Parathyroid hormone response to long-term phosphorus supplementation in steers


Late Wet / Early Dry Season

Common indicators of P deficiency/status:

- **Plasma inorganic P (PiP)**
  - short term, non-robust in range-land conditions

- **Faecal P:ME**
  - short term, debatable thresholds

- **Rib cortical thickness**
  - Bone is the major reservoir of P that can be mobilised to meet dietary short-falls in P requirement
  - Bone reserve = long-term P status
  - Biopsy = invasive
Objective

To search for a less-invasive marker of “P status” than a bone biopsy by considering the endocrinology that underpins bone metabolism
Method

• Thirty *Bos indicus* cross weaner steers, individually fed *ad libitum*

• Five levels of dietary P, 6 steers per level, P1-P5: 0.9, 1.3, 1.8, 2.1 and 2.4g P/kg DM

• After 6 months:
  • Biopsy: 12\textsuperscript{th} rib (ribCT, mm)
  • Plasma: P, Ca, Mg
  • Bone markers: OC, BAP, PYD, tDPD
  • Hormones: uOC, 1,25OHVitD3, PTH

• Relationship between metabolic markers x dietary P level
Biopsy of the rib bone for determination of cortical thickness (rib CT)
P1 (left) compared to a P5 steer
Results and Discussion

Dietary P level
Rib cortical thickness, mm
P1 P2 P3 P4 P5
0 1 2 3 4 5
a a ab ab b

Dietary P level
Rib cortical thickness, mm

P1 P2 P3 P4 P5
Plasma PiP v. Plasma logPTH

Dietary P x Plasma PiP

Dietary P x log PTH

P status OK?
Plasma Total Calcium x PiP

Fitted Line Plot
Plasma total Ca, mmol/L = 2.57237 + 15.7262 * exp(-2.93854 * 'PiP, mmol/L')
Plasma total Ca/logPTH

Fitted Line Plot

Plasma total Ca/logPTH = 1.3188 + 995.423 * exp(-4.74052 * 'PiP, mmol/L')
Plasma PTH and Plasma total Ca warrant further investigation as metabolic predictors of P requirement in steers