## Importance of minerals in ruminant nutrition

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#### Introduction

- Farm Animal Vet
- Veterinary Christian Fellowship
- Lake District
- Production Medicine
- Livestock Development Consultancy



#### Importance of Minerals

- The least likely reason for a problem
- Macro nutrients are more important
- Water access is more important
- Fermentation is more important
- Transition cow management is more important



#### What is the important level?

- Cost of analysis and type of analysis
- Measuring the level of minerals in the feed not the diet
- As Fed (AF) (Fresh matter) vs Dry matter (DM)
- Fodder levels vary
  - Geology, age of plant, fertilisation, weather,
- Levels for US or Europe- extrapolated to tropics

#### Five diets of Dairy Cows

- Analysed basis
- The formulated diet
- The fed diet
- The food that is eaten (Sorting)
- The fermented diet



# What is important level in the cow?

- Absorption will vary depending on bio availability
- Absorption will vary depending on the interactions with other minerals and proteins in the feed
- Measurement in serum
- Most minerals homeostatically controlled
- Liver levels may be more accurate
- Enzymes often used as markers of mineral status



#### Ranges -not absolute

- Deficient: levels at which clinical or pathological signs of deficiency should be apparent in some individuals.
- Marginal: levels at which subclinical effects may prevail, such as reduced immune response, or reduced growth rate or fertility.
- Adequate: levels sufficient for optimum functioning of all body mechanisms with a small margin of reserve to counteract commonly encountered antagonistic conditions.
- High: levels elevated well above normal but not necessarily toxic.
- Toxic: levels at which subclinical, clinical or pathological signs of toxicity would be expected to occur.

#### Production Problems

- Absolute deficiency causing illness is rare
- Normally reduced production/fertility or more susceptible to other problems
- Difficult to assess in individuals /small groups of animals
- Response to supplementation



#### Over to you

- Group of fattening bullocks
- Been scoured 1 month and treated Ivermectin/Closantel
- Rough coated, not growing, poor doers
- What questions do you have? What are you going to do?



### Copper

- Levels low in fast growing pasture
- Supplemented in concentrates
- Antagonism in absorption Mb, S or Fe
- Coat depigmentation-spectacles
- Diarrhoea/Immune suppression / PGE
- Delayed oestreus/silent heats/ reduced oestreus behaviour





- Reserves in liver
- Blood shows immediate level
- Easy to over or under supplement

#### Over to you

• Dairy farmer 25 cows has had several still births over past few weeks.

#### Selenium/Vit E

- Prevent damage from Free radicals
- White muscle disease /Cardiac striation
- Immunosuppression
- Still birth/ weakly calves/ Increased calf morbidity and mortality
- Increased retained placenta

#### Selenium/Vet E

- High levels of Vit E may reduce requirement for Selenium
- Hay and stored young grass low in Vit E
- Treatment clinical cases by injection



#### Cobalt

- Usually seen in sheep/goats
- Geographical
- Required for B12 production in rumen
- Reduced appetite and growth
- Immunosuppression, increase in infections
- Increase in number of poor doers

- Treatment- Injection Vit B12
- Prevention by inclusion of Cobalt in diet
- Improvement of rumen function beyond Vit B12



#### Iodine

- Required for thyroid hormones
- Can be secondary to Selenium defy or brassica or legume diet
- Retained placenta, still born weak calves
- Decreased production
- Immuno suppression

- Treatment by adding Iodine to diet
- Correcting Brassica or other mineral intake
- Potassium Iodide to water in large herds
- 15g per 100 cows three times a week
- Small groups make up solution and add to feed

#### Boluses



- Quality assurance. the dilution and counterfeiting of veterinary products is commonplace. The bolus technology is difficult to counterfeit.
- Bioavailability- The supplements are of known provenance and bio availability. Many mineral supplements, even if assured of the mineral levels can have poor bioavailability.
- Single dose. Bolus application can be given during the last trimester and lasts 180 days. This will supplement the peri natal calf and through until the cow is back in calf 3-4 months post calving.
- Compliance. As it is given in a single dose there is no need to give daily feed or supplement.

#### Mineral Supplements



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- Cheap
- Easy to use
- Variable quality



### Over to you

• What is your differential diagnosis?



#### Treatment



• I/V Calcium/Mg/P

#### Prevention Ca/P/Mg

- All interlinked
- Not absolute deficiency
- Failure of absorption/change in diet/change in requirement (calcium requirements triple at calving)
- Supplement Magnesium
- Dietary Cation Anion Balance-Decab

#### Prevention Decab

- Acid Base status effects the Calcium hormone system
- Increase anions (Chloride and Sulphate)
  Decrease cations (Potassium and Sodium)
- Acidify the cows acid base system- 70-80g Magnesium Chloride /cow/day

#### Small herd

- Scandi System
- LOW Calcium in diet precalving
- High dietary Calcium at calving

#### Conclusion

- Diagnosis in a group can only be by lab diagnosis of multiple animals
- Diets can indicate possible deficiency
- In UK over 5,000 forage mineral analyses are undertaken each year, with over 10,000 cattle samples analysed for nutritional status
- Prevention by bolus
- Over supplementation is common

#### Boundary values (parts per billion) of trace minerals for blood serum in dairy cows

	Mineral										
		Со		Cu		Мо		Se		I	
		Lower Limit (ppb)	Upper Limit (ppb)								
	Deficient	LOD	0.70	LOD	550	LOD	10.00	2	25	10	50
L e v e	Deficient to Marginal							25	30	50	80
	Marginal	0.70	0.90	550	599	10 188		30	80	80	100
	Adequate	0.90	15	600	1500	10	100	80	300	100	400
	High	15	3000	>1500	and all	>100		300	3500	700	3000
Ι	Toxic	3000					and all	>3500		>3000	25000



#### Example from Sri Lanka