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## Development and implementation of a training program to ensure high repeatability of body condition scoring of dairy cows

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### ABSTRACT

A body condition score (BCS) in dairy cattle is a subjective assessment of the proportion of body fat that she possesses and is a common measure used in animal welfare assessment. The objectives of our study were to develop and implement a training program to produce highly repeatable BCS by many assessors as part of a cross-Canada epidemiological study on dairy cow comfort and welfare. In preliminary studies, we established that without any proper standard operating procedures (SOP) to describe the practical steps of the process and good standard reference for each score, assessors provided with a BCS chart scored with each other only with substantial agreement within 0.5 points and moderate agreement on exact score (mean weighted kappa coefficient = 0.79 and 0.46, respectively). Detailed SOP were developed to assess BCS in 4 locations on a dairy farm. Assessing BCS presented more challenges in some locations (when cows exited the milking parlor, when the assessor was located outside the freestall pen) than others (when cows were headlocked at the feed bunk, when assessor was located inside the freestall pen). Additionally, training material and a training procedure were developed to ensure that future assessors would achieve almost perfect repeatability with the trainer within 0.5 points (weighted kappa coefficient >0.80). Twelve trainees followed this training and their repeatability was assessed using photographs in classroom sessions and live observations on farm over a 1-wk period. Repeatability was maintained above target agreement at periodic checks over the 6 mo of on-farm data collection. Two trainers were used as a reference standard to which all trainees were compared. This study demonstrates that to obtain reliable measures, a training program must include validated procedures to help assessors cope with a variety of farm setups. Regular repeatability checks are essential to ensure that the ref-

erence standard is maintained over time and to secure high data quality. This method to develop a training program as well as the training program implemented can be used as a model to successfully train on-farm assessors.

**Key words:** training program, interobserver repeatability, body condition score, dairy cow welfare

### INTRODUCTION

The BCS of a dairy cow is a subjective assessment of the proportion of body fat that she possesses and has been used by animal scientists and producers as a key monitoring tool in dairy cow management since its introduction in the 1970s (Roche et al., 2009). More recently, BCS has been used in on-farm animal welfare assessments (e.g., Whay et al., 2003; Welfare Quality Consortium, 2009).

The scoring chart used to measure BCS differs between countries (e.g., Bewley et al., 2010), but lowest values always reflect emaciation (thin cow) and highest values equate to obesity (fat cow; Roche et al., 2004). Research has demonstrated relationships between a cow's stored energy reserves and her health: cows that are too fat at calving are more prone to reproductive and metabolic diseases, whereas cows that are too thin 30 to 100 d postpartum may not have sufficient body reserves to support high levels of milk production during early lactation and are, therefore, more likely to enter into a state of negative energy balance (de Vries and Veerkamp, 2000). Typically, best management practices require taking corrective actions for cows with extreme BCS (e.g., DFC, 2009) and animal welfare assessment schemes monitor if a cow is too thin, too fat or in ideal condition (e.g., Welfare Quality Consortium, 2009).

The accuracy of BCS assessment is important when it is used as a decision support tool by dairy producers or in animal welfare assessments. However, considering the subjective nature of the scoring process, determining both inter- and intra-assessor repeatability of BCS evaluation is important. To help achieve consistent BCS assessment, BCS educational material has been developed (e.g., Elanco Animal Health, 1996; DEFRA, 2001;

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Alberta Agriculture and Rural Development, 2004). This material includes a combination of photographs and text, which detail differences in the conformation of anatomical locations that correspond to each level of BCS. However, very few studies have evaluated the effectiveness of such material in ensuring good repeatability of the scoring. Nor has much research been done on the importance of training in ensuring the accuracy of BCS assessment.

More recently, greater emphasis has been placed on the importance of formal training programs for animal welfare assessors to reduce inter- and intraobserver variation of animal-based measures and to maintain the integrity of the assessment (EFSA, 2011; Rushen et al., 2011; Gibbons et al., 2012). When training future assessors for welfare assessments, differences between people are expected due to observer-related factors such as experience and personal biases. However, with appropriate training and regular repeatability assessment, the variability in the data collected should be substantially reduced (e.g., Gibbons et al., 2012). Ideally, if different assessors receive a high standard of training with assessments at regular intervals, they should produce more accurate and reliable data (e.g., Mullan et al., 2011). Despite the recognition that training is essential to reduce variation among assessors, few studies provide detailed information on the training program used or the effectiveness of that training.

Two preliminary studies were conducted to (1) develop BCS standard operating procedures (SOP) using a chart used extensively in the field and (2) test the effect of training on repeatability. This paper reports the strengths and weaknesses of BCS methods in different locations of a freestall barn to provide guidelines to assessors to cope with a variety of farm setups. This paper also highlights that BCS charts, even if extensively used, may not be self-explanatory. Interobserver repeatability before and after training will be reported.

As part of a cross-Canada epidemiological study on dairy cow comfort and welfare, a training program was implemented to train assessors who were naïve to the scoring system, differed in previous experience with dairy cattle, and were geographically separated, with little direct contact. In this paper, the effectiveness of the training program to produce highly repeatable BCS between assessors will be examined.

## MATERIALS AND METHODS

The BCS chart used was the Elanco Animal Health body condition scoring chart for dairy cattle [Elanco Animal Health, 1996], based on Wildman et al. (1982) and Ferguson et al. (1994)]. This is a 14-point BCS

chart, with scores ranging from <2 to 5 in 0.25 increments, based on 10 different body parts (Figure 1).

Two preliminary studies were conducted to (1) develop BCS SOP and (2) test the effect of training on repeatability of the assessors. Both preliminary studies were conducted at the University of British Columbia Dairy Educational Research Center (Agassiz, British Columbia, Canada). Only lactating Holstein cows were assessed for BCS.

### *Development of SOP*

Four pairs of assessors with no experience with the chart, each including a veterinary student and an animal scientist were asked to evaluate the ease of use of the selected BCS chart at different locations on a dairy farm. Each pair of assessors was tested in 4 different locations: (1) when cows were locked at the headlock feed bunk, (2) from inside the freestall pen containing 12 to 48 cows, (3) in the milking parlor (double 12 parallel with 2 exit alleys) during milking, and (4) from outside of a freestall pen containing 12 to 48 cows, allowing the assessors to walk on 2 sides of the pen, in the feed alley, and along another side of the pen (either back or side). Using a decision Aid Form (Table 1), for each location, the pair of assessors had to follow 6 steps and by discussing together, (1) choose a position for each assessor and develop a procedure to score, (2) evaluate how well they were able to score (scale from 1 = very badly to 5 = very well), (3) record the time needed to score 40 cows, (4) describe the difficulties encountered with this strategy, (5) develop an improved strategy based on their results, and (6) test the improved strategy by redoing steps 1 to 6. As a result of this process, a BCS SOP for each location was developed containing a concise description of the sampling protocol as well as strengths and weaknesses of the use of the BCS chart at each location (Table 2). No SOP was developed especially for tie-stall farms, as cows could be observed with a high level of precision and palpated at their tie-stall.

### *Effects of Training on Repeatability*

The repeatability of assessors who were either given training or no training in BCS was compared. First, 2 pairs of nontrained assessors (veterinary students with little experience with cattle) were given the BCS chart. Each pair was asked to score 50 cows, both nontrained assessors scoring independently at the headlock feed bunk. No further instructions or information were provided. Range and prevalence of BCS points scored by nontrained assessors are detailed in Table 3. Interobserver repeatability between nontrained assessors was calculated for scores from live observations.

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