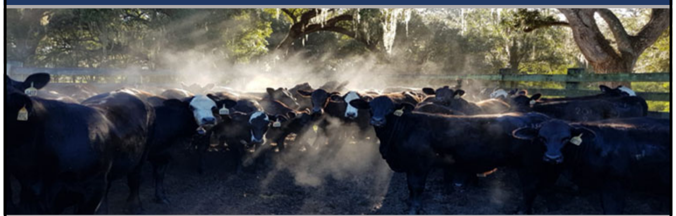
Pre-calving nutrition of beef females

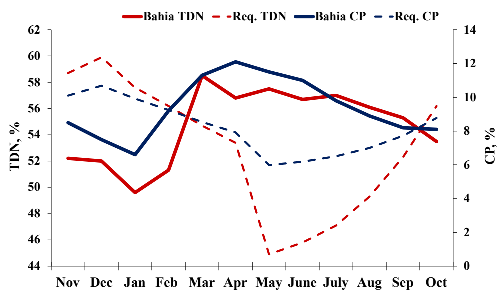


Elizabeth Palmer | PhD student
Range Cattle Research and Education Center
November 10, 2020

UF | UNIVERSITY of FLORIDA

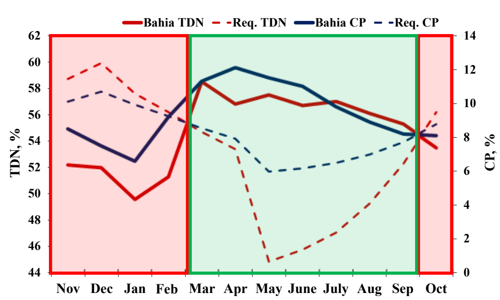
1

Nutrient requirements for beef cattle



2

Nutrient requirements for beef cattle



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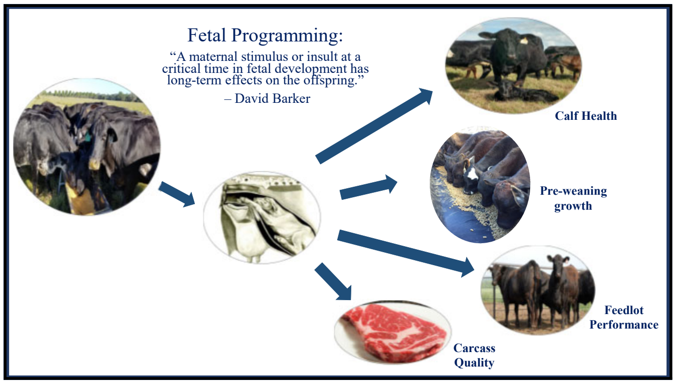
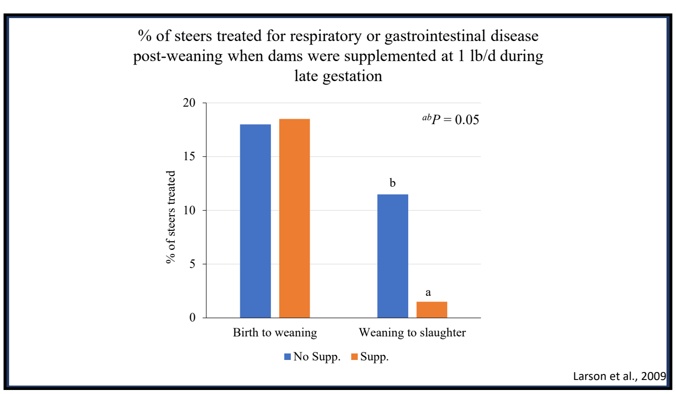


4

Calf health

5



6

BCS of cows provided 100 or 70% of their daily energy requirement for the last 40 d of gestation

	100% of daily energy requirements	70% of daily energy requirements
BCS		
d 0	6.55	6.60
Calving	6.55	6.36
BCS Change		
d 0 to calving	0.01	-0.25

Moriel et al., 2016

7

Short-term nutrient restrictions during late gestation can reduce calf response to vaccination

	100% of daily energy requirements	70% of daily energy requirements
BCS		
d 0	6.55	6.60
Calving	6.55	6.36
BCS Change		
d 0 to calving	0.01	-0.25

	100% of daily energy requirements	70% of daily energy requirements
Serum titers		
Bovine viral diarrhea virus -1a	6.36[b]	5.15[a]

P = 0.05

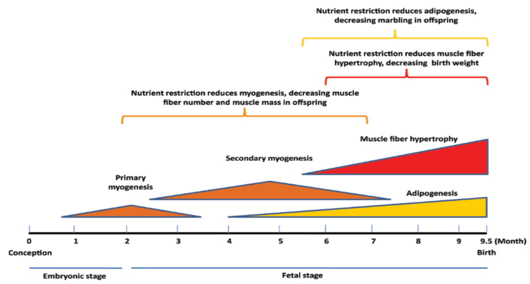
Moriel et al., 2016

8

Post-weaning growth and carcass quality

9

75% of fetal growth occurs during the last trimester of gestation
(Robinson et al., 1997)



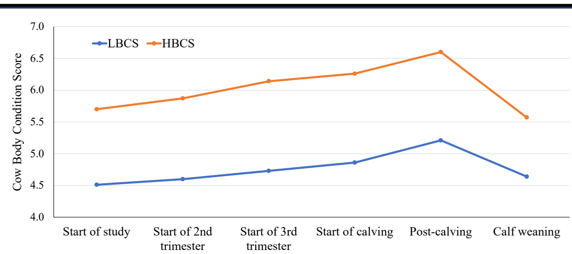
Du et al., 2010

10

Steer performance when cows were fed 1 lb/d of a CP supplement during late-gestation

	Stalker et al. 2007 (42% CP)		Stalker et al. 2006 (42% CP)		Larson et al. 2009 (28% CP)	
	No Suppl.	Suppl.	No Suppl.	Suppl.	No Suppl.	Suppl.
Feedlot ADG, kg/d	3.52[a]	3.70[b]	3.45	3.43	3.65[a]	3.74[b]
Carcass weight, kg	763[a]	803[b]	799	812	803[a]	821[b]
Marbling Score	449	461	467	479	444[a]	493[b]
Choice, %	–	–	85	96	71[a]	86[b]

11



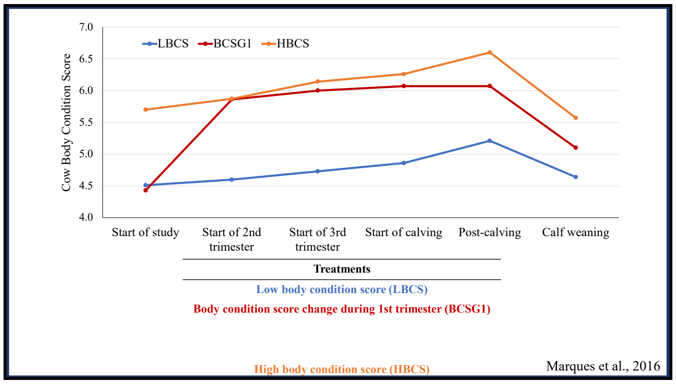
Treatments

Low body condition score (LBCS)

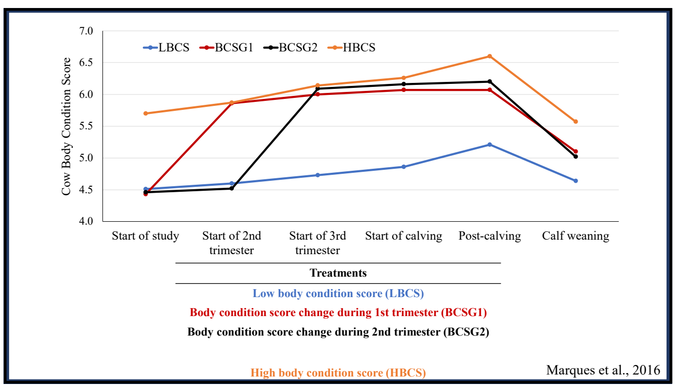
High body condition score (HBCS)

Marques et al., 2016

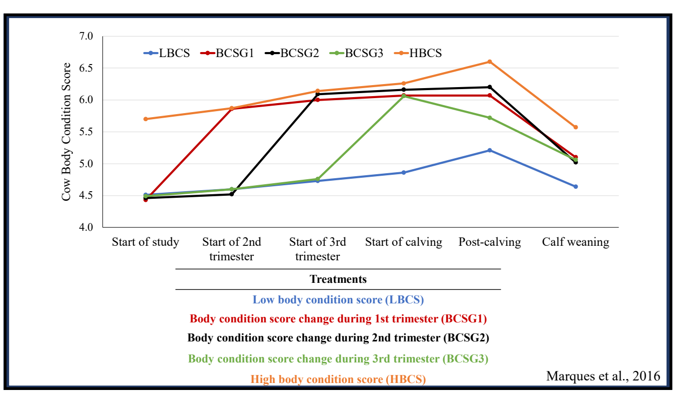
12


7.0
6.5
6.0
5.5
5.0
4.5
4.0
Cow Body Condition Score
LBCS
BCSG1
HBCS
Start of study
Start of 2nd trimester
Start of 3rd trimester
Start of calving
Post-calving
Calf weaning
Treatments
Low body condition score (LBCS)
Body condition score change during 1st trimester (BCSG1)
High body condition score (HBCS)
Marques et al., 2016

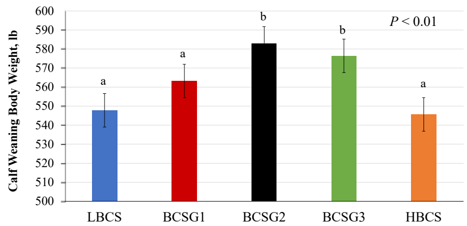
13


7.0
6.5
6.0
5.5
5.0
4.5
4.0
Cow Body Condition Score
LBCS
BCSG1
BCSG2
HBCS
Start of study
Start of 2nd trimester
Start of 3rd trimester
Start of calving
Post-calving
Calf weaning
Treatments
Low body condition score (LBCS)
Body condition score change during 1st trimester (BCSG1)
Body condition score change during 2nd trimester (BCSG2)
High body condition score (HBCS)
Marques et al., 2016

14


7.0
6.5
6.0
5.5
5.0
4.5
4.0
Cow Body Condition Score
LBCS
BCSG1
BCSG2
BCSG3
HBCS
Start of study
Start of 2nd trimester
Start of 3rd trimester
Start of calving
Post-calving
Calf weaning
Treatments
Low body condition score (LBCS)
Body condition score change during 1st trimester (BCSG1)
Body condition score change during 2nd trimester (BCSG2)
Body condition score change during 3rd trimester (BCSG3)
High body condition score (HBCS)
Marques et al., 2016

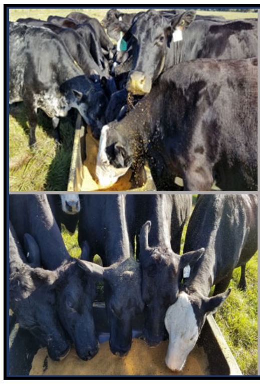
15



Treatments
Low body condition score (LBCS)
Body condition score change during 1st trimester (BCSG1)
Body condition score change during 2nd trimester (BCSG2)
Body condition score change during 3rd trimester (BCSG3)
High body condition score (HBCS)

Marques et al., 2016

16

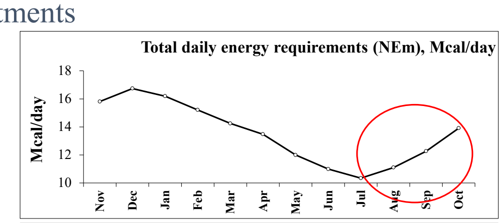


Can we be more cost-effective in our supplementation strategy?

How does **TIMING** of supplementation during late gestation influence calf post-natal performance?

17

Treatments



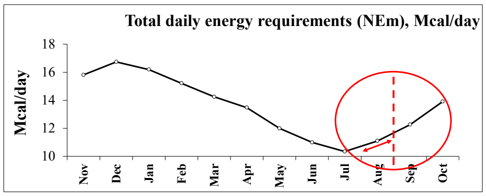
Treatment	d 0 to 42	d 42 to 84	d 84 until end of breeding season
Control (CON)	0 lb/d	0 lb/d	4 lb/d
Late84	2.25 lb/d	2.25 lb/d	4 lb/d

d 84 = near calving
d 140 to 224 = breeding season (1 bull/pasture)

d 0 to 84 = DDG supplement (32% CP and 83% TDN on DM basis)
d 84 to end of breeding season = sugarcane molasses supplement

18

Treatments



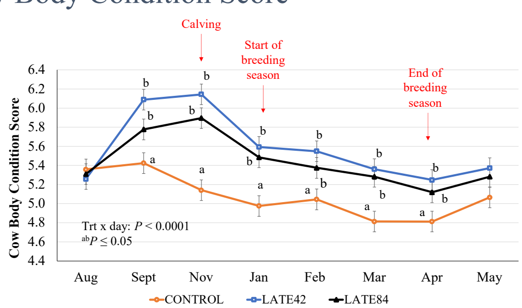
Treatment	d 0 to 42	d 42 to 84	d 84 until end of breeding season
Control (CON)	0 lb/d	0 lb/d	4 lb/d
Late84	2.25 lb/d	2.25 lb/d	4 lb/d
Late42	4.50 lb/d	0 lb/d	4 lb/d

d 84 = near calving
d 140 to 224 = breeding season (1 bull/pasture)

d 0 to 84 = DDG supplement (32% CP and 83% TDN on DM basis)
d 84 to end of breeding season = sugarcane molasses supplement

19

Cow Body Condition Score



20

Cow Reproduction

Item	Treatment: MOL-W	LATE42	LATE84	SEM	*P* - value
1st calf crop					
Calving rate, %	98.2	97.8	94.4	2.43	0.48
Calving date, d of study	88	87	84	3.3	0.68
Calf plasma IgG, mg/mL	52.4	45.1	46.5	4.77	0.44
2nd calf crop					
Pregnancy diagnosis on d 283, %	90.1	87.0	91.8	3.74	0.67
Calving rate, %	89.8	89.2	88.1	4.60	0.96
Male calves, %	52	51	61	7.4	0.57
Calf birth weight, lb	84	84	79	6.2	0.59
Calving date, d of study	457	448	456	4.8	0.40

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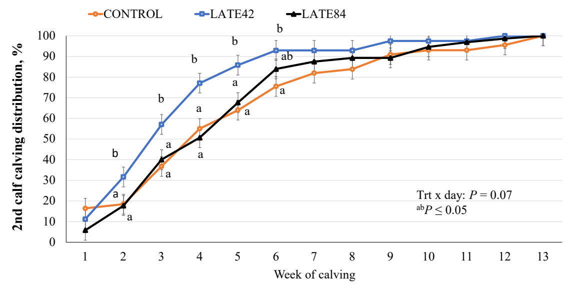
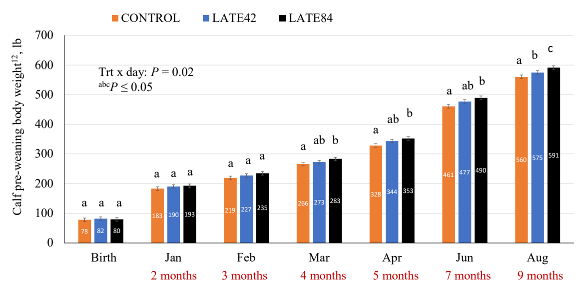
Cow Reproduction



22

Pre-weaning calf growth

[1]Adjusted for calf sex ($P < 0.05$)
[2]Adjusted for calving date ($P < 0.05$)



23

Steer immunity

Item	Treatment			SEM	*P* - value	
	MOL-W	LATE42	LATE84		Trt	Trt × Day
Serum BVDV-1, log_2	**3.21**	**3.99**	**3.59**	0.405	0.39	0.91
Serum PI_3, log_2	**2.12**	**3.61**	**3.16**	0.588	0.26	0.52
Seroconversion BVDV-1, % total	**78**	**85**	**88**	7.2	0.64	0.27
Seroconversion PI_3, % total						
D 347	**21^{a}**	**63^{b}**	**54^{ab}**	11	0.32	0.01
D 389	**80^{a}**	**82^{a}**	**83^{a}**			

$^{ab}P \leq 0.05$

24

Steer carcass characteristics

	Treatment				
Item	MOL-W	LATE42	LATE84	SEM	*P* - value
Hot Carcass Weight, lb	741	745	744	12.0	0.98
Dressing Percent, %	59.7	60.5	59.8	0.30	0.12
12th rib fat thickness, in	0.70	0.67	0.64	0.089	0.49
Longissimus muscle area, in^2	12.3	12.5	12.5	1.58	0.74
KPH, %	2.92	2.62	2.67	0.13	0.20
Yield Grade	3.8	3.6	3.5	0.14	0.33
Marbling	521[a]	570[b]	545[ab]	15	0.07
Average choice, %	5[a]	36[b]	17[ab]	9.3	0.10
Low choice, %	72	46	58	10	0.17
Select, %	23	19	25	8	0.87

[ab]$P \leq 0.05$

25

Steer carcass characteristics

	Treatment				
Item	MOL-W	LATE42	LATE84	SEM	*P* - value
Hot Carcass Weight, lb	741	745	744	12.0	0.98
Dressing Percent, %	59.7	60.5	59.8	0.30	0.12
12th rib fat thickness, in	0.70	0.67	0.64	0.089	0.49
Longissimus muscle area, in^2	12.3	12.5	12.5	1.58	0.74
KPH, %	2.92	2.62	2.67	0.13	0.20
Yield Grade	3.8	3.6	3.5	0.14	0.33
Marbling	521[a]	570[b]	545[ab]	15	0.07
Average choice, %	5[a]	36[b]	17[ab]	9.3	0.10
Low choice, %	72	46	58	10	0.17
Select, %	23	19	25	8	0.87

[ab]$P \leq 0.05$

26

Take home message:

The best supplementation strategy for the cow was not the same for the calf.

Manipulations to the maternal diet during late gestation can increase calf weights at weaning, enhance immunity and shift the percentage of steers grading choice.

27

Supplementing methionine to grazing beef cows

1. Methionine is a limiting AA for beef cows during late gestation when grazing low quality forages

2. Methionine can influence the post-natal growth of offspring

28

Methionine supplementation in *heifers*

- **36 Brangus crossbred heifers/yr**
- **Supplementation**
  - Began 56 d before parturition (d 0)
  - Ended when all heifers within a pasture calved (d 74)

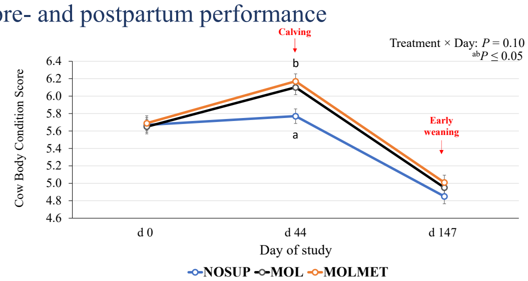
Treatments
No pre- or postpartum supplement (NOSUP)
2.2 lb/d of molasses/urea on a DM basis (MOL)
2.2 lb/d of MOL + 15 g/d of methionine hydroxy analog (Alimet; MOLMET)

- **Calves early weaned on d 147**
  - **Calves from each treatment fed a high-concentrate diet during a 47-d backgrounding period**

Moriel et al., 2020

29

Cow pre- and postpartum performance



Treatment
No pre- or postpartum supplement (NOSUP)
2.2 lb/d of molasses/urea on a DM basis (MOL)
2.2 lb/d of MOL + 15 g/d of methionine hydroxy analog (MOLMET)

Moriel et al., 2020

30

Cow pre- and postpartum performance

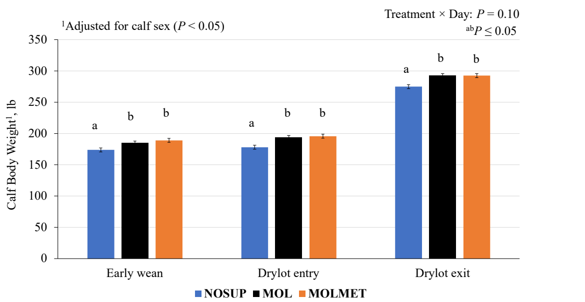
Item	Treatment NOSUP	MOL	MOLMET	SEM	*P* - value
Days on treatment					
Pre-partum	59	57	55	5.1	0.85
Post-partum	18	15	18	4.6	0.42
Pregnant cows d 288, %	83.3	90.0	90.9	10.1	0.82
Calf birth weight[1], lb	55	62	58	2.2	0.13
Calving date 2nd calf, day of the study	453	452	445	7.4	0.68

[ab] $P \leq 0.05$
[1] Adjusted for calf sex ($P < 0.05$)

Moriel et al., 2020

31

Calf feedlot performance



Moriel et al., 2020

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Calf feedlot performance

Item	Treatment NOSUP	MOL	MOLMET	SEM	*P* - value
ADG, lb/d					
Birth to early wean (d 0 to 147)	1.28	1.25	1.36	0.064	0.48
Drylot (d 154 to 201)	1.85[a]	2.00[b]	2.18[b]	0.068	0.02
Birth to d 201	1.41[a]	1.58[b]	1.65[b]	0.081	0.10
Total DMI, lb/d (d 154 to 201)	8.21	8.62	8.62	0.249	0.41
G:F (d 154 to 201)	0.246	0.243	0.236	0.006	0.51

[ab] $P \leq 0.05$

Moriel et al., 2020

33

Calf feedlot performance

Item	Treatment NOSUP	MOL	MOLMET	SEM	*P* - value
ADG, lb/d					
Birth to early wean (d 0 to 147)	1.28	1.25	1.36	0.064	0.48
Drylot (d 154 to 201)	1.85[a]	2.00[b]	2.18[b]	0.068	0.02
Birth to d 201	1.41[a]	1.58[b]	1.65[b]	0.081	0.10
Total DMI, lb/d (d 154 to 201)	8.21	8.62	8.62	0.249	0.41
G:F (d 154 to 201)	0.246	0.243	0.236	0.006	0.51

[ab]$P \leq 0.05$

Moriel et al., 2020

34

Calf immune response

Item	Treatment NOSUP	MOL	MOLMET	SEM	*P* - value Trt	Trt x day
Plasma glucose, mg/dL	89.0	90.2	90.4	1.13	0.66	0.72
Plasma cortisol, ug/dL	2.05	1.99	1.87	0.15	0.71	0.99
Plasma haptoglobin, mg/mL	0.56	0.51	0.50	0.044	0.56	0.33
Serum BVDV-1						
Titers, log_2	2.45	3.20	2.42	0.306	0.13	0.11
Positive seroconversion, % of total	56.1[a]	84.2[b]	78.7[b]	7.16	0.02	0.11
Serum PI-3						
Titers, log_2	4.72	4.67	4.74	0.266	0.99	0.22
Positive seroconversion, % of total	83.9[a]	100[b]	94.3[b]	4.15	0.01	0.27

[ab]$P \leq 0.05$

Moriel et al., 2020

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Calf immune response

Item	Treatment NOSUP	MOL	MOLMET	SEM	*P* - value Trt	Trt x day
Plasma glucose, mg/dL	89.0	90.2	90.4	1.13	0.66	0.72
Plasma cortisol, ug/dL	2.05	1.99	1.87	0.15	0.71	0.99
Plasma haptoglobin, mg/mL	0.56	0.51	0.50	0.044	0.56	0.33
Serum BVDV-1						
Titers, log_2	2.45	3.20	2.42	0.306	0.13	0.11
Positive seroconversion, % of total	56.1[a]	84.2[b]	78.7[b]	7.16	0.02	0.11
Serum PI-3						
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Positive seroconversion, % of total	83.9[a]	100[b]	94.3[b]	4.15	0.01	0.27

[ab]$P \leq 0.05$

Moriel et al., 2020

36

Methionine supplementation in *mature cows*

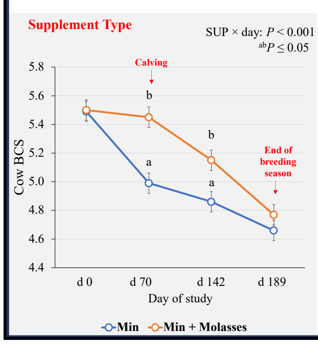
- 160 multiparous Brangus cows
- Supplement began on d 0
  - 70 d before calving

	Methionine (MET)	No Methionine (NoMET)
Trace Mineral (MIN)	**MIN × MET** 56 g/d Min + 15 g/d Met	**MIN × NoMET** 56 g/d Min + 0 g/d Met
Molasses + MIN (MOL)	**MOL × MET** 3 lb/d Mol + 56 g/d Min + 15 g/d Met	**MOL × NoMET** 3 lb/d Mol + 56 g/d Min + 0 g/d Met

Palmer et al., 2020

37

Cow BCS



Palmer et al., 2020

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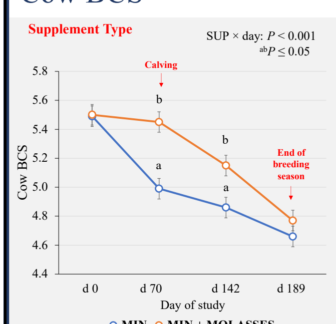
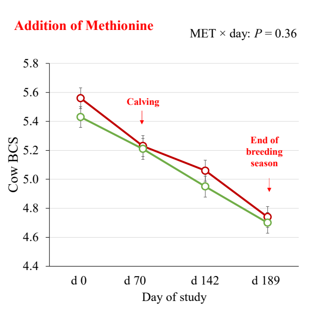
Cow BCS





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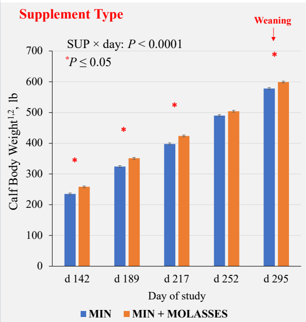
Pre-weaning calf growth

[1]Adjusted for calf sex ($P < 0.05$)
[2]Adjusted for calving date ($P < 0.05$)

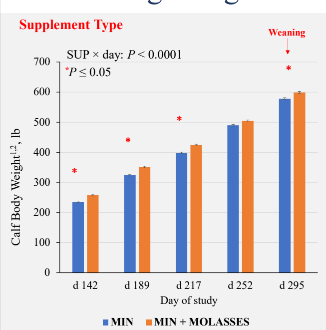


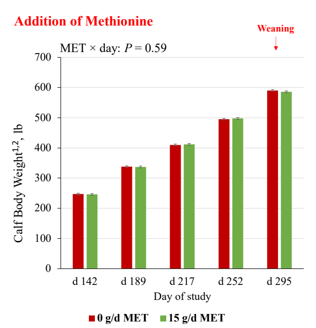
Palmer et al., 2020

40

Pre-weaning calf growth

[1]Adjusted for calf sex ($P < 0.05$)
[2]Adjusted for calving date ($P < 0.05$)





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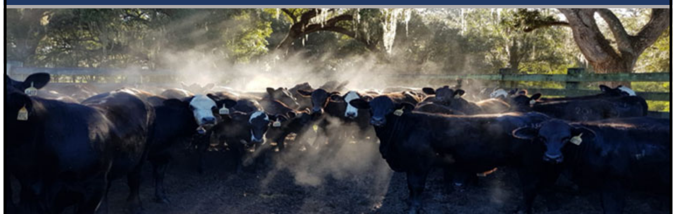
Pre-calving nutrition….

- Enhances cow BCS at calving and can lead to cows calving earlier in the subsequent breeding season
- Increases calf weight at weaning
- Improves calf response to vaccination
- Influences carcass quality grades by improving marbling

42

Thank you



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