal transport. This approach, however, led to only eight responses from livestock drivers. Another nine livestock drivers were therefore recruited in person when unloading cattle at a large Danish cattle slaughterhouse. Thus, some participants were recruited through convenience sampling (Houe et al., 2004). All participants were emailed a unique link to the survey.

2.2. Collection of data

The questionnaire consisted of 30 video recordings of walking Holstein cows seen from the side at a distance where the cows would take up approximately two thirds of the picture. Each cow walked approximately 10 m and each video recording lasted between 4 and 11 s. The 30 recordings were a convenience sample of available videos and covered the spectrum from not lame to severely lame. The recordings were presented in an arbitrary order (same for all participants) with respect to degree of lameness. For each cow, the participants were asked to indicate if the cow was 'not lame', 'mildly lame' or 'lame'. Definitions of these categories were given to the participants before they saw the recordings: A 'not lame' cow was defined as a cow with a normal gait. A 'mildly lame' cow was defined as a cow that did not have a normal gait but where the affected limb could not be identified. A 'lame' cow was defined as a lame cow where the affected leg or legs could be identified. In addition, the participants were asked if the cow was fit for transport or not, based solely on its degree of lameness, given that the duration of the transport would not exceed 8 h. However, no specific threshold for lameness in relation to fitness for transport was stated. This judgement was left for the participants. Participants were reminded about the legislation in brief (slightly ill or injured animals might be transported provided that their condition do not worsen, only non-lame and mildly lame animals may be transported). Participants were instructed not to watch each video recording more than three times. Each question had to be answered in order to proceed. Total time needed to answer the survey was approximately 10 min.

2.3. Statistical analysis

Weighted and unweighted versions of Cohen's kappa were used as the measure of interrater agreement between pairs of observers. The kappa statistic measures the obtained degree of agreement above chance. For the interpretation of kappa values we used the cut-offs suggested by Landis and Koch (1977): values < 0 = no agreement; 0–0.20 = slight agreement, 0.21–0.40 = fair agreement, 0.41–0.60 = moderate agreement, 0.61–0.80 = substantial agreement and 0.81–1 = almost perfect agreement. In addition to kappa for pairs of raters, we also calculated the (unweighted) variant for multiple ratings per subject including 95% normal approximation confidence limits, see Fleiss et al. (2003). This was calculated to check that the approach described below gave reasonable results for within group agreement. Lameness was rated on an ordinal scale with categories 0 (not lame), 1 (mildly lame), and 2 (lame). For the analysis of weighted kappa, agreement was weighted by 1 (agree), 0.4 (disagreement between successive categories: 0–1 or 1–2), or 0 (disagreement between categories 0 and 2).

Two approaches were made to investigate if 1) agreement within group differed between groups, and 2) agreement between groups differed between pairs of groups (i.e. three pairwise combinations: farmers-veterinarians, farmers-livestock drivers and veterinarians-livestock drivers).

Approach 1 - agreement within groups: For each professional group (farmers, veterinarians, and livestock drivers) kappa was calculated between all pairs of individuals within that group. To compare within group agreement between groups, these kappa values were then used as response in a linear mixed model with a fixed effect of group and two random effects for subject repeatability (one for the first subject and one for the second subject within a pair). The overall effect of group was tested by a likelihood ratio chi-square test on two degrees of freedom (χ_2^2), specifically given by minus two times the logarithm of the ratio between the likelihood functions obtained by maximum likelihood estimation of the models with and without the fixed effect of group. Contrasts between groups were estimated and assessed by a standard normal distribution Wald's test (z), specifically calculated by division of the estimated difference (δ) by the corresponding standard error (se). The *p*-values from the three tests of contrasts were adjusted for multiple comparison to control the familywise error rate by the single-step procedure suggested by Hothorn et al. (2008) and implemented in the 'glht' function from the 'multcomp' package in R (R-Development Core Team, 2016).

Approach 2 - agreement between groups: For each pair of professional groups (farmers-veterinarians, farmers-livestock drivers, veterinarians-livestock drivers) kappa was calculated between all pairs of