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# Effect of stall design on dairy calf transition to voluntary feeding on an automatic milk feeder after introduction to group housing

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## ABSTRACT

Automatic milk feeders (AMF) for young dairy calves are widely used in the dairy industry. These feeders are thought to have benefits for calf health and welfare and may reduce labor required for feeding; however, little is known about how calves adapt to feeding with AMF. The objective of this study was to observe the effects of feeding stall design on calves learning to use the AMF. The hypothesis was that solid side stalls, compared with steel bar stalls, would result in a longer latency to approach and feed from the AMF without assistance. A total of 147 Holstein calves (80 male and 67 female) were enrolled at 4 d of age, introduced to a group pen, and, at the same time, trained on an AMF. For training, calves were allowed to suck on the trainer's fingers and guided to the teat. Calves were allocated to 1 of 2 stall designs at the pen level, depending on which treatment cohort they were born into, either with steel bar stall walls (n = 46 male, 34 female calves) or with solid side stall walls (n = 34 male, 33 female calves). For 72 h after introductory training on the AMF, data from the feeders were collected and calf behavior was monitored by video. Outcomes measured included latency to first voluntary visit to the feeder and to first feeding, time spent in the feeder, amount of milk consumed over 72 h, number of retraining sessions required (retrained if <2 L was consumed every 12 h), and exploratory behavior, such as sniffing and licking of the feeder. Data were analyzed using mixed effects linear regression models or a Poisson model for the outcome of retraining. For certain outcomes the effects of stall design interacted with difficulty of training (willingness to enter feeder and drink); for the 38% of calves that were scored as moderately difficult to train on a scale of easy, moderate, or difficult, treatment (stall design) differences were detected. These calves took 2× longer to lick or bite toward the nipple, 2× longer to first voluntarily feeding, and consumed less milk over 72 h following training when trained on the steel bar stall design. These results suggest simple features of a stall may influence how quickly calves learn to use an AMF, but that the influence of stall wall design was affected by how easy calves were to train on the feeder upon initial introduction, which may depend in part on certain aspects of calf temperament. For many calves, solid side stalls at an AMF resulted faster in adaption than the steel bar stalls.

**Key words:** dairy calves, automatic milk feeder, stall, learning

## INTRODUCTION

Several studies have documented the use of automatic milk feeders (**AMF**) for rearing calves on dairy farms (Vasseur et al., 2010; Jorgensen et al., 2017; Medrano-Galarza et al., 2017). Several questions exist about how best to manage the systems to optimize calves' adaption to them, and so promote health, growth, and labor efficiencies. Calves typically spend a period of time housed individually before moving to group housing with the AMF, and need to adjust to new social and physical environments.

Fujiwara et al. (2014) investigated whether keeping calves in pairs versus individual housing before introduction to the group pen, 6 d after birth, was associated with adaption to AMF. Overall, those authors found no difference between individually or pair-housed calves. However, only 27% of all calves drank voluntarily from the feeder within 24 h and a general decline in milk intake was noted for the first few days after introduction to the group pen, with only 69% of calves consuming milk on their first voluntary visit to the AMF. This adaption period, with the decreased milk intake as well as the stress of joining a new social group, could potentially put calves at risk for health issues (de Passillé et al., 2014). Jensen (2007) also found that calves introduced

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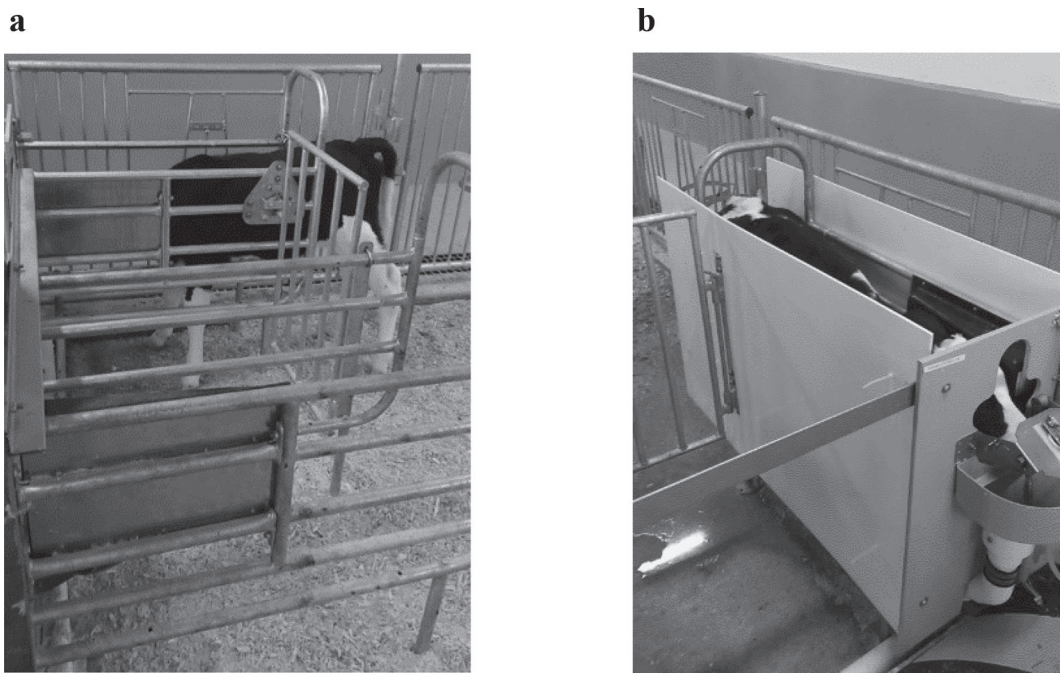


**Figure 1**. Photo of automated milk feeders (AMF) with (a) steel bar sides and (b) solid sides made of plastic. Photos were taken at the University of Guelph Dairy Research and Innovation Facility, Elora, Ontario, Canada.

at a younger age of 6 compared with 14 d required more assistance and had greater difficulty adapting to the AMF after introduction. However, a recent study by Abdelfattah et al. (2018) did not find cortisol changes related to age at grouping despite behavior differences between calves grouped at various ages (e.g., differences in cross-sucking behavior, displacements at the feeder, vocalizing); therefore, minimizing the time it takes for calves to adapt may help improve their welfare.

It is possible that some physical features of AMF may also have an influence on calf adaption to them. Physical differences exist between the design of the automated feeders that are commercially available (e.g., DeLaval, 2016; Lely, 2016). These include the placement and position of the teat within the feeder and whether calves have to flip it upwards to drink (e.g., DeLaval Inc., Tumba, Sweden), the construction material and size of the stall, and in some cases the feeder may be installed on a different floor level than the group pen, requiring calves to step up when entering the feeder. None of these features, to our knowledge, have been investigated to determine whether they affect calves learning to use the feeder. Commonly used stall designs include a steel bar style (see Figure 1a), which permits calves visual contact with the group while they feed. Another is a solid side style (see Figure 1b), where calves are unable to see in or out of the feeder stall. Researchers have previously demonstrated that competitive behavior in dairy calves is reduced by using longer stall wall lengths (Jensen et al., 2008) as well as when using a closing gate at the rear of the feeding stall (Weber and Wechsler, 2001). We aimed to investigate whether type of stall would affect behavior other than just competitive behavior of calves, but if it might affect how quickly they adapt to this type of feeding system. Previous research suggests calves learn better when they are housed with other calves (Costa et al., 2014; Miller-Cushon and DeVries, 2016) and, by applying learning theory (Gleitman et al., 2011), that calves learn by observing one another; thus, it seems plausible that calves may learn to use an AMF better when they can see other calves using it.

The objective of our study was to compare the influence of 2 different AMF stall wall designs on how quickly calves learned to use the feeder. We hypothesized that calves trained on the steel bar stall feeder would adapt more quickly because they are able to see other calves using the feeder.

## MATERIALS AND METHODS

### *Animals, Housing, and Feeding*

A total of 147 calves (80 male and 67 female) were enrolled in the study and trained on the AMF. Calves were enrolled if they were able to stand and drink from