Manganese in California

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Manganese not magnesium

  - Manganese = reproduction
  - Magnesium = grass tetany
- Manganese absorption can be as high as 17%, but retention may actually be as low as 2% (Grace, 1975)
- Absorption is not increased with deficiency (Keen et al., 1987)
- Plus copper and zinc are antagonists

Manganese deficiency

- Abortion
- Altered estrus
- Seminal tubular degradation
- Small birth weight
- Limb and spinal deformities
- Increased services per conception
- Weakness
- Incoordination

Correction

- Cattle supplemented with manganese (Hansen et al., 2005, etc.)
  - Did not have better weight gain
  - Did show increased reproductive performance
  - Deficient cows had higher incidences of calves with skeletal problems

Is this a problem here?

How?

- Manganese is different
  - A liver biopsy does not reflect the diet
    - The heart is most accurate
  - Liver removes it readily from plasma
    - Thus levels can fluctuate with plasma testing
  - Levels vary between whole blood, plasma, and serum
  - Serum fluctuates the least
    - Thus it is our choice

Serum collection

Critical levels

- Essentially fed different diets and looked at the signs to develop this set
  - 0-5 ppb = deficient
  - 5-6 ppb = marginal
  - 6-70 ppb = adequate

Sampling

- Sampled 11 Counties in CA
- 10 samples from each herd
  - Whole blood Selenium
  - Serum trace element screen
  - Serum manganese

County	Head/County	Region	Head/Region
San Joaquin	40	Central	120
San Benito	50	Central	
Alameda	30	Central	
Siskiyou	40	Intermountain	70
Shasta	50/30	Northern foothills/Intermountain[a]	230
Humboldt	30	Northern foothills	
Yuba	10	Northern foothills	
Tehama	90	Northern foothills	
Colusa	20	Northern foothills	
Glenn	30	Northern foothills	
Inyo	10	Southern	135[b]
Los Angeles	10	Southern	
Ventura	40	Southern	
Santa Barbara	75	Southern	
Total 555			
[a]The higher elevations of Eastern Shasta County were counted as intermountain			
[b]In Southern California 73 head were not sampled for manganese due to funding depletion			

Percentage of whole blood and serum samples below adequate levels

		Intermountain	Nothern foothills	Central	Southern	Statewide
Mineral	Adequate level[1]	% below critical level				
Selenium	0.08 mg/ml	3%	4%	28%	2%	12%
Copper	0.8 mg/ml	1%	13%	31%	55%	28%
Zinc	0.8 mg/ml	47%	35%	23%	40%	36%
Magnesium	18 mg/ml	9%	3%	11%	7%	7%
Manganese	6 ng/ml	96%	90%	92%	97%	92%
Calcium	80 mg/ml	0%	1%	0%	3%	2%
Phosphorus	45 mg/ml	23%	11%	3%	4%	9%
Iron	1.3 mg/ml	34%	33%	62%	65%	52%
Potasium	3.9 mg/ml	9%	18%	9%	18%	16%
Sodium	135 mg/ml	0%	8%	15%	9%	10%

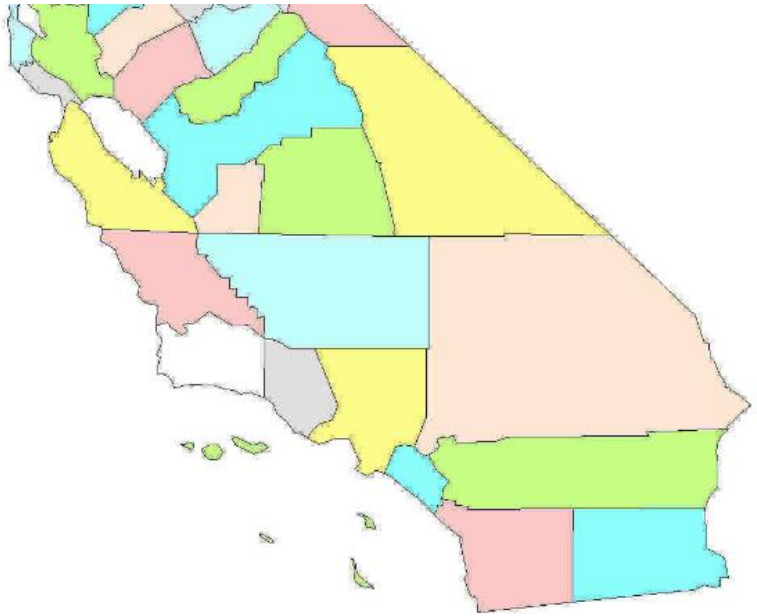
[1]Adapted from: Puls, 1988; Wikse et al., 1992; Dargatz and Ross, 1996; kinkaid, 2000; and based on the recommendations of CAHFS UC Davis

Percentage of manganese serum levels below potentially differing critical levels

	Intermountain	Nothern foothills	Central	Southern	Statewide
Critical level	% below potential critical level				
6 ppb	96%	90%	92%	97%	92%
5 ppb	94%	85%	86%	97%	88%
3.5 ppb	81%	69%	76%	95%	77%
2.5 ppb	40%	42%	58%	74%	52%

Mineral Project

- http://animalsciencey.ucdavis.edu/extension/mineralproject/



Summary

- Most cows look good for Se, Mg, and Cu. The mineral programs are working
  - Cu levels are low as you go south
- Zinc levels likely need to be increased >5,000 ppm
- Manganese is almost always deficient
  - Differing supplement levels indicate it may take as high as 1% to have adequate serum levels.

Summary

- Calcium, phosphorus, and potassium good
- Remember that correct sampling is very important!
- We may be tying up our manganese
  - Copper and zinc
- We are looking into trials that feature correction of manganese levels

Thank you

- Thank you to the Rustici Range Research Endowment