

# Hypocalcemia in our Metabolic Athletes:



To quote [Dr. Oetzel](#) from this year's ACVIM Forum, "Cows are metabolic athletes!" Investigators are still trying to understand with 100% certainty the complexity of calcium metabolism during lactation. The calcium outflow during early lactation is huge at 3.4 times maintenance. The demand for calcium equates to 76 grams (grams not milligrams!) of calcium per day. Your regular strength tums tablet is only 200 mg of elemental calcium. Just before calving 10 grams a day goes into the development of the fetal skeleton and about 30 grams is going into the colostrum. Inevitably cows must draw on bone calcium in order to survive this metabolic feat.

The average milking cow will lose about **1.1 kilograms** of calcium from the 9.5 kg of available skeletal calcium in the first 30 days! This results in expected lactational osteoporosis

Many second or later lactation cows will develop subclinical hypocalcemia that resolves after day 4 of calving. While about 4% will develop clinical hypocalcemia otherwise known as Milk Fever. This can be result from delayed hypocalcemia (most often due to concurrent disease such as metritis or mastitis) or persistent hypocalcemia due to primary causes. As with any disease prevention is better than treatment however Dr. Oetzel notes even with the best programs subclinical and clinical hypocalcemia will occur. Oral calcium is preferred and safer than IV calcium when a suspected hypocalcemic cow is still standing. Similarly oral calcium is preferred as part of preventing a hypocalcemic relapse post IV calcium therapy.



There are 3 stages of clinical Milk Fever.

Stage 1 is often missed as it is short lived prior to the onset of recumbency. In this short window of approximately 1 hour keen personnel will notice "**dancing cows**" due to wobbliness, weight shifting or shuffling of the hind feet +/- transient hyperexcitability.

Stage	Clinical Signs	Physical Examination
<p><b>1</b> Duration = 1 hour Treatment = oral calcium</p>	<p><b>Wobbly, Weight shifting, Weak, Dull, Transient Hypersensitivity</b></p>	<p><b>Cold ears +/-extremities.</b> Slight tachycardia (80-90 bpm) Slight hyperthermia due to <b>increased activity</b> <b>Triceps - fine muscle tremors</b></p>
<p><b>2</b> Duration 1-12 hours Treatment= IV calcium</p>	<p><b>Sternal Recumbency</b> Neck may be extended with an S curve or tucked into flank. Fine muscle tremors</p>	<p><b>Rapid Heart Rate</b> 90-120 bpm Decreased intensity to heart sounds. <b>Cold extremities.</b> Low rectal temperature, <b>Loss of anal tone GI signs</b> (atony, mild bloat, constipation), <b>Dilated pupils</b> unresponsive to light</p>
<p><b>3</b> Death within a few hours without IV calcium treatment</p>	<p><b>Lateral recumbency</b> Loss of consciousness to coma</p>	<p><b>Mild to Severe Bloat</b> <b>Very weak rapid heart rate</b> over 120 bpm</p>

Toxemia due to metritis or mastitis is an important differential diagnosis for an early post-partem cow in sternal recumbency as they are very vulnerable to cardiac toxicity if given IV calcium.

Milk Fever Clinical Stage	Range of Expected Serum Calcium (note they do not always read the textbook)
Stage 1	5.5 to 8.6 mg/dl or <b>1.37 to 2.15 mmol/L</b>
Stage 2	3.5 to 6.5 mg/dl or <b>.87 to 1.62 mmol/L</b>
Stage 3	As low as 1.0 mg/dl or <b>.25mmol/L</b>
<b>Cardiac Toxicity</b> (Increased risk along with acidosis due to high IV calcium doses)	24 mg/dl or <b>5.99 mmol/L</b> is approaching 28-32 mg/dl or <b>6.99 to 7.99 mmol/L</b> is certainly <b>fatal</b>

A stress leukon and hyperglycemia is expected due to high serum cortisol and impaired insulin secretion. Hypophosphatemia is common however Dr. Oetzel notes this usually responds spontaneously except in a controversial 5% of recumbent lactation cows when it may be responsible for ongoing recumbency. Hypomagnesemia is a risk factor for hypocalcemia but in clinical cases of milk fever it is expected to go up due to the effect of parathyroid hormone at the level of the tubules. Ideally blood would be **collected on day 1/Pre-Treatment** and **submitted if there was no response to the initial single bottle of IV calcium** therapy. If the cow responds then the pre-treatment sample can be discarded.

References:  
Oetzel Garrett R. Hypocalcemia in Dairy Cattle. University of Wisconsin-Madison, In ACVIM Forum 2023 Proceedings. Philadelphia, USA.

McArt JAA, Oetzel GR. Considerations in the Diagnosis and Treatment of Early Lactation Calcium Disturbances. Vet Clin North Am Food Anim Pract. 2023 Jul;39(2):241-259. doi: 10.1016/j.cvfa.2023.02.009. Epub 2023 Apr 7. PMID: 37032301.

