**Open or nipple bucket feeding performance and behavior of dairy calves**

**Al Kertz, PhD, DIPL ACAN**
**ANDHIL LLC**
**St. Louis, MO 63122**
**andhil@swbell.net**
**www.andhil.com**

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There have been on-going debates as to whether dairy calves should be fed their milk/milk replacer (MR) by nipple or open buckets. The comparison could be nipple bottle versus open bucket or nipple bucket versus open bucket. In the latter, the comparison is more direct and does not involve bottle versus bucket.

The last USDA/NAHMS study (USDA, 2016; for other NAHMS data see Chapter 1 Kertz 2019), found 72.3% of operations used buckets and 58.8% of dairy heifer calves were liquid-fed via buckets. The most used method to feed the liquid diet in Brazil was the open bucket in 71% of the operations (Santos and Bittar, 2015). This study (Silva et al., 2025) was designed to compare open bucket versus nipple bucket to feed milk. It was done at the University of Sao Paulo calf research facility in Piracicaba in Brazil.

After colostrum was provided, calves were randomly assigned to either

- (1) open bucket: bucket with a diameter of 27 cm and a volume capacity of 10 L (n = 15), or (2) nipple bucket: a commercial model of nipple bucket (n = 15).
- Calves were fed 6 L/day of whole milk, divided into 2 meals (0700 and 1700 hours) with no refusals to record.
- Calves were gradually weaned from 56 to 60 days of age by reducing 1 L of milk per day with no data or sample collection conducted during this period.
- Calves were individually housed in wood hutches (1.35 meters height, 1 meter width, and 1.45 meters depth) and tethered by chain (2 meters long), allowing an area for walking but no physical contact with other calves. Hutches were distributed in a trimmed grassy field and moved daily.
- Free access to clean water was provided throughout the study in individual buckets. Calves had free access to a pelleted calf starter (87.4% DM, 25.4% CP, 5.9% ether extract, 14.7% NDF, 45.4% NFC), with delivery just after the morning milk feeding.

Behavior was observed weekly from 2 to 8 weeks of age.

- Direct observations were conducted for 4 hours just after the morning feeding (at 0700 hours) with 5-minute intervals for a total observation time of 28 hours per calf.
- Speed of liquid intake was timed once a week from the initial moment the animal had contact with the nipple or open bucket with the milk until the entire volume was consumed or when the animal no longer showed interest in the feed. Two observers were responsible for the observation of behavior.

**Table 1.** Performance and other significant measurements of calves fed either with open bucket or nipple bucket.

| Item | Open bucket | Nipple bucket |
|---|---|---|
| **Initial body weight, lb** | 83.7 | 81.5 |
| **Final body weight, lb** | 155.1 | 151.1 |
| **Average daily gain, lb/day** | 1.34 | 1.33 |
| **Starter intake, lb/day** | 0.70 | 0.47 |
| **Milk intake speed, minutes/3 L** | 1.86 | 5.33 |
| **Total dry matter intake, lb/day** | 2.36 | 2.12 |
| **Withers height, inches** | 32.2 | 31.8 |
| **Fecal score** | 1.85 | 1.59 |
| **Blood glucose, mg/dL** | 121.1 | 131.5 |

- Body weights and average daily gain did not differ between treatments.
- Starter intake was greater ($P < 0.009$) for open versus nipple bucket-fed calves.
- Milk intake speed was much faster ($P<0.001$) for open bucket versus nipple bucket fed calves **(Figure 1)**, and total dry matter intake was also greater ($P<0.009$) for open bucket versus nipple bucket fed calves reflecting differences in starter intake (**Figure 2).** Authors attributed this to calves still wanting to suckle after drinking their milk so fast, so they ate more starter instead.
- Withers height did not differ between treatments.
- Greater ($P < 0.015$) fecal score for open bucket fed calves reflected more moisture in feces.
- Greater blood glucose ($P < 0.079$) at 2 hours post feeding may have reflected that calves on the nipple bucket finished their milk consumption slower and later.

**Figure 1.**

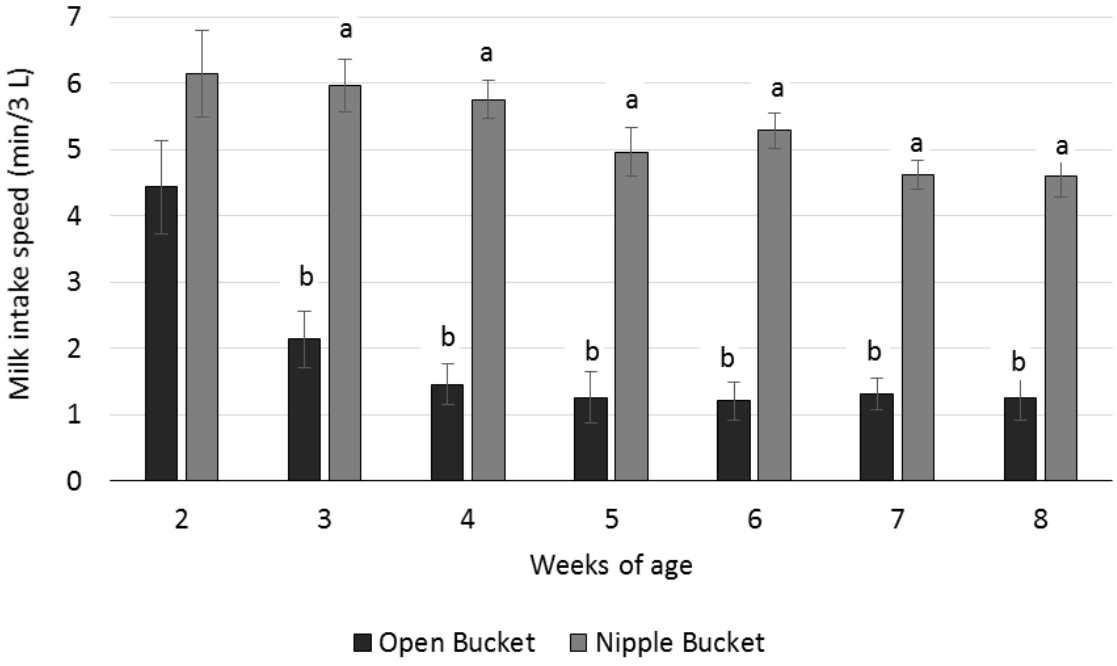


**Figure 2**. Starter intake over weeks on trial for calves fed milk in open or nipple buckets.

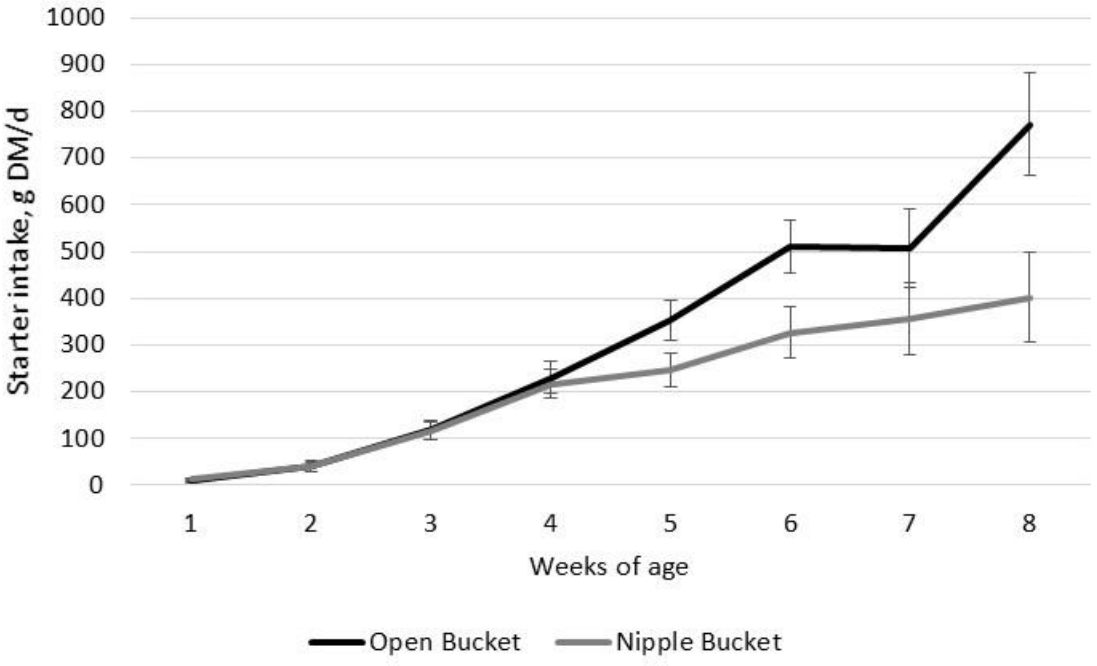


**Table 2.** Time spent by dairy calves for open versus nipple bucket for

behaviors during 4 hours of observation (0700 to 1100 hours) for weeks 2 to 8.

| Item, minutes | Open bucket | Nipple bucket |
|---|---|---|
| **Eating starter** | 3.71 | 1.92 |
| **Consuming milk** | 4.37 | 7.01 |
| **Ruminating** | 1.65 | 1.20 |

- Open bucket fed calves spent more time eating ($P < 0.001$) than nipple bucket fed calves. This follows as they also ate more starter **(Table 1).**
- Calves spent more time drinking milk ($P < 0.001$) when fed milk by nipple versus open bucket.
- Calves spent more time ruminating ($P < 0.331$) when fed milk by bucket versus nipple bucket. But they only spent 1.65 minutes per 4 hours which is only about 0.7% of that time. By comparison, Porter et al., (2007) found that calves fed a pelleted starter versus a well-texturized starter ruminated 8.7% versus 21.0% of the time.

**Figure 3.**

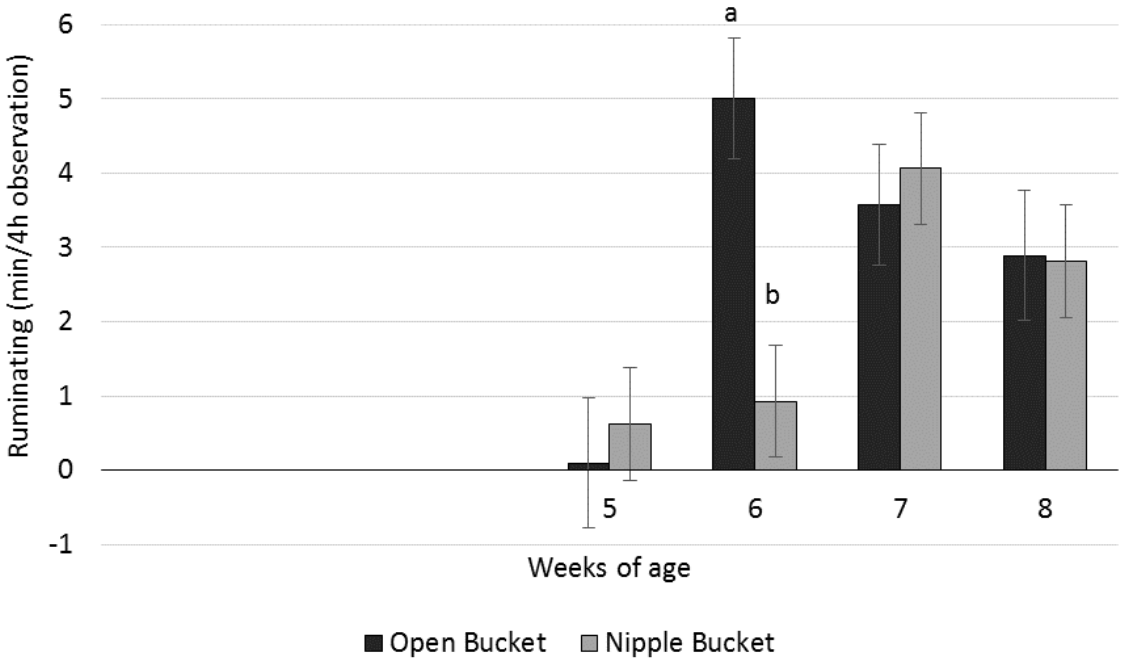

**Figure 3.** shows essentially no calves ruminating before 5 weeks of age due to feeding an all-pelleted starter. The increased ruminating at age 5 weeks, and especially in week 6 with the calves fed milk in open buckets, reflects starter intake in **Figure 2**.

After week 5, calves spent an average of 4 minutes daily ruminating which is an average of 1.7% of the time. This is still quite low and reflects that a pelleted starter results in little ruminating. This information and **Figures 1 and 3** were kindly provided by Dr. Carla Bittar who also created **Figure 2** when I requested that information.

**The Bottom Line**

Rate of drinking milk was slower for calves fed in nipple versus open buckets. But calves fed in the open buckets also ate more starter with no differences in weight gain. On both treatments, there was little ruminating before 5 weeks of age, and still little ruminating with more starter intake. This reflects that pelleted starters result in limited ruminating time. It would have been beneficial to have had a 2-week post weaning period to determine if there were any carryover effects from preweaning treatments (Kertz 2025).

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