EFFECTS OF SHORT-TERM OILSEED SUPPLEMENTATION ON PLASMA FATTY ACID COMPOSITION IN LACTATING BEEF COWS

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Introduction

- The results of short-term increases in energy, termed "flushing" have long been known to be beneficial to reproduction in sheep
  (Perkins, 1984; Nottle et al., 1997)
- Flushing cattle has been shown to be equivocal
  (Perkins, 1984)
  - Embryo quality was improved (Nolan et al., 1998)
  - Did not influence follicular growth or any other reproductive parameter measured
    (Dunne et al., 1999; Mackey et al., 1999)

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Introduction

- Supplementation of fat can influence energy status and subsequent plasma fatty acids.
- Observed difference in short time frame
  - Plasma fatty acids differ within 7 days of initiation of dietary treatment (Filley et al., 1999; Scholljegerdes et al., 2006)
- Of particular importance to reproduction is linoleic acid (18:2*n-6*), which is the precursor to the 2-series prostaglandins.

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Introduction

- An increase in dietary 18:2*n-6* will increase $PGF_2\alpha$ production (Lammoglia et al., 1997; Filley et al., 1999; Grant et al., 2005)
  - May negatively influence embryonic survival (Mattos et al., 2003; Hess et al., 2005)
- Linolenic acid (18:3*n-3*) can inhibit 20:4*n-6* production and thereby decrease the formation of $PGF_2\alpha$ (Mattos et al., 2000)
- Rolled flaxseed (source of 18:3*n-3*) or rolled sunflower seed (source of 18:2*n-6*) fed for 8 weeks starting 28 days prior to the breeding season (Ambrose et al., 2006)
  - Early pregnancy loss (32 to 90 d) of 4.8% and 11.4% for cows fed flaxseed versus sunflower seeds, respectively

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Introduction

- Timed AI is becoming increasingly attractive to livestock producers because of the reduction in labor requirements associated with heat detection
  - AI conception rates are generally lower than protocols using heat detection
- Therefore development of a short-term feeding program that coincides with a timed AI protocol may help increase AI conception rates

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Objective

To evaluate the efficacy of a short-term increase in dietary energy and essential fatty acids around the time of AI until maternal recognition of pregnancy on plasma fatty acid concentrations over time in lactating beef cows grazing summer range

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Materials and Methods

- 24 multiparous cows (initial BW = 512 kg; BCS = 5.5)
  - Confirmed cyclic via ultrasound and serum P4
- 6 ruminally cannulated heifers (initial BW = 523 kg)
- Randomly allotted to three treatments
  - Control = Grazing only
  - Soybean = Grazing plus whole soybeans-based supplement fed at 0.57% of BW
  - Flaxseed = Grazing plus whole flaxseed-based supplement fed at 0.52% of BW

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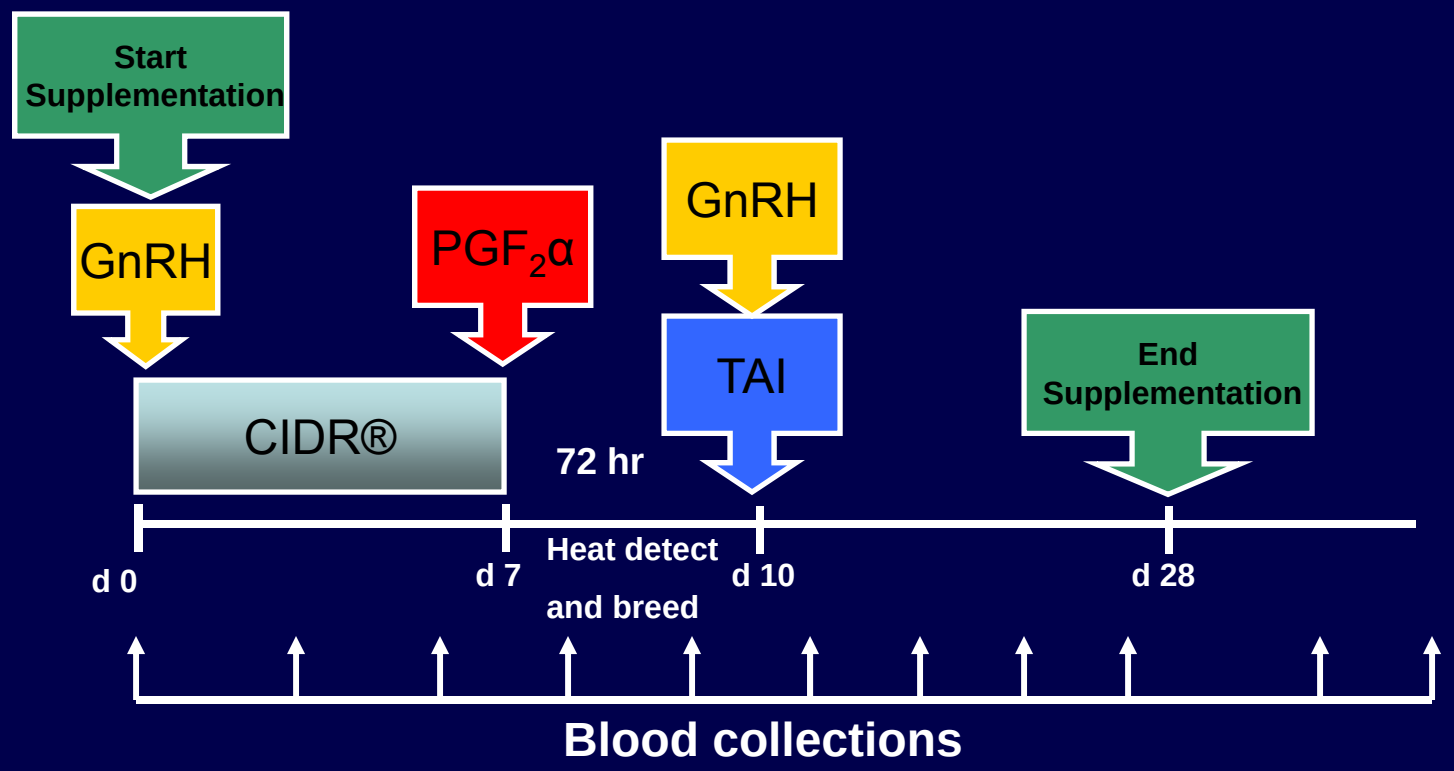
Experiment Timeline

Select Synch + CIDR & TAI



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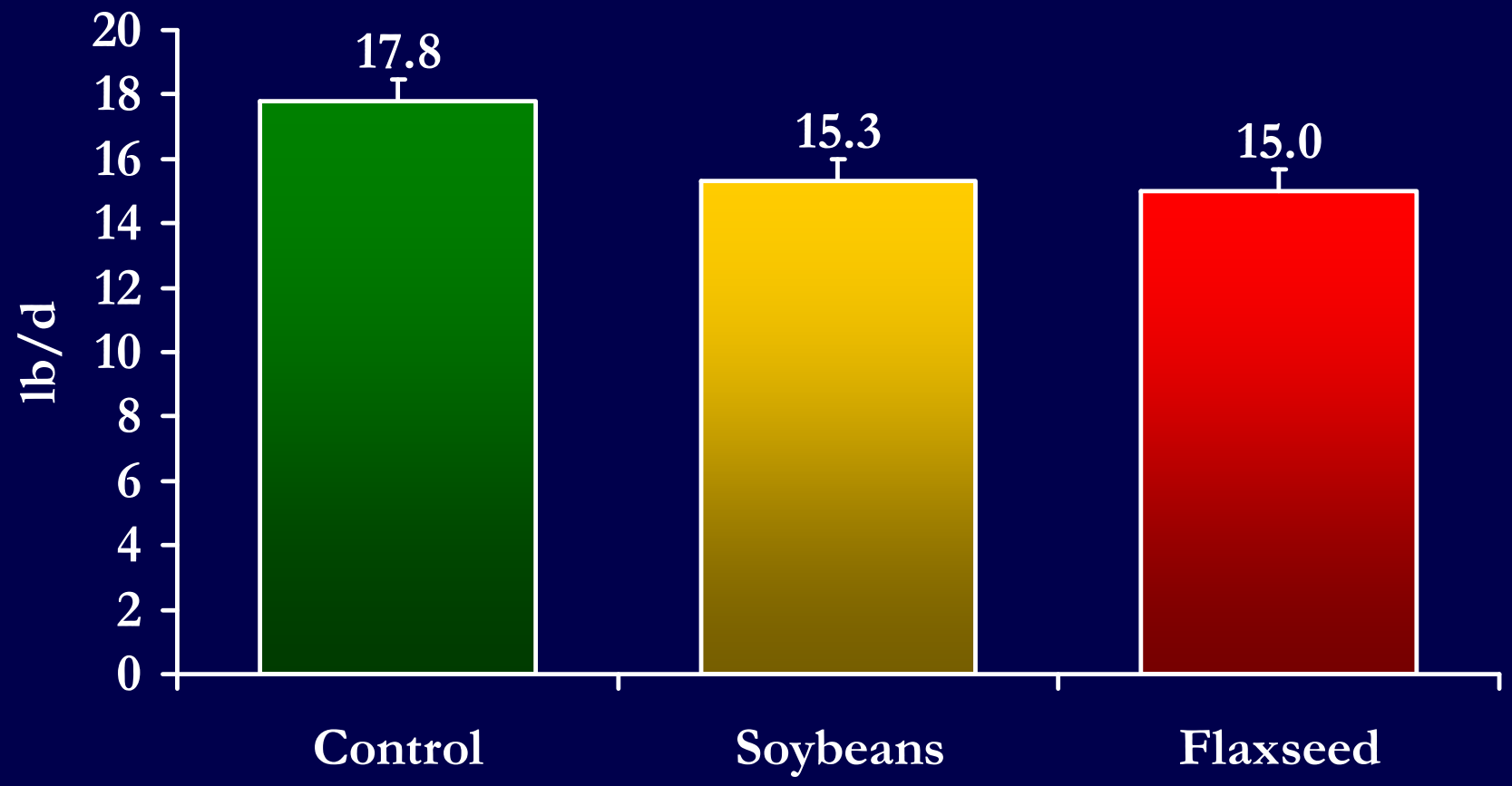
Forage DM intake

Con vs. Suppl. $P = 0.05$



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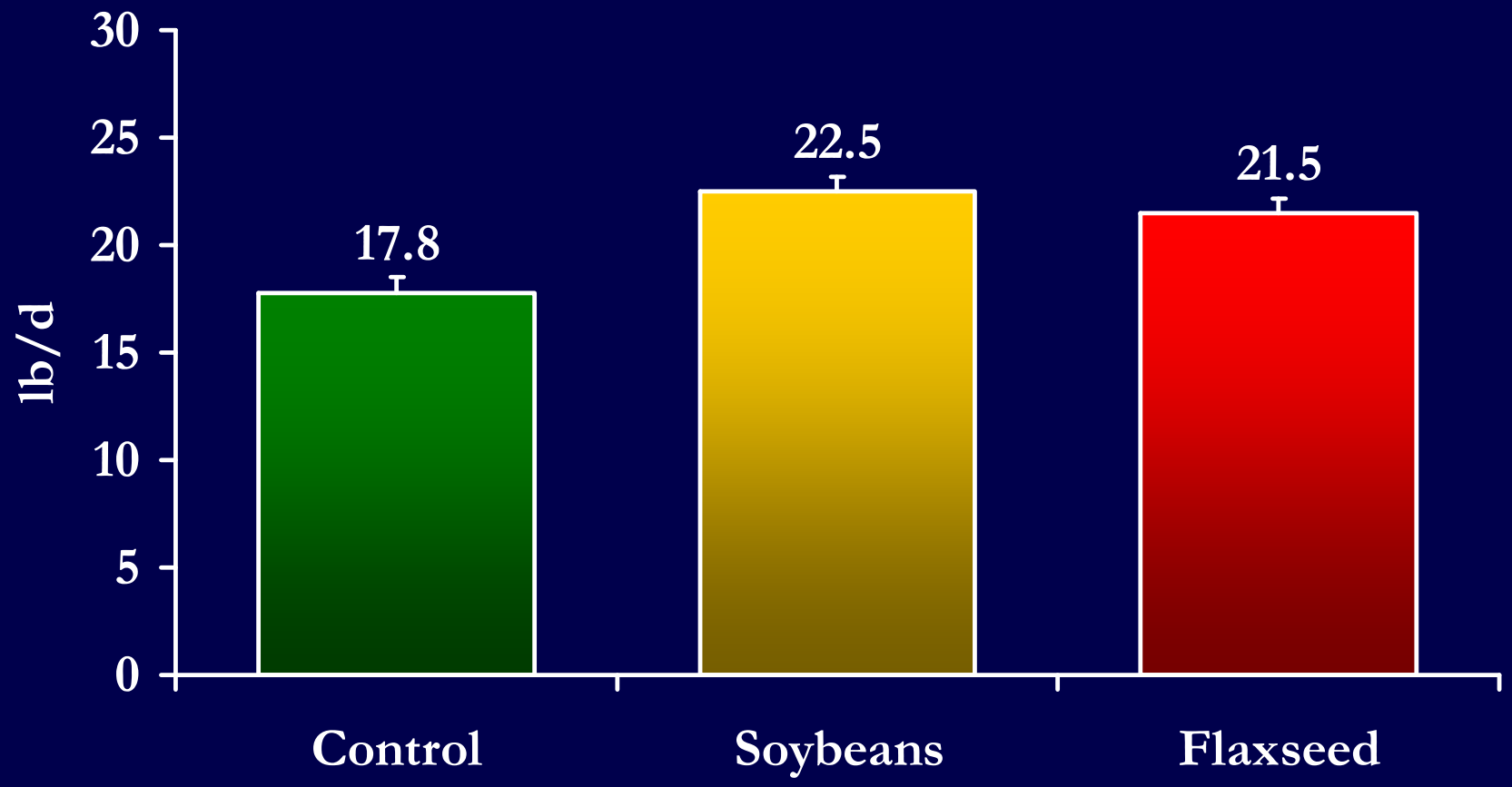
Total DM intake

Con vs. Suppl. $P = 0.01$



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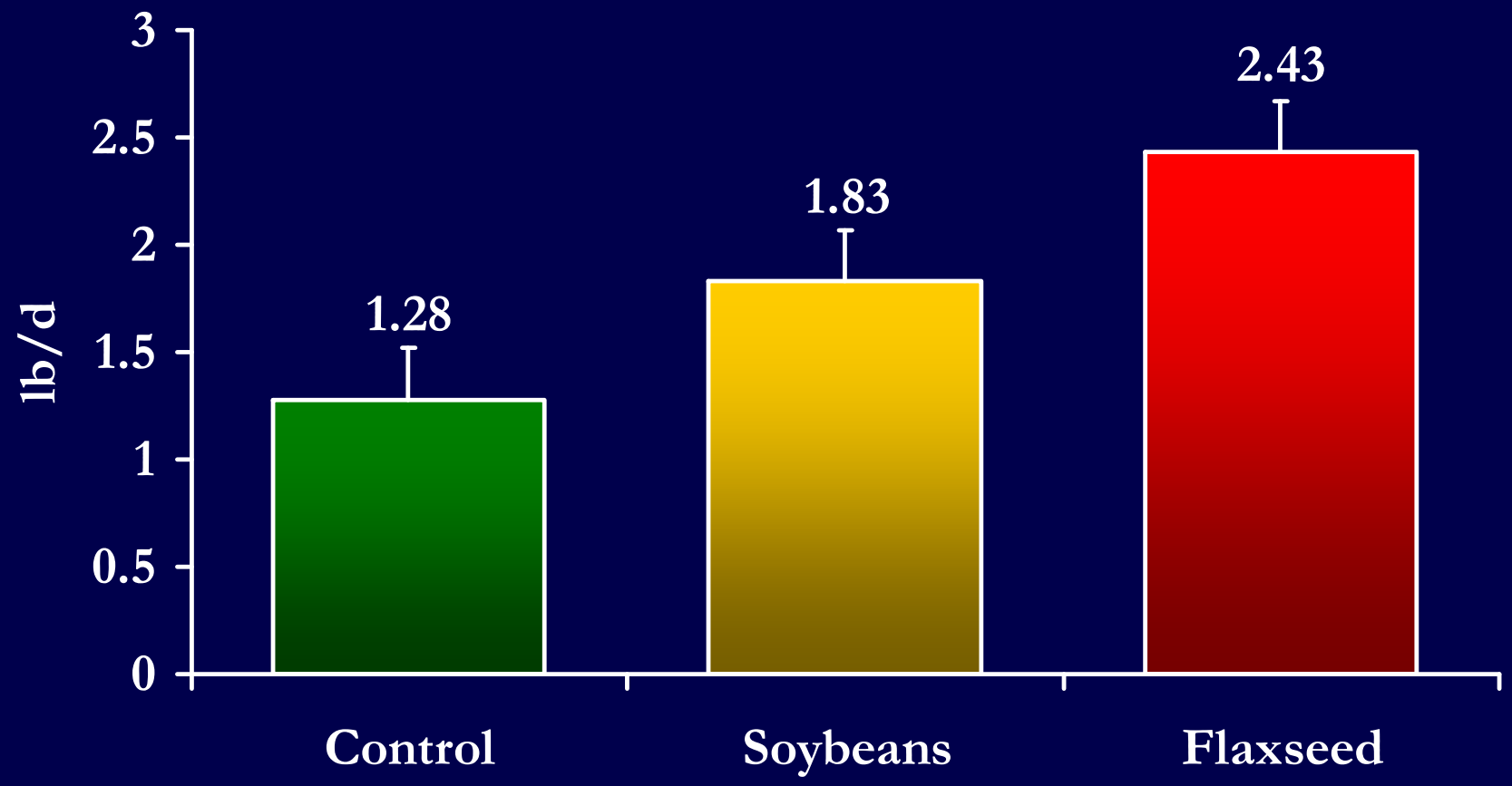
Average Daily Gain

Con vs. Suppl. $P = 0.01$



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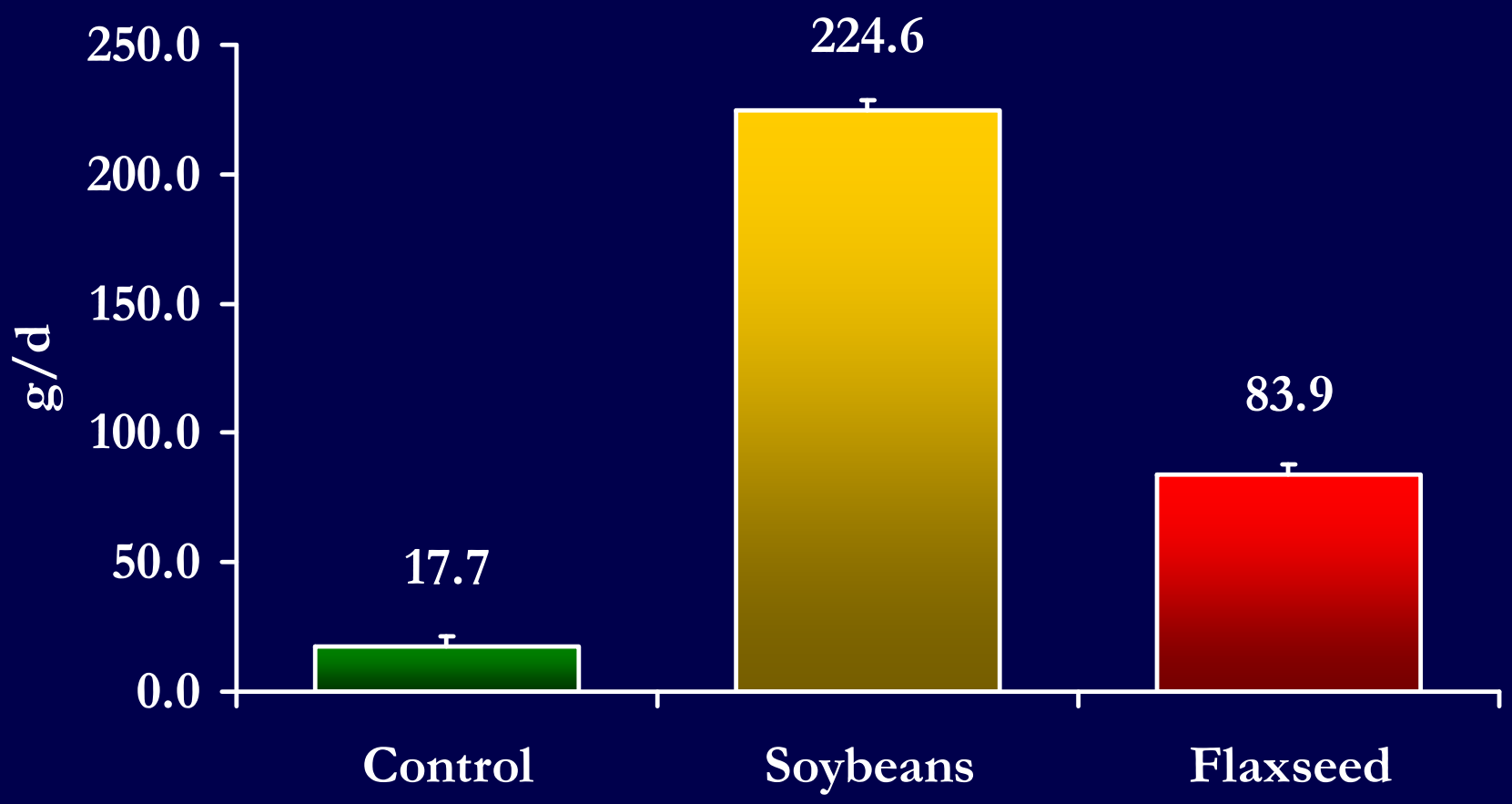
18:2*n-6* Intake

Con vs. Suppl. $P < 0.001$
Flax vs. Soybean $P < 0.001$



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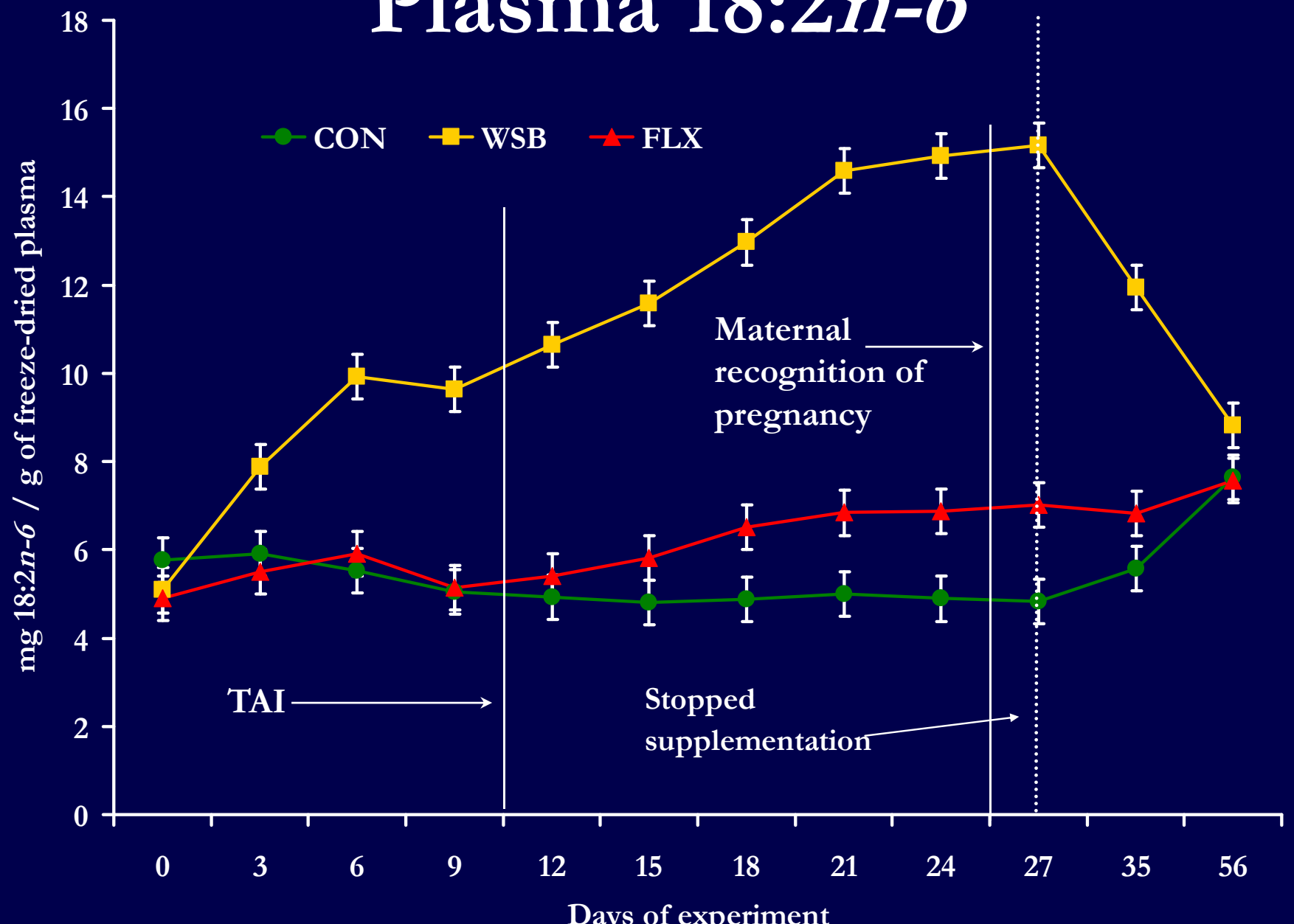
Plasma 18:2*n-6*



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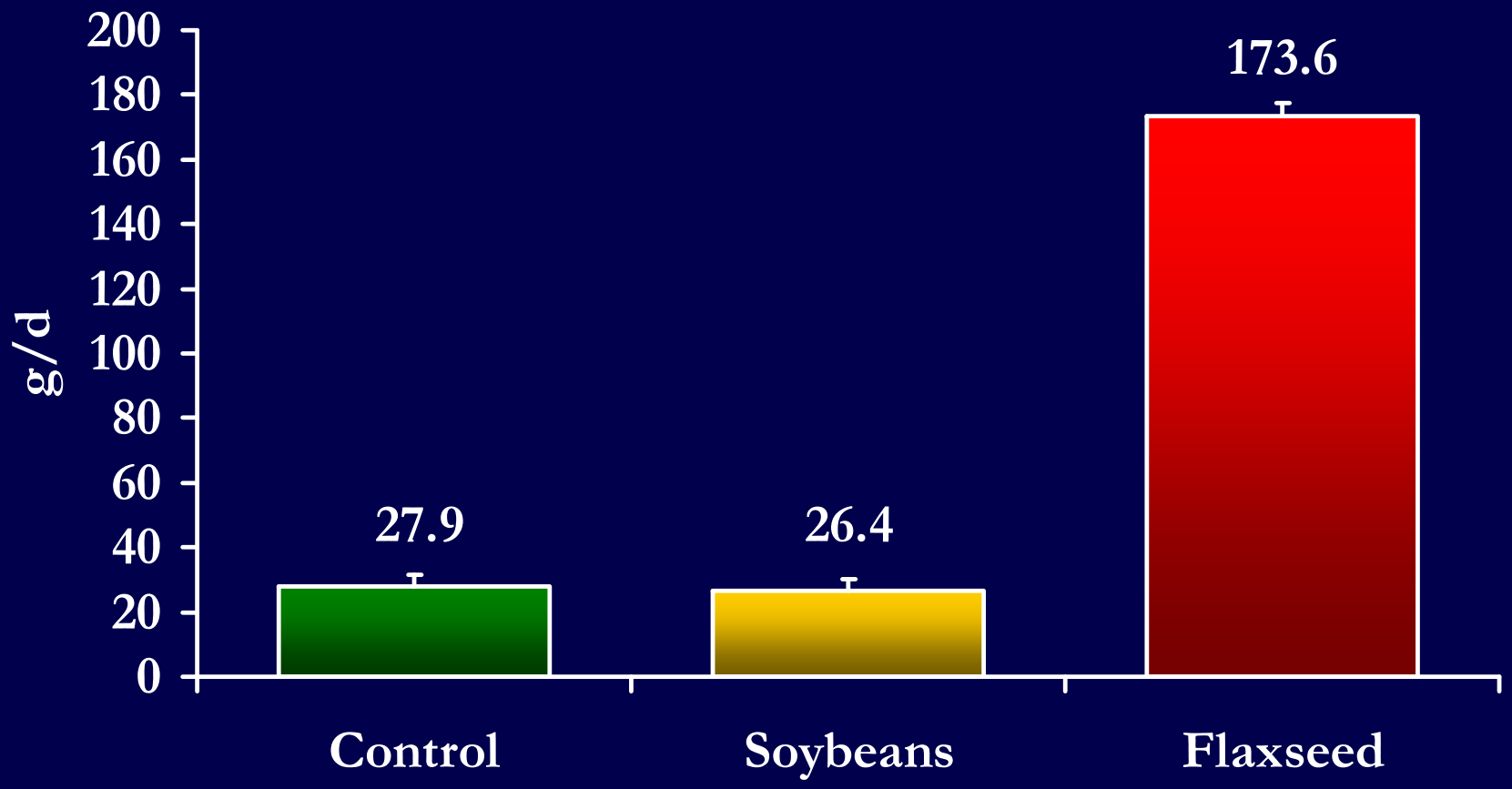
18:3*n-3* Intake

Con vs. Suppl. $P < 0.001$
Flax vs. Soybean $P < 0.001$



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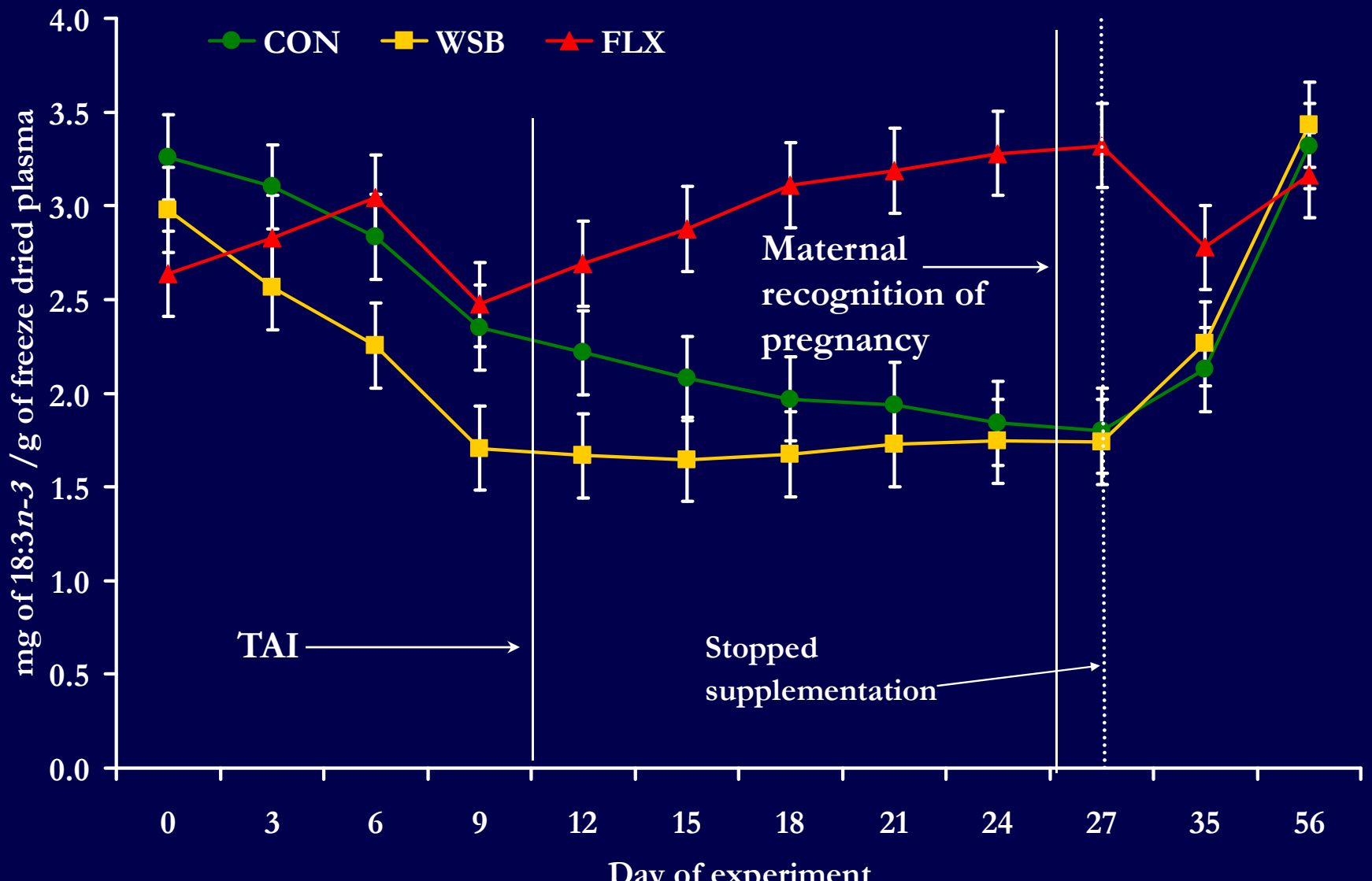
Plasma 18:3*n-3*



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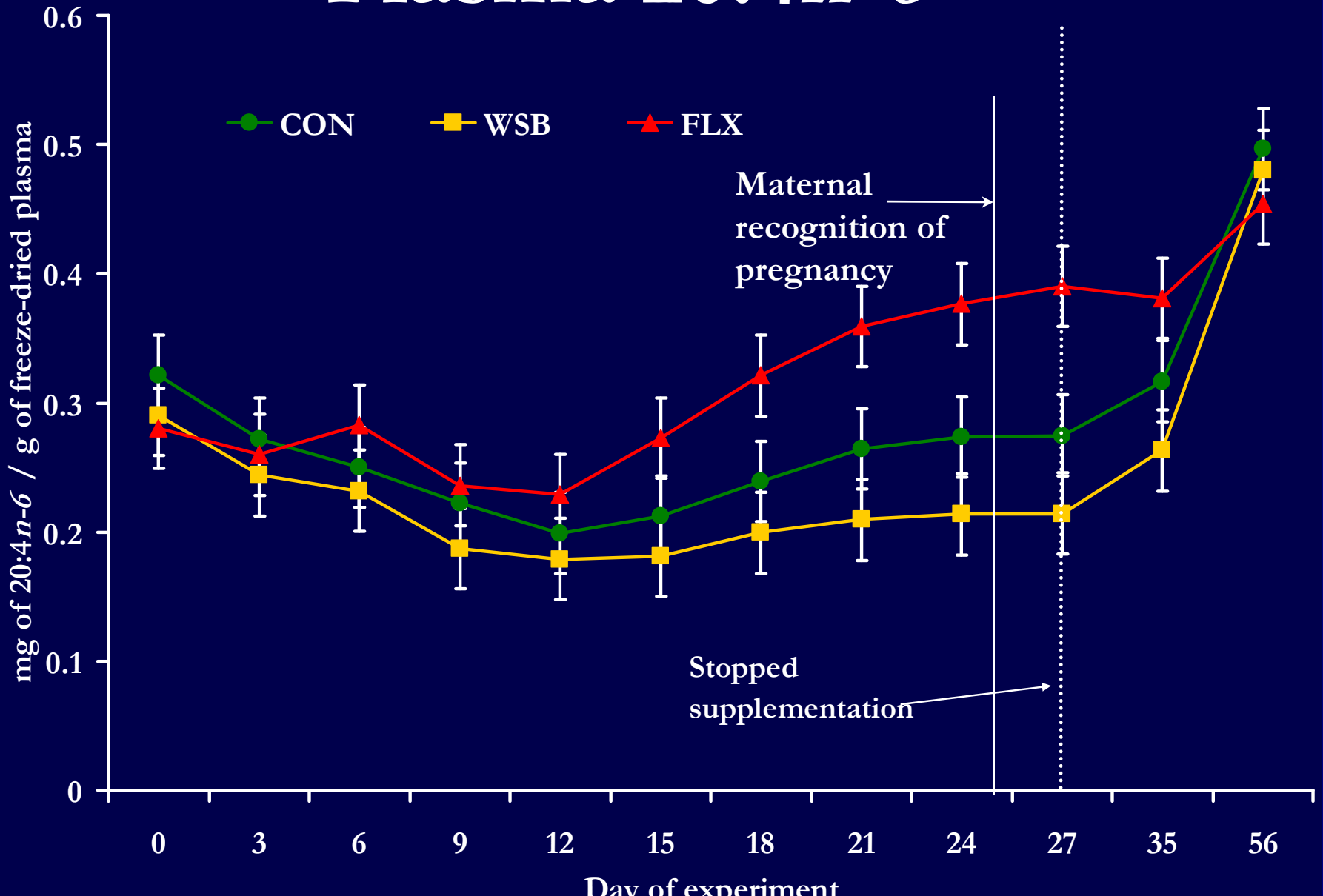
Plasma 20:4*n-6*



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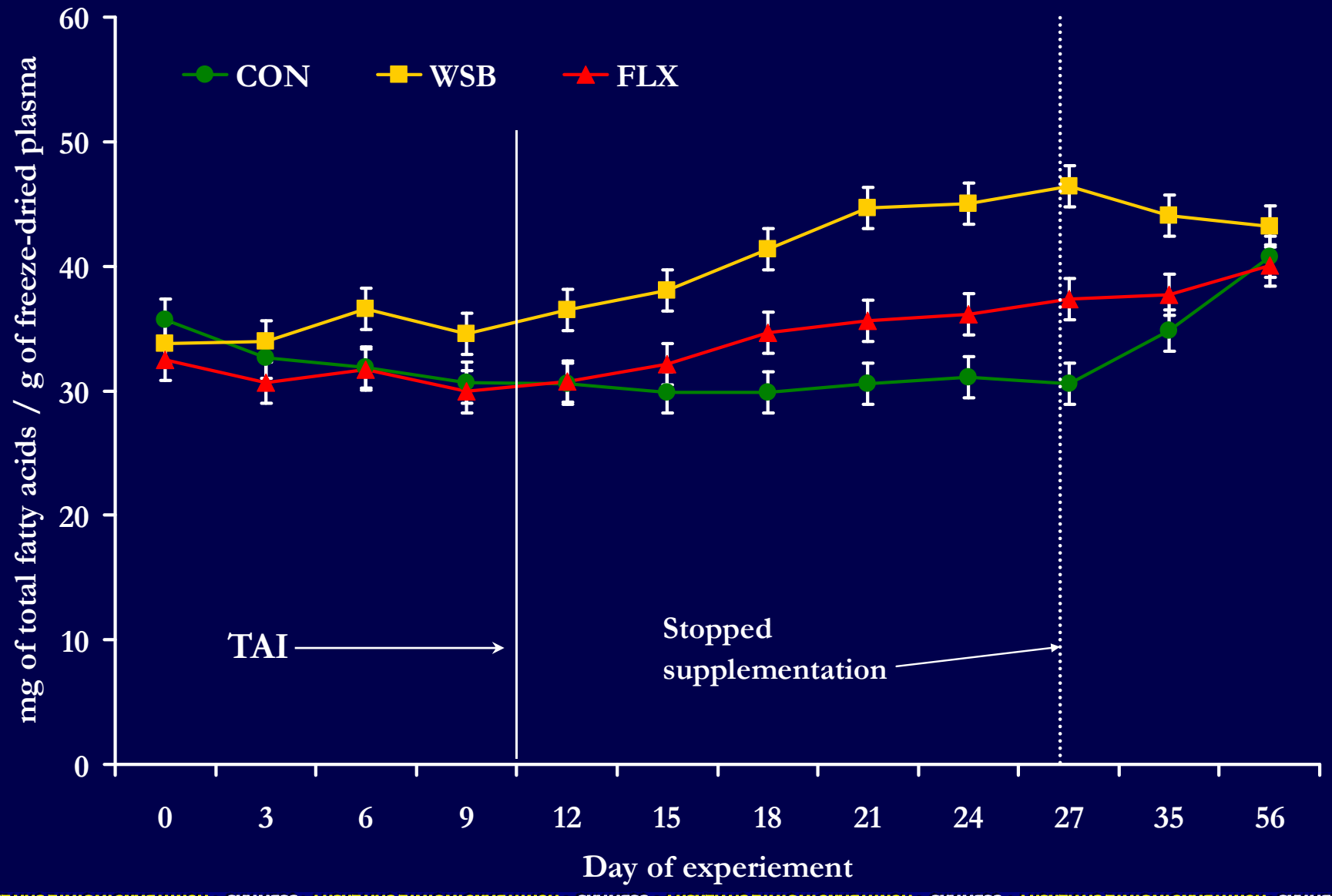
Plasma Total Fatty Acids



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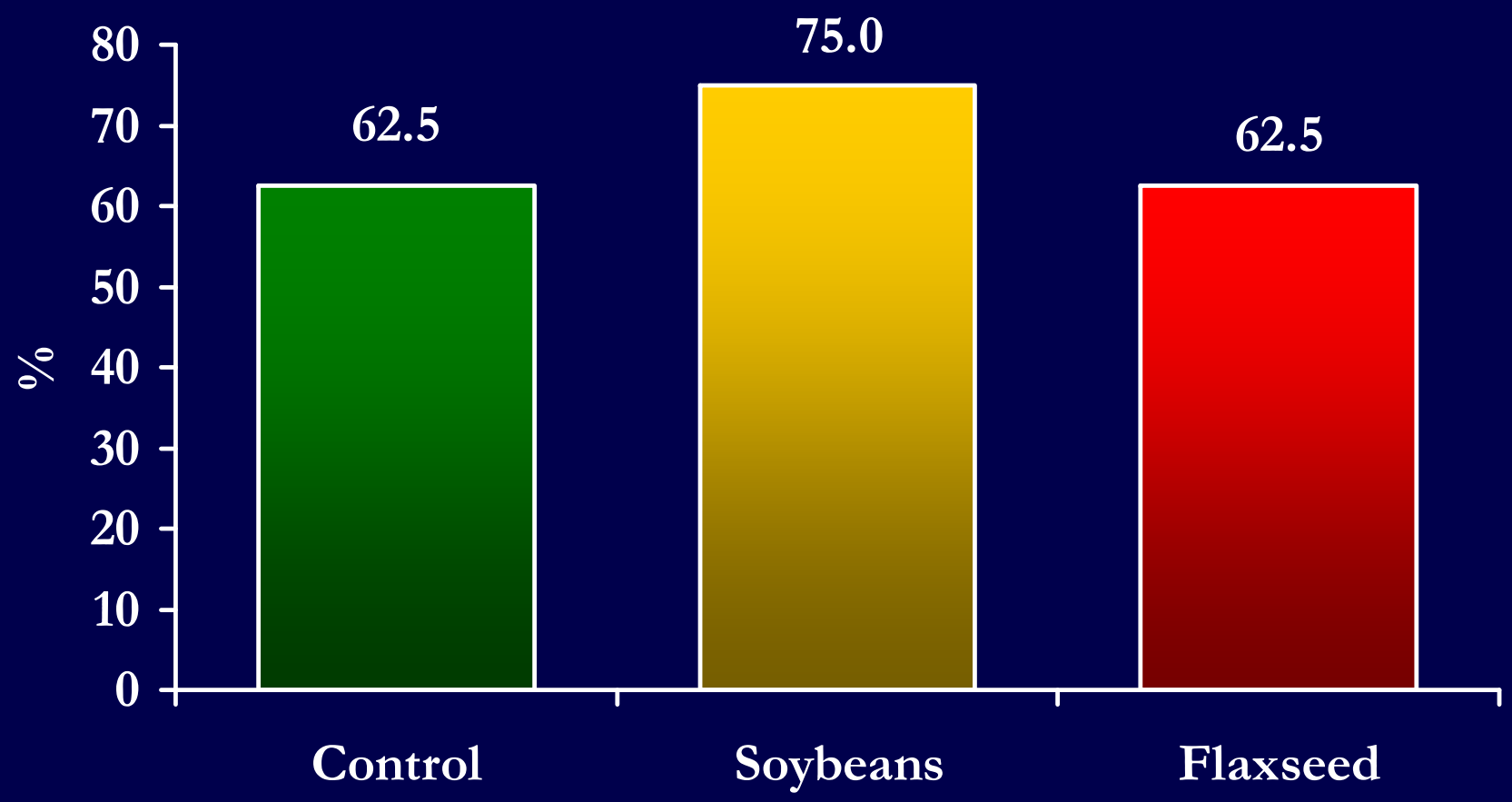
AI Pregnancy Rate

$P = 0.84$



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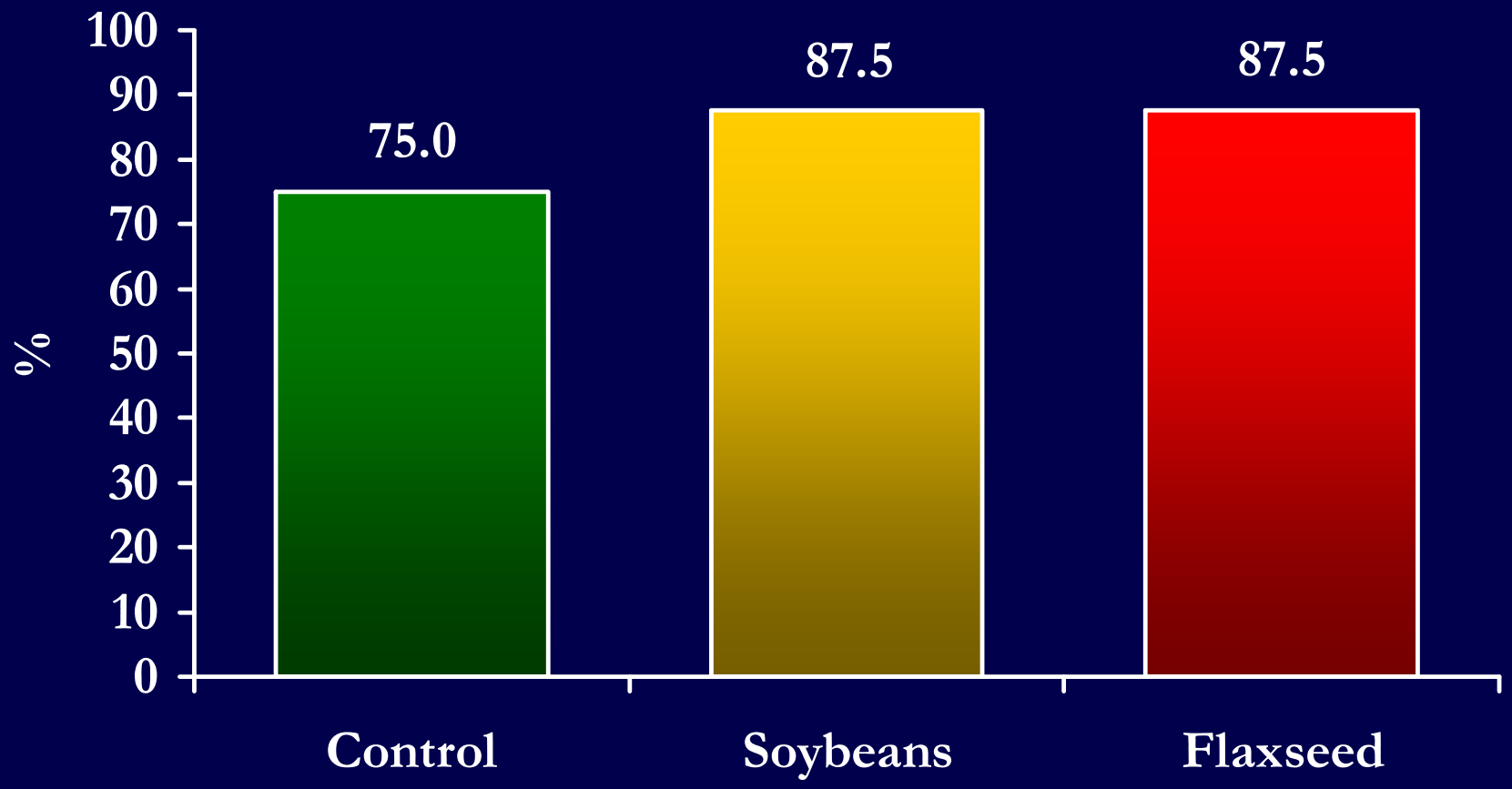
Overall Pregnancy Rate

$P = 0.77$



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Conclusions

- Additional fat reduced forage intake
- Cow performance was improved with fat supplementation
- Supplemental whole soybeans increased plasma 18:2*n-6*
- Supplemental whole flaxseed increased plasma 18:3*n-3*

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Conclusions

- Supplemental whole soybeans increased fatty acid concentrations in the plasma earlier than whole flaxseed
- Plasma arachidonic acid was greater in cows fed whole flaxseed
- Whole soybeans increased total plasma fatty acid concentration by breeding

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Implications

- Feeding either whole soybeans or whole flaxseed starting at the beginning of estrous synchronization will increase the supply of key fatty acids known to influence reproduction and improve animal energy status

EFFECTS OF SHORT-TERM OILSEED SUPPLEMENTATION ON PLASMA FATTY ACID COMPOSITION IN HEIFERS

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Introduction

- Heifers supplemented with whole sunflower seeds (Funston et al., 2002)
  - 0, 30, 60 d prior to TAI
  - Four locations (n = 1,014)
- Diets
  - Sunflower = 11.6% CP, 7.1% Fat
  - Control = 11.7% CP, 3.4% Fat

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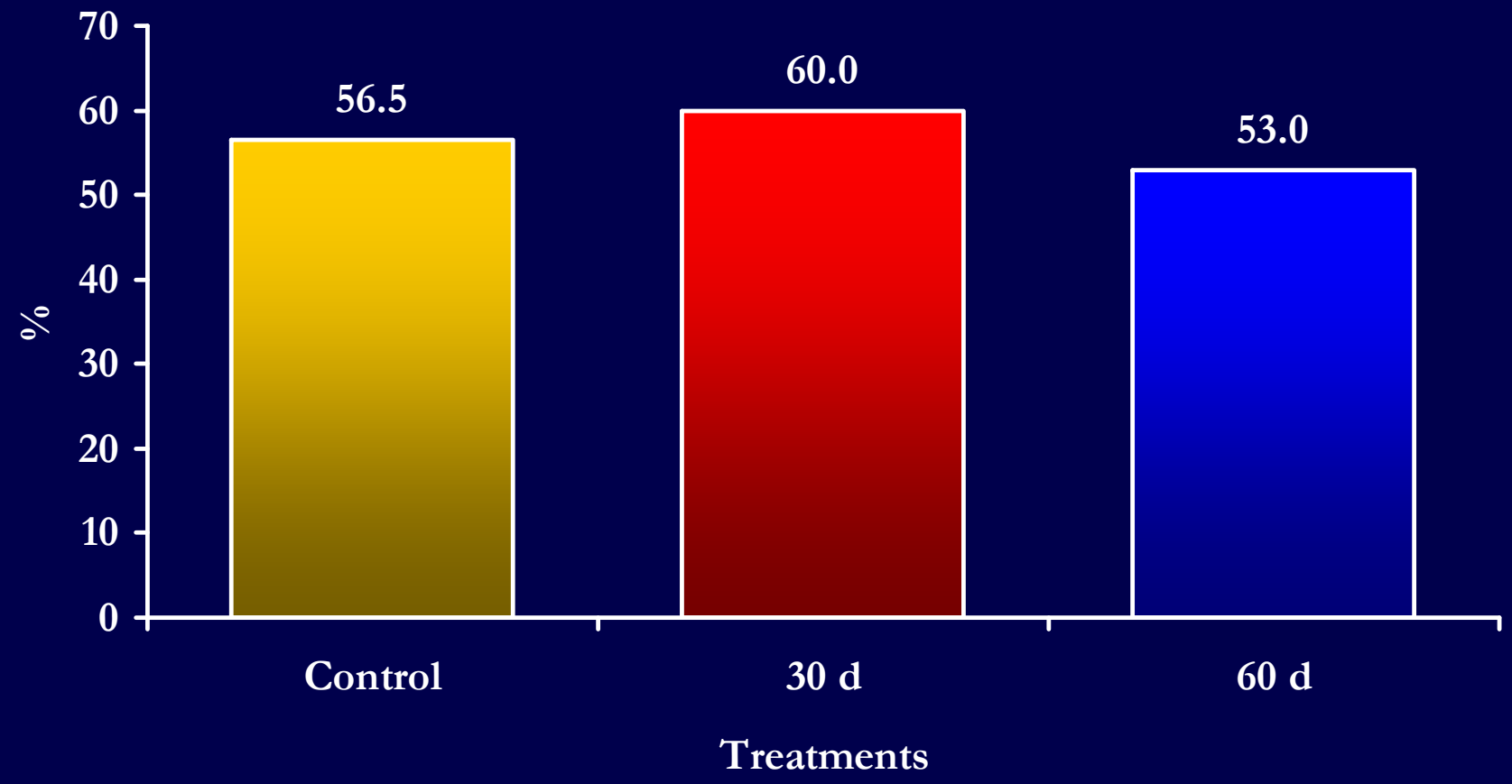
AI Pregnancy Rate

$P > 0.10$



Funston et al., 2002

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Objective

To evaluate the efficacy of a short-term increase in dietary energy and essential fatty acids around the time of AI until maternal recognition of pregnancy on growth performance and AI conception rates in developing beef heifers fed a forage-based diet

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Materials and Methods

- All heifers were determined to be pubertal using the Heat Watch system prior to initiation of experiment
- 96 cross bred heifers (Initial wt. 870 lbs)
  - Blocked by weight and randomly assigned to 12 pens with 8 heifers per pen and 4 pens per treatment

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Materials and Methods

Table 1. Initial ingredients and chemical composition of diets provided to heifers

	Treatments		
Item	Control	Soybean	Flaxseed
Ingredient, % as fed			
Chopped hay	99.7	83.1	86.2
Pellet[2]	0.3	16.9	13.8
Chemical composition, DM basis			
DM	91.2	90.9	91.3
CP	12.5	15.8	15.9
TDN	59.5	64.9	65.1
Total fatty acids	0.91	2.8	2.8
Ca	0.53	0.5	0.5
P	0.17	0.23	0.24

[1]Estimated based on forages of similar quality.

[2]Pellet composition: Control = 61.1% $CaCO_3$, 30.0% Salt, 6.82% CHS/PN TM-FDLT, 1.5% Mineral oil, 0.53% SCH/PN VT-FDLT; Soybean = 75.8% soybean; 21.0% corn, 2% $CaCO_3$, 1.0% Salt, 0.23% CHS/PN TM-FDLOT, 0.02% CHS/PN VT-FDLT; Flaxseed = 45% flaxseed, 51.7% Soybean meal, 1.9% $CaCO_3$, 1.2% Salt, 0.28% CHS/PN TM-FDLT, 0.02% CHS/PN VT-FDLT.

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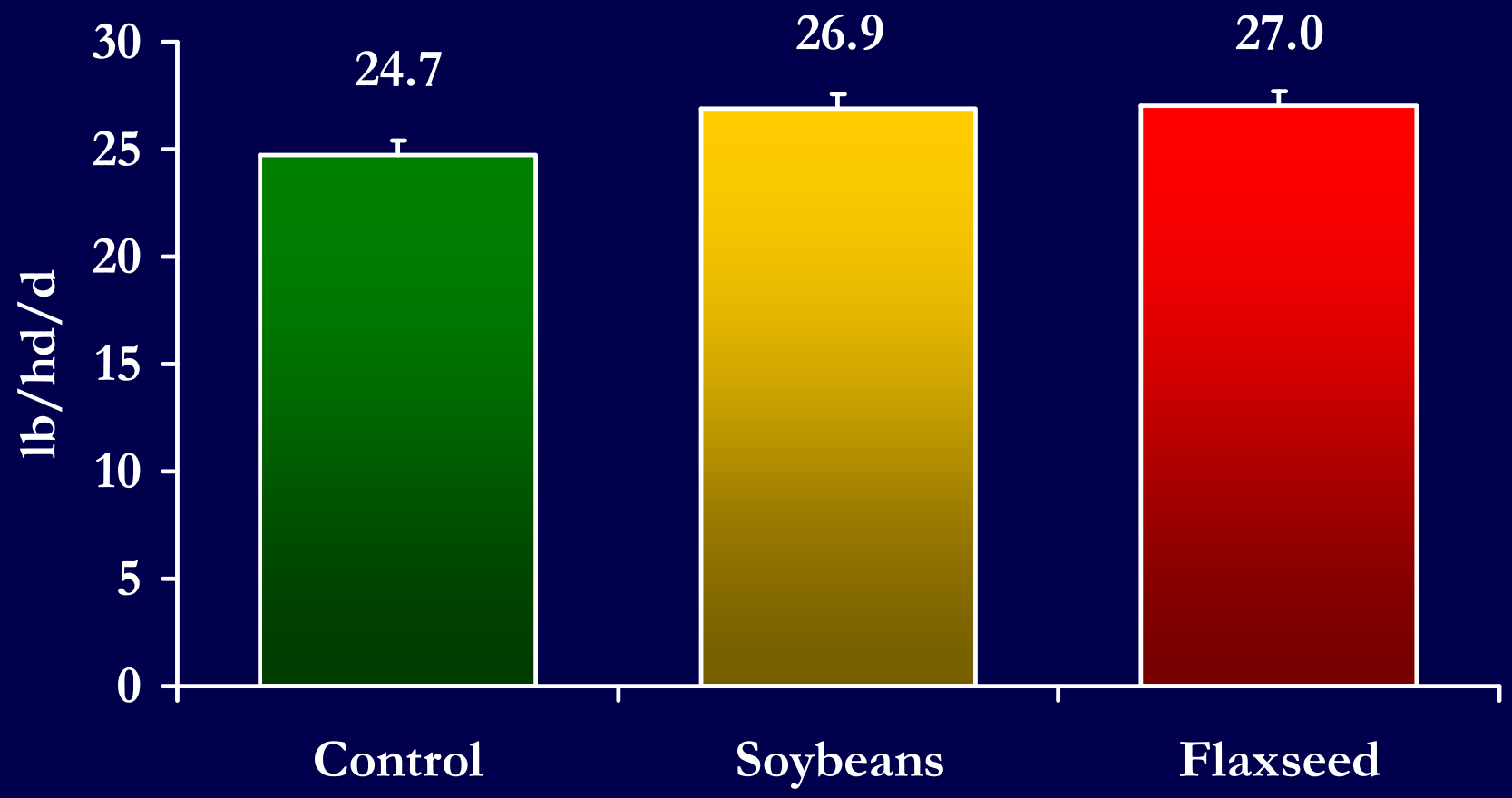
Heifer Intake

Con vs Supplement $P = 0.03$



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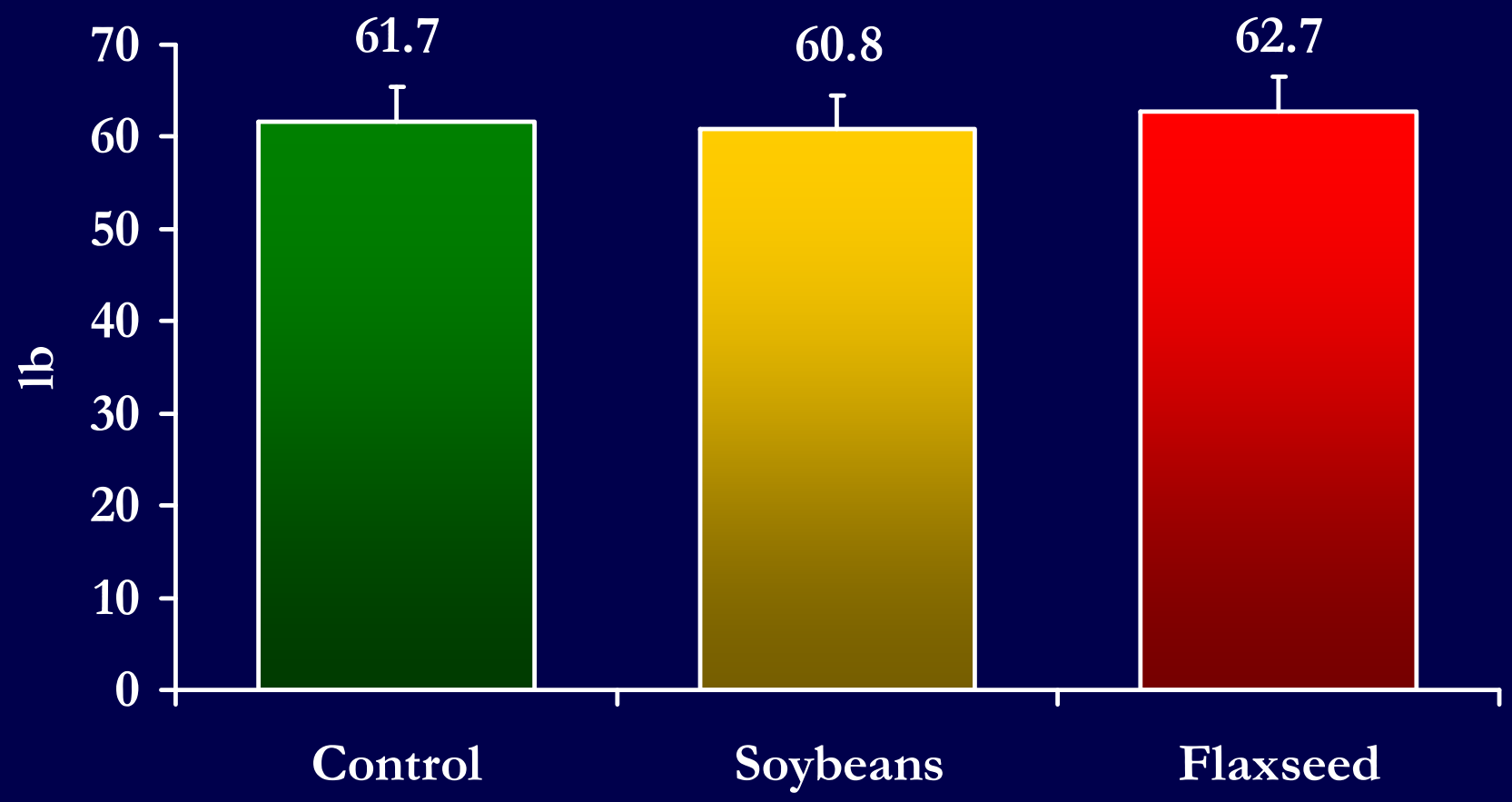
Heifer Gain

$P = 0.72$



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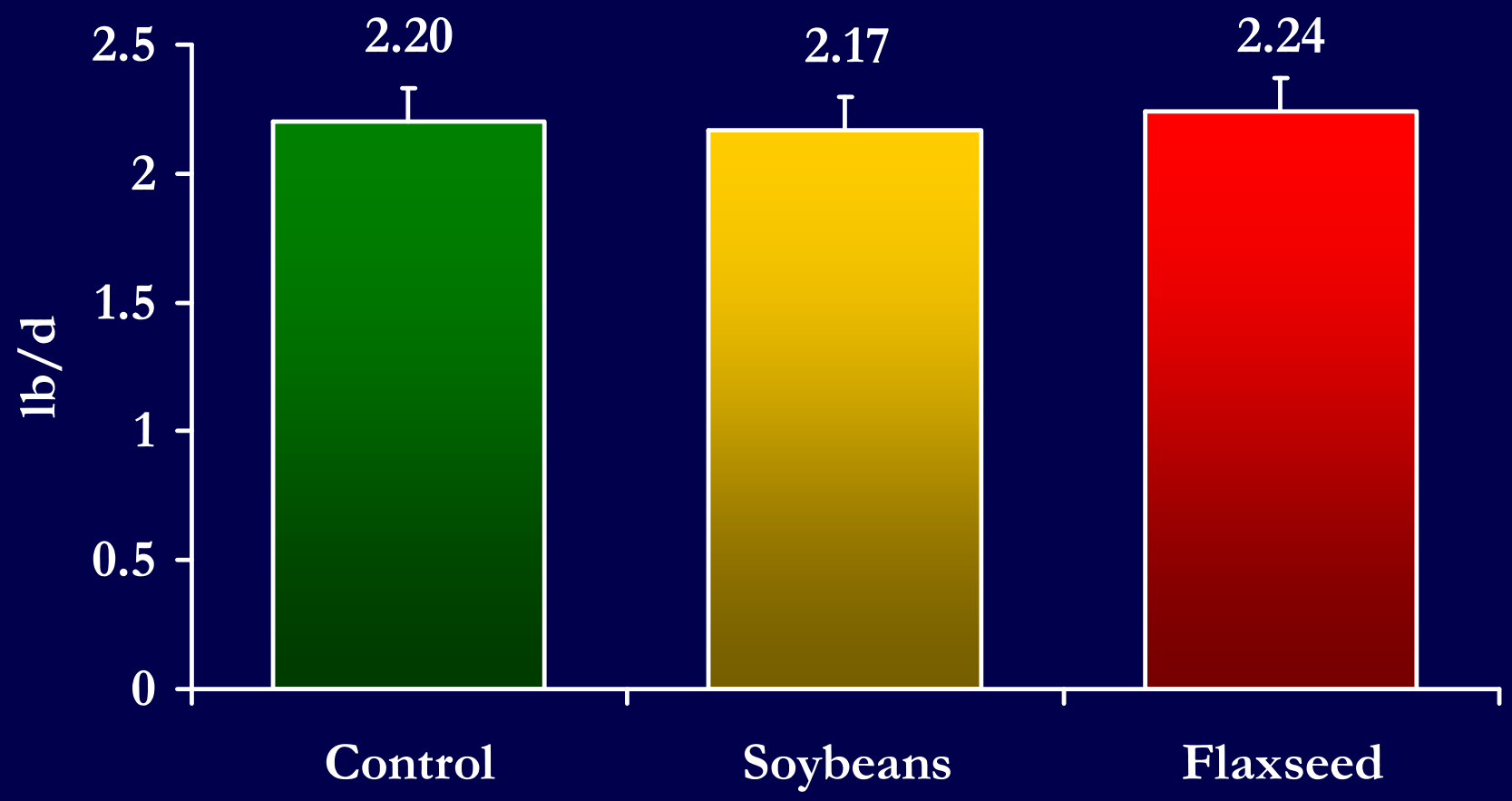
Heifer Average Daily Gain

$P = 0.94$



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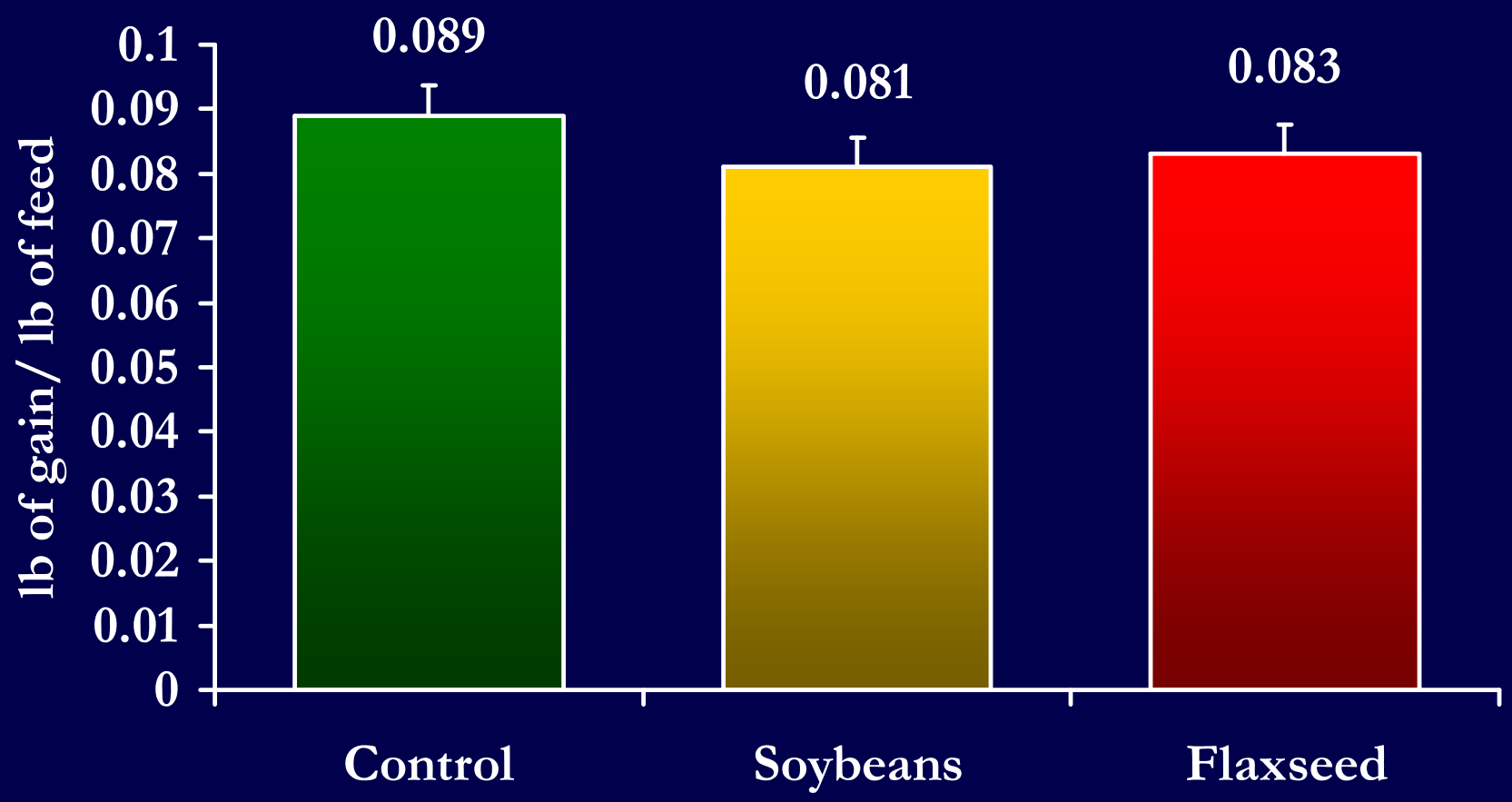
Heifer Gain to Feed

$P = 0.21$



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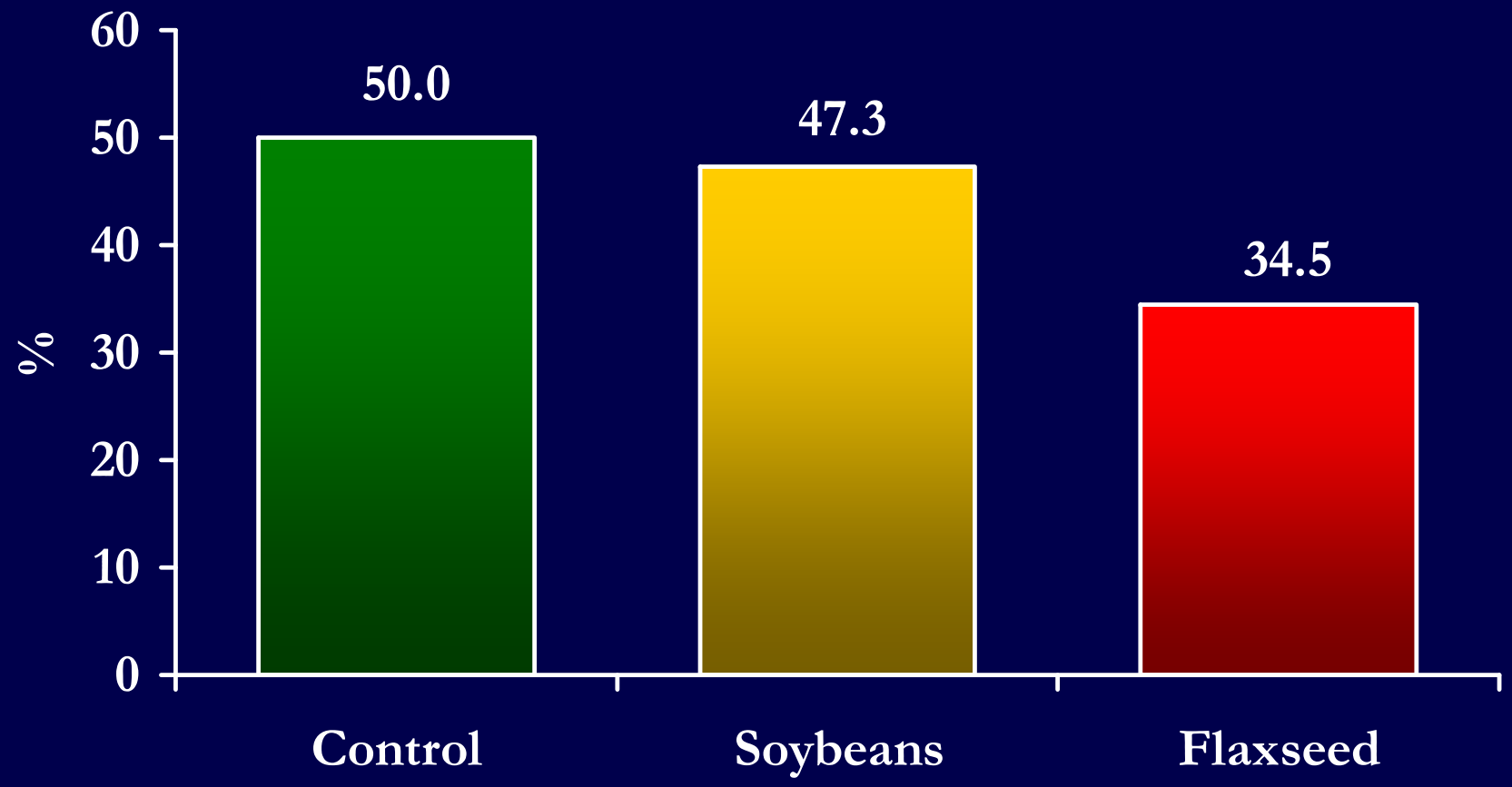
AI Pregnancy Rate

$P = 0.42$



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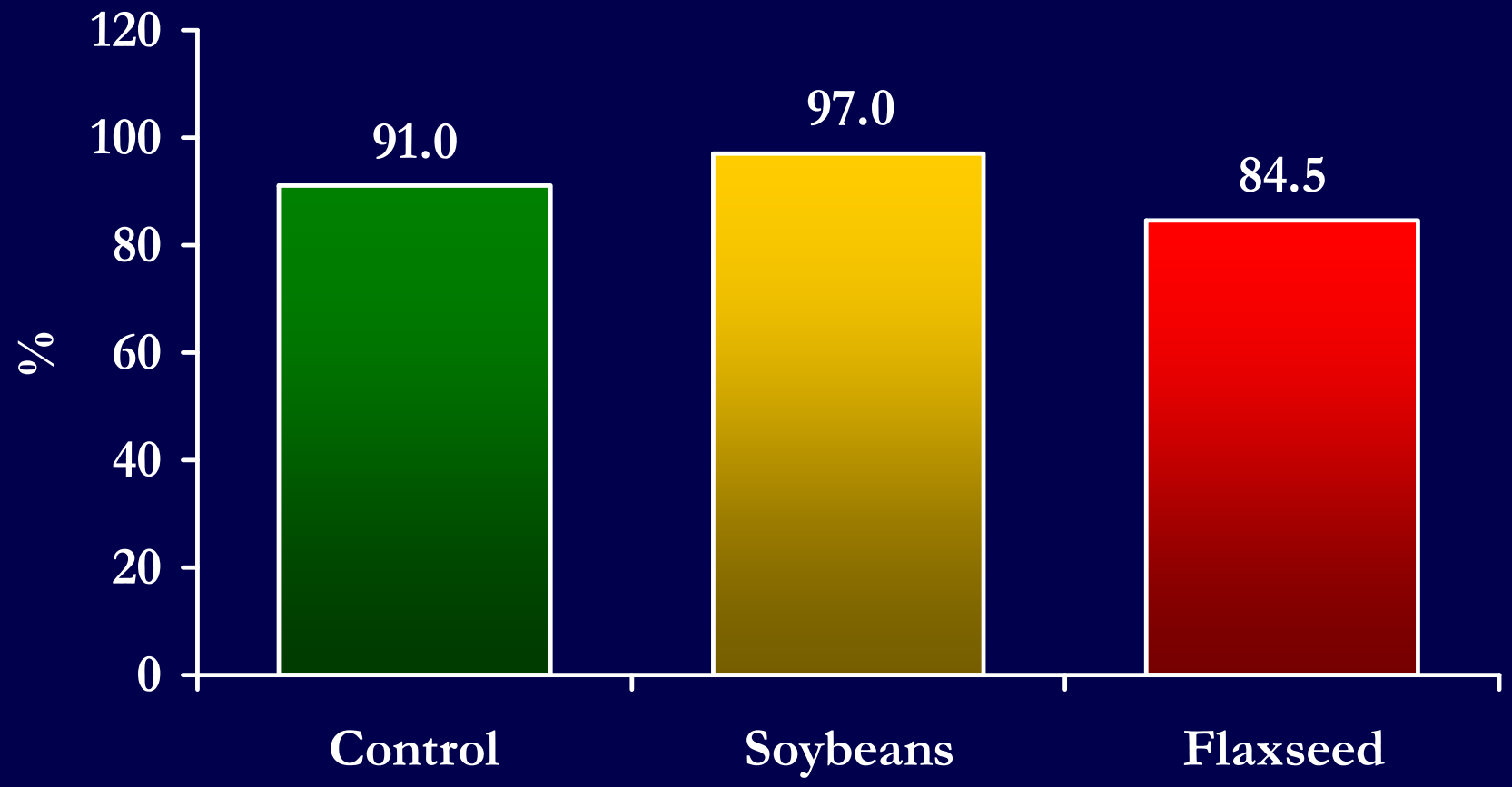
Overall Pregnancy Rate

Soybean versus Flax $P = 0.12$



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Conclusion

- Feeding fat at 3% of the diet was not enough to increase ADG or G to F
- Overall conception rates did not differ due to large variation

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Implication

- Further study is warranted due to the large numerical difference with Soybean in overall pregnancy rates

- Level of fat should be increased in order to see the benefit of additional energy in growth performance.

Questions