



Low-Moisture Molasses Tubs A Limit-Fed Creep Feeding Opportunity for Pre-weaned Calves

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An important goal of our research program is to discover solutions that correct mineral deficiencies in Florida beef calves prior to weaning. Our research, and the research of others, has shown that calves are often deficient or marginally adequate in copper and most often deficient in selenium at the time of weaning. Although calves are almost always born adequate in these essential minerals, their tissue stores decrease steadily over the pre-weaning period. This is due to several impacting factors, such as, (1) Florida forages are commonly deficient in copper and selenium, (2) milk is a poor source of these minerals, (3) calves consume inadequate amounts of free-choice, salt-based mineral supplements, and (4) antagonists (i.e. sulfur and molybdenum) are often present in Florida's forages. Deficiencies in copper and selenium can be problematic, particularly at the time of weaning. Weaning is one of the most stressful events that a calf will encounter throughout its lifetime and further trace mineral loss is a consequence of that stress. Thus, if calves are marginally adequate at weaning, they will almost certainly experience deficiency shortly after weaning due to increased losses of copper and selenium as a result of the normal, temporary stress response of cow and calf separation. Other normal calf management practices, which often accompany weaning, can exasperate the problem. Castration, vaccination, transportation, and commingling also contribute to stress and trace mineral loss. Because copper and selenium are essential minerals supporting the immune system, deficiencies at weaning can make calves are more susceptible to disease during this critical transition period.

Mineral fortification of creep feed is one logical method to address this problem. Unfortunately, many studies have confirmed that the efficiency of added body weight gain among creep-fed calves is poor, in fact, the poorest of all phases of the beef production system. For this reason, we have focused on the concept of "limit-fed" creep feeding, which aims to deliver a concentrated package of trace minerals in a small daily intake of creep feed (i.e. < 0.25 lb/day). In our first study, we discovered that calves had a strong aversion to consumption of mineral-concentrated creep feed, which did not exist in calves consuming the same supplement without mineral fortification. We hypothesized that the sulfate sources of minerals, particularly copper and zinc, were disassociating in the calves' mouths, causing a taste aversion, such as a person might experience with a metallic taste experience. This hypothesis is supported by the highly soluble nature of copper and zinc sulfate. Visual observation of the calves' reactions as

they attempted to consume the supplements also supported our hypothesis. In further studies, we confirmed this hypothesis by correcting the intake aversion through replacement of soluble sources of copper and zinc (i.e. sulfate and organic) with lesser soluble sources (i.e. hydroxychloride). The results of these studies are more specifically outlined in another Ona Report ([November, 2014](#)). Further studies discovered that the copper and selenium status of pre-weaned calves are improved by consumption of trace mineral-fortified limit-fed creep and these calves have improved measures of immunity in the critical post-weaning transition period.

Our team was pleased with the results of these initial research efforts. Multiple notable findings were achieved, including, (1) a formulation for a calf creep-feed that optimized free-choice intake, (2) improved efficiency of gain due to low daily intake, (3) ensured mineral adequacy at weaning, and (4) improved measures of post-weaning immune competence. The problem, however, was practicality of the system. For the management system to work, cattle producers must commit to hand-feeding calves within cow exclusion areas daily, or at least every other day for 60 to 90 days prior to weaning. This labor intensive requirement greatly restricts producer implementation, despite the evidence of efficacy. With this constraint in mind, our team sought to evaluate a self-limiting supplementation option with a similar positive outcome, but with less daily labor requirements.

Low-moisture molasses tubs are a common form of supplementation for the cowherd. Free-choice intake is limited by the physical structure of the supplement. Typically, adult cattle will consume an average of 1 to 3 lb daily. In our next experiments, we sought to evaluate this self-limiting supplementation option in our pre-weaned calf experiments. Our first study evaluated different sources of copper, zinc, and manganese, similar to our initial studies using loose grain mixtures. These results largely mirrored our initial findings, in that calves preferred formulations that included the lesser soluble forms of these elements (i.e. hydroxychloride) versus more soluble options (i.e. sulfate and organic).

In the next study, we applied the low-moisture molasses block supplementation system into a 90-day pre-weaning experimental model. Here, mineral fortification of molasses tubs slightly impacted voluntary supplement consumption. Overall average supplement intake was greater among calves consuming Control vs. Fortified treatments (average intake = 0.78 and 0.47 lb per calf daily). Block intake changed over time. The first week's average daily intake averaged 0.33 lb per calf. Daily intake peaked at week 5 of supplementation at 1.03 lb per calf daily and decreased gradually with the final week's intake of 0.64 lb per calf daily. Although calves consuming molasses tub supplements without mineral fortification had greater intake, no differences were observed for pre- and post-weaning calf performance (Table 1).

In summary, solutions to solve copper and selenium deficiency of Florida beef calves at the time of weaning have been discovered. Key elements of these research findings include, (1) creep feed formulations that correct calf intake aversion, (2) low intake improves efficiency of gain associated with traditional creep feeding, and (3) self-limiting supplementation options, such as low-moisture molasses tubs, resolve labor issues previously impacting implementation. Further adoption of this management system will occur through creation of new products by innovative feed companies and continued education of cow/calf producers on the value of calf

mineral adequacy at the time of weaning.

Table 1. Effect of mineral fortification of self-limited creep supplement on pre- and post-weaning calf performance.

Item	Control	Fortified	SEM
	----- lb -----		
Initial BW	409	398	8.3
Weaning BW	566	556	9.1
Pre-weaning ADG	1.76	1.79	0.079
Post-weaning BW, d 15	551	534	11.3
15 d post-weaning ADG	-1.23	-1.60	0.543
Final BW	580	569	11.3
d 15 to 30 post-weaning ADG	1.07	1.24	0.260
Overall post-weaning ADG	0.38	0.43	0.255

Treatments (Control or Fortified with minerals) consisted of low-moisture, molasses tubs provided to calves in cow-exclusion areas for approximately 90 days prior to weaning (see photo).



Photo Caption: Low-moisture molasses tubs offer a self-limiting creep feeding application that is effective in delivering essential trace minerals to pre-weaned beef calves with minimal labor.

If you have any questions please contact me at jarth@ufl.edu.