High energy & starch supplement post-weaning does not enhance marbling in beef cattle

Paul Greenwood
Jason Siddell, Malcolm McPhee,
Brad Walmsley and Dave Pethick

World class science, creating first class beef
Background

Literature suggests:

- Marbling phenotype is dependent on numbers of adipocytes in muscle by feedlot entry
- Intramuscular adipocyte gene expression up-regulated post-weaning (6-12 months)
- Nutritional intervention post-weaning to enhance number of pre-adipocytes may have long-term impacts on marbling
- High starch or ω-6 FA post-weaning/pre-feedlot will increase marbling cf. traditional forage-based systems
- Elite and low marbling genotypes may differ in responses to post-weaning/pre-feedlot nutritional treatments

Reviewed by Hocquette et al. (2010)
Objectives

1) Determine whether high energy/starch supplement during the immediate post-weaning period enhances marbling

2) Determine whether nutrition and genotype interact to affect intramuscular (IM) and subcutaneous (SC) fat development

3) Obtain data and samples for detailed modelling & biological studies of fat depot development
Experimental Design

3 x genotypes (total n = 165)

High marbling & High subcutaneous fat
Angus with high EBVs (n = 55)

Low marbling & High subcutaneous fat
Hereford with breed average EBVs (n = 55)

High marbling & Lower subcutaneous fat
High marbling sire-line Wagyu x Angus cows with high EBVs (n = 55)
Experimental Design

2 x post-weaning nutritional systems
(168 d, total n = 150)

Forage (pasture) only x 2 replicates (n = 75)

Forage (pasture) + high energy/starch supplement x 2 replicates (n = 75):
12.3MJME & 110g CP /kgDM, 1% LW/day

Pasture - N fertilised improved pasture
(cocksfoot, tall fescue, phalaris)

- tetraploid ryegrass
- grazing oats

Aim: MATCH GROWTH RATES of replicates
Liveweight - Angus
Liveweight - Hereford
Liveweight – Wagyu x Angus

Date

Liveweight (kg)

S1
S2
F1
F2
Experimental Design

- 5 x slaughter times (total n = 165)
  - Weaning (Baseline) ~ 6 mo (n = 15)
  - End of nutritional treatments ~ 12 mo (n = 30)
  - End of backgrounding ~ 18 mo (n = 30)
  - Short feedlotting ~ 21 mo (n = 30)
  - Long feedlotting ~ 26 mo (n = 60)

Start expt av. ~ 220 kg – End expt av. ~ 745 kg LW
Measurements & samples

- Liveweight & ultrasound scans
- COMMERCIAL CHILLER ASSESSMENT
- Weight & samples of fat depots (subcutaneous, intermuscular, intramuscular, internal) & muscles: predictive models + genomics
- Objective meat quality - 5 cuts
- Taste panel assessments of meat quality (MSA models) - 9 cuts
Carcass weight (kg)

Nutrition

\[ P = 0.32 \]

\[ \text{SED} = 5.43 \text{ kg} \]

\[ GxN \quad P = 0.53 \]
Rib fat (mm)

Nutrition

$P = 0.021$

$\text{SED} = 0.51 \text{ mm}$

GxN $P = 0.70$

- Red: Forage
- Blue: Supplement
Rump (P8) fat (mm)

- Nutrition: $P = 0.12$, $\text{SED} = 0.73$ mm
- GxN: $P = 0.28$
MSA Marble score

Nutrition

\( P = 0.13 \)

SED = 18.5

GxN \( P = 0.43 \)

Days

Forage

Supplement
AUS Marble score

Nutrition
$P = 0.16$
RSD = 0.15

GxN $P = 0.44$
Conclusions

• Post-weaning supplementation did not enhance commercial assessments of marbling, and tended to suppress subcutaneous fatness

• No interactions between Genotype and Nutrition

• Resource for post-weaning modelling & developmental studies on fat depots & their distribution