FutureBeef

How do we identify and evaluate P deficiency?

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A joint initiative of:

Queensland Government | Northern Territory Government | Department of Agriculture and Food, Government of Western Australia | mla Meat & Livestock Australia

Diagnosis of P deficiency in grazing cattle

Usually we want to evaluate:

- If a specific mob/paddock is P deficient
- If the cattle will respond to P supplements

Diagnosis of P deficiency in grazing cattle
Our knowledge is limited!

Two aspects to P deficiency:

1) Whether the P intake is sufficient to meet current needs
2) The P status of the animal (amount of P in body reserves which can be mobilized)

(This is similar to breeders using body condition reserves in the dry season)

- Therefore need to estimate both:
  - (i) diet P, and
  - (ii) amount of P in body reserves which can be mobilized
- Low dietary P → reduced pasture intake (decrease by 10 - 30%)

Voluntary feed intake seems to decrease when blood P is < about 1 mmol/L

Aiming to maintain maximum voluntary feed intake if possible

Diagnosis of P deficiency in grazing cattle

Options of increasing complexity

1) Observation, cattle behaviour, experience, history
2) Soil
3) Pastures
4) Faeces
5) Blood
6) Bone (research only)

Diagnosis of Phosphorus deficiency

Bone chewing (depraved appetite)

- Chewing bones and sometimes carcasses
- Chewing / licking sticks, stones, soil and rubbish
- Excellent research from Africa *ca.* 100 years ago linked bone-chewing to severe P deficiency
- Often leads to botulism deaths in unvaccinated cattle

Recent research has shown that bone chewing is a learned response – not innate (hard-wired)

Diagnosis of Phosphorus deficiency

Bone abnormalities

- "Peg-leg". Abnormal walking – particularly in young cows and low-rainfall years.
- Weak bones e.g. breaking bones (necks, hips) when handling cattle in crush
- Weak and soft bone at slaughter / post-mortem
- Strong evidence that there is a serious nutritional problem

Diagnosis of Phosphorus deficiency

Other ways to assess whether there is a P deficiency

- What is known of the soil fertility and of soil P?
- Mapping & Vegetation?
- What are the memories from before anyone fed P supplements?
- What happens when supplements are fed?

Diagnosis of Phosphorus deficiency

Cattle performance

- How does cattle growth, mortality and reproduction compare between paddocks and properties?
  - Low dietary P → reduced pasture intake (10 – 30%)
  - Reduced growth rate (30 – 50 kg LW per annum)
  - Reduced fertility, milk & calf growth

Which is the primary limiting nutrient? – P or protein or energy?

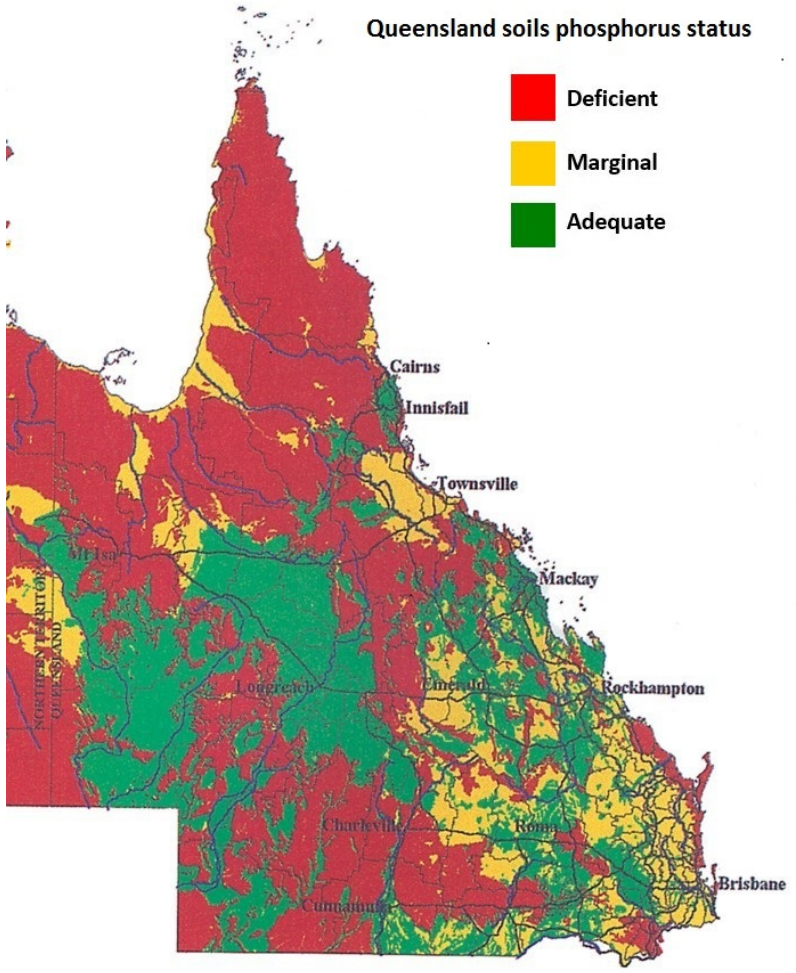
Management changes have reduced the impact of P deficiency

- **Two rounds of weaning and earlier weaning to reduce lactation demands**
- **Supplementation**

Soil analyses for diagnosis of Phosphorus deficiency

Most valuable if there are large areas of a few soil types

- Soil P is often not uniform even within the same soil type
- Paddocks often contain a mix of soil types
- Be careful with the analysis method for soil test
  - Colwell bicarbonate extracted P is recommended
  - The availability of soil P can vary with soil pH



Categories for soil P concentration

- **Acutely deficient 2-3 ppm**
- **Deficient 4-5 ppm**
- **Marginal 6-8 ppm**
- **Adequate >8 ppm**

Pasture analyses for diagnosis of P deficiency

Pasture P is a general guide (like soil testing)

- Problems: - pasture P is not uniform
- P content differs substantially between plant species and parts of the plant
- Cattle are very selective in their grazing
  - Between land types
  - Between plants
  - Between plant parts

Categories for pasture P concentration

- **Acutely deficient** **< 0.5 g P/kg DM**
- **Deficient** **0.5 – 1.0 g P/kg DM**
- **Marginal** **1.0 – 1.5 g P/kg DM**
- **Adequate** **> 2.0 g P/kg DM**

Faecal analyses to estimate diet P, energy and protein

- Diet digestibility and diet protein can be estimated from faecal NIRS
- Faecal NIRS does not measure diet P
- Faecal P can be measured by conventional chemistry
- Faecal P has been used to estimate diet P

Faecal analyses to estimate diet P, energy and protein

- Research indicates that in cattle grazing tropical pastures (No P supplement, No concentrate supplement) the diet P concentration in the late wet season can be estimated reasonably from P concentration in faeces
- Estimates of diet P concentration from faecal P concentration may be incorrect because of bone P mobilisation/replenishment
- The amount of diet P needed depends on the protein and energy levels in the diet
- Faecal P/diet ME ratio is discussed in the 2012 Producer Manual as an indicator of dietary P status. However recent research has indicated this ratio is not always a satisfactory indicator.
- Need to apply estimation of diet P from faeces with caution

Blood samples

“Blood P (also called PIP, plasma inorganic phosphorus) is the best diagnostic in growing cattle“

This is based on results from major phosphorus projects with growing cattle (1990) across northern Australia:

- Conclusion was that blood P at the end of the pasture growing season successfully diagnosed P deficiency in 90-100% of cases in growing cattle

- BUT there have been problems applying this to breeders

The ‘P-screen’ test

Developed in early 1990’s:

- The best test for growing cattle
- Uses measurements of blood P and faecal nitrogen (to estimate diet quality)
- Depends on sampling in mid to late wet season after cattle have been grazing the paddock for several months
- Test animals cannot be fed P supplements through the wet season
- Other factors can influence blood P (e.g. lactation in breeders, age, stress)
- Sampling kits and laboratory analysis available from DAF

The ‘P-screen’ test

Applying the test to breeder cows?

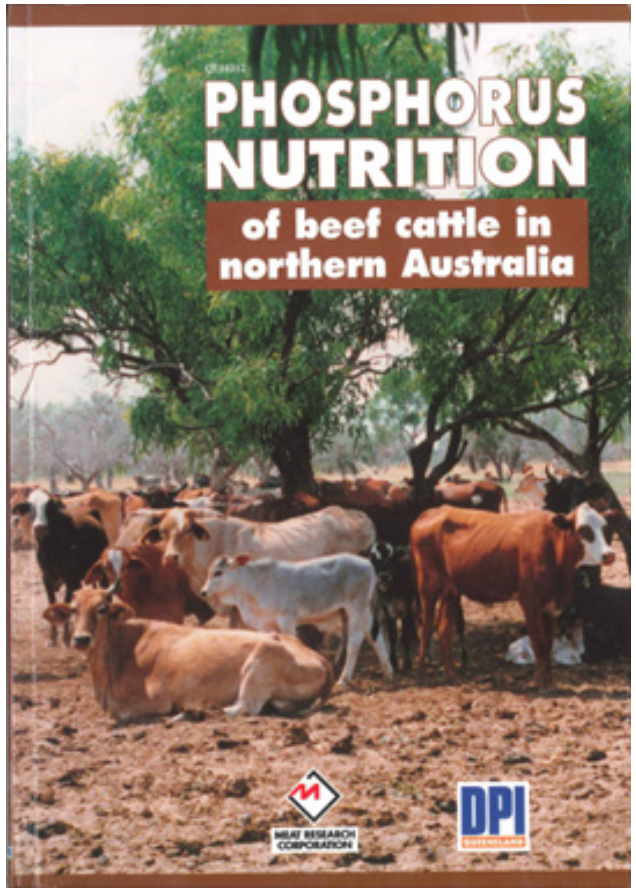
- Depends on testing monitor group of young growing cattle in the breeder mob
- Assessing the mob/paddock on the basis of the status of the growing cattle
- But lactating cows can still produce good weaners with lower blood P than needed by growing cattle. (Due to mobilization from body P reserves)

Future developments

- Using Faecal NIRS (for diet quality) as well as blood measures
- Research is aiming to develop extra blood markers to assess P mobilisation/replenishment

Thank you

For further information



Two excellent producer books

FutureBeef website:
https://futurebeef.com.au/?s=phosphorus