

Effects of feeding a ruminally protected lysine (AjiPro™-L) from calving to the fourth week of lactation on production of high producing lactation dairy cattle.

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Objectives

examine the effects of rumen protected lysine (AjiPro™-L) supplementation dosage on production performance (milk yield and milk components) of early lactation (wk 1-4pp) cows and response to withdrawal



PROCEDURES:

- Spruce Haven Farm and Research Center, Auburn, NY.
- Sixty-nine multiparous cows
- 3 treatments with 23 cows/trt.
- Cows (multiparous) were balanced across treatments based on their previous lactation 305d ME.
- Cows were housed in individual tie-stalls.

TREATMENTS:

- a) Control: Standard herd diet
- b) Same as a with 100g/d of AjiPro-L
- c) Same as a with 200g/d of AjiPro-L

PROCEDURES:

Treatment Initiation:

- Day 1 postpartum, remain on treatment for 4 weeks.

Treatment Administration:

- 500g/d of AjiPro-L-corn meal premixes incorporated into the TMR.
- The three premixes contained 0, 100 and 200g of AjiPro-L with the remaining comprised of cornmeal.

PROCEDURES:

- AjiPro-L composition:
 - 50% L-LysHCl (40% L-Lys + 10% HCl)
 - 50% maximally saturated oil and lecithin,
 - expected bio-availability ~ 40%.
- Therefore,
 - feeding 100 and 200 g/cow/d of AjiPro-L should provide 16 and 32g/cow/d of intestinally available lysine.

Ration Ingredient Composition

<u>Ingredient</u>	<u>% DM</u>
■ Corn Silage	23.5
■ Haylage	20.3
■ Western Alfalfa Hay	4.1
■ Citrus Pulp	11.8
■ Corn Meal	17.2
■ Soybean meal	5.93
■ Roasted soybeans	4.71
■ Canola meal	2.74
■ Corn gluten feed	1.88
■ Blood meal	1.16
■ Soy Plus	1.05
■ Tallow	.41
■ Min/Vit	2.81
■ Test article	2.58

Ration Chemical Composition

<u>Nutrient</u>	<u>Control</u>	<u>Treatment</u>	
		<u>100g</u> <u>AjiPro-L</u>	<u>200g</u> <u>AjiPro-L</u>
Crude Protein, %	17.6	17.7	17.8
RUP, %	42.1	42.4	42.6
Soluble Protein, %CP	35.6	35.5	35.4
Ether Ext., %	5.2	5.3	5.4
Starch, %	24.5	24.4	24.3
Sugar, %	7.0	7.0	7.0
Soluble Fiber, %	7.1	7.1	7.0
CPM AA Balance			
Lys, g	13.4	28.6	43.8
Lys, % rqd ¹	110	121	132
Lys, % MP	6.99	7.67	8.36
<u>Lys:Met Ratio</u>	<u>3.49:1</u>	<u>3.86:1</u>	<u>4.24:1</u>

¹Rqd based on 613 kg Cow, 40DIM, 38.1 kg Milk, 3.6% Fat, 3.20% CP

PROCEDURES:

Data recorded was as follows:

- ***Phase 1:***
- Housed in individual tie stalls week 1 thru 4
- DM intake: Daily individual intakes.
- Daily milk weights (2x milking)
- Milk composition: am/pm composite :
 - fat, crude protein, MUN, lactose, and somatic cell
- Blood samples:
 - prior to fresh daily feed offering in the morning
 - day 14 of the study.
 - Blood was collected via tail venapuncture for determination of Glu, NEFA and BHBA concentrations.
- Body weights and condition scores were recorded
 - calving, wk 1 and 4

PROCEDURES:

Data recorded was as follows:

- ***Phase 2:***
- Housed in a common group pen week 5-12, received control diet
- Daily milk weights (2x milking)
- Milk composition: am/pm composite :
 - fat, crude protein, MUN, lactose, and somatic cell
- Body weights and condition scores recorded week 4, 8, and 12

STATISTICAL ANALYSIS

- SAS

- The model was as follows:

$y = \text{Trt}$

Cow (Trt) [Random Effect, Error term]

Week

Trt x Week

Effect of Rumen Protected Lysine (AjiPro-L) on Dry Matter Intake from 1-4 Weeks of Lactation

<i>Variable</i>	<u>AjiPro-L treatments</u>			<i>SEM</i>	<i>P</i> <
	<i>Cont</i>	<i>100g</i>	<i>200g</i>		
n	22	22	21		
Lact. No.	2.4	2.3	2.4		
DMI, kg	17.9	18.4	17.6	.28	.11
DMI, % Bwt	2.75	2.91	2.71	.09	.25

Effect of Rumen Protected Lysine (AjiPro-L) on Milk Yield Parameters from 1-4 Weeks of Lactation

<i>Variable</i>	<u>-----AjiPro-L Treatments-----</u>			<i>SEM</i>	<i>P</i> <
	<i>Cont</i>	<i>100g</i>	<i>200g</i>		
Cows/trt	22	22	21		
Milk, kg	37.1 ^b	38.5 ^a	39.2 ^a	.32	.01
Milk/DMI	2.14 ^b	2.13 ^b	2.28 ^a	.03	.01
3.5 FCM	44.2 ^b	47.3 ^a	47.9 ^a	.56	.01
Fat, kg	1.73 ^b	1.89 ^a	1.91 ^a	.03	.01
Protein, kg	1.18	1.20	1.21	.02	.30

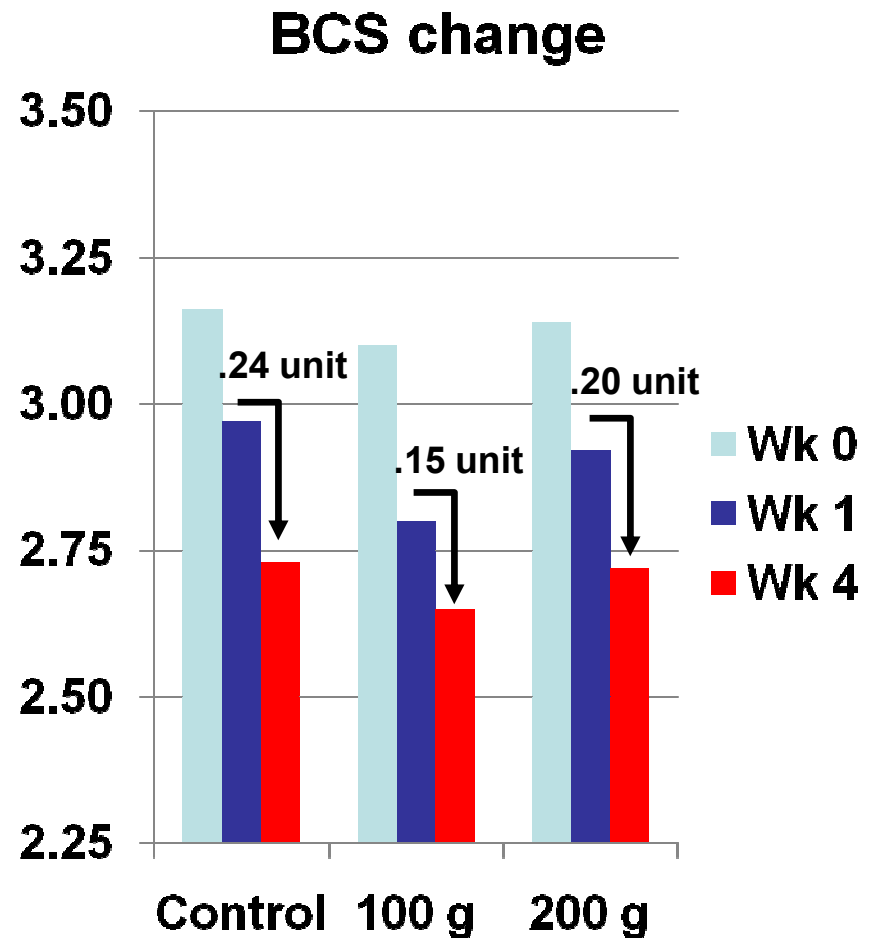
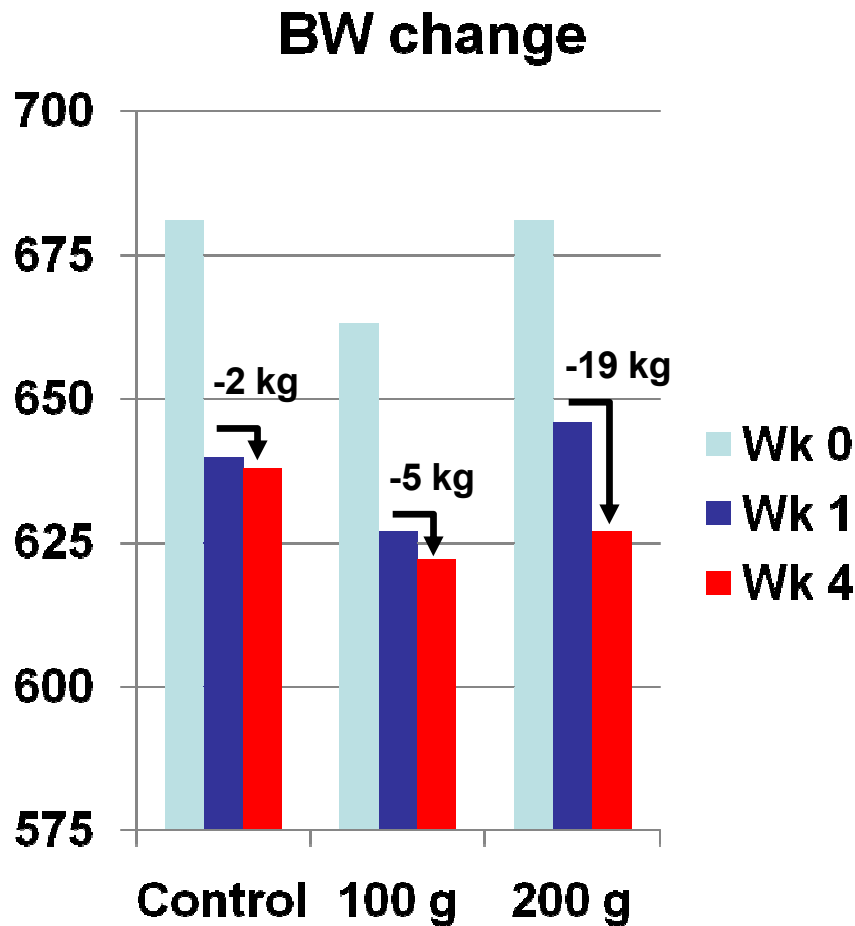
^{ab}Means in the same row with different superscripts are statistically different (*P*<)

Effect of Rumen Protected Lys (AjiPro-L) on Milk Composition Parameters from 1-4 Weeks of Lactation

<i>Variable</i>	<u>-----AjiPro-L Treatments-----</u>			<i>SEM</i>	<i>P</i> <
	<i>Cont</i>	<i>100g</i>	<i>200g</i>		
Cows/trt	22	22	21		
Fat, %	4.74 ^b	4.97 ^a	4.89 ^b	.07	.07
Protein, %	3.20	3.17	3.11	.04	.22
Lactose, %	4.75	4.74	4.74	.01	NS
SCC x1000	176	165	158	22	NS
MUN	9.72	9.92	10.24	.20	NS

^{ab}Means in the same row with different superscripts are statistically different ($P < .05$)

Effect of Rumen Protected Lys (AjiPro-L) on Body Weight and Body Condition from 1-4 Weeks of Lactation



Effect of Rumen Protected Lysine (AjiPro-L) on Plasma Glucose, NEFA and BHBA on Day 14 postpartum

<i>Variable</i>	<u>AjiPro-L treatments</u>			<i>SEM</i>	<i>P</i> <
	<i>Cont</i>	<i>100g</i>	<i>200g</i>		
n	22	22	21		
Glu, mg/dL	45.3 ^b	46.0 ^b	51.4 ^a	1.8	.04
NEFA, mEq/L	.325	.287	.361	.03	ns
BHBA, mg/dL	8.8	7.9	7.8	1.2	ns

PHASE 2: Figure 1 Milk: Week 1-12

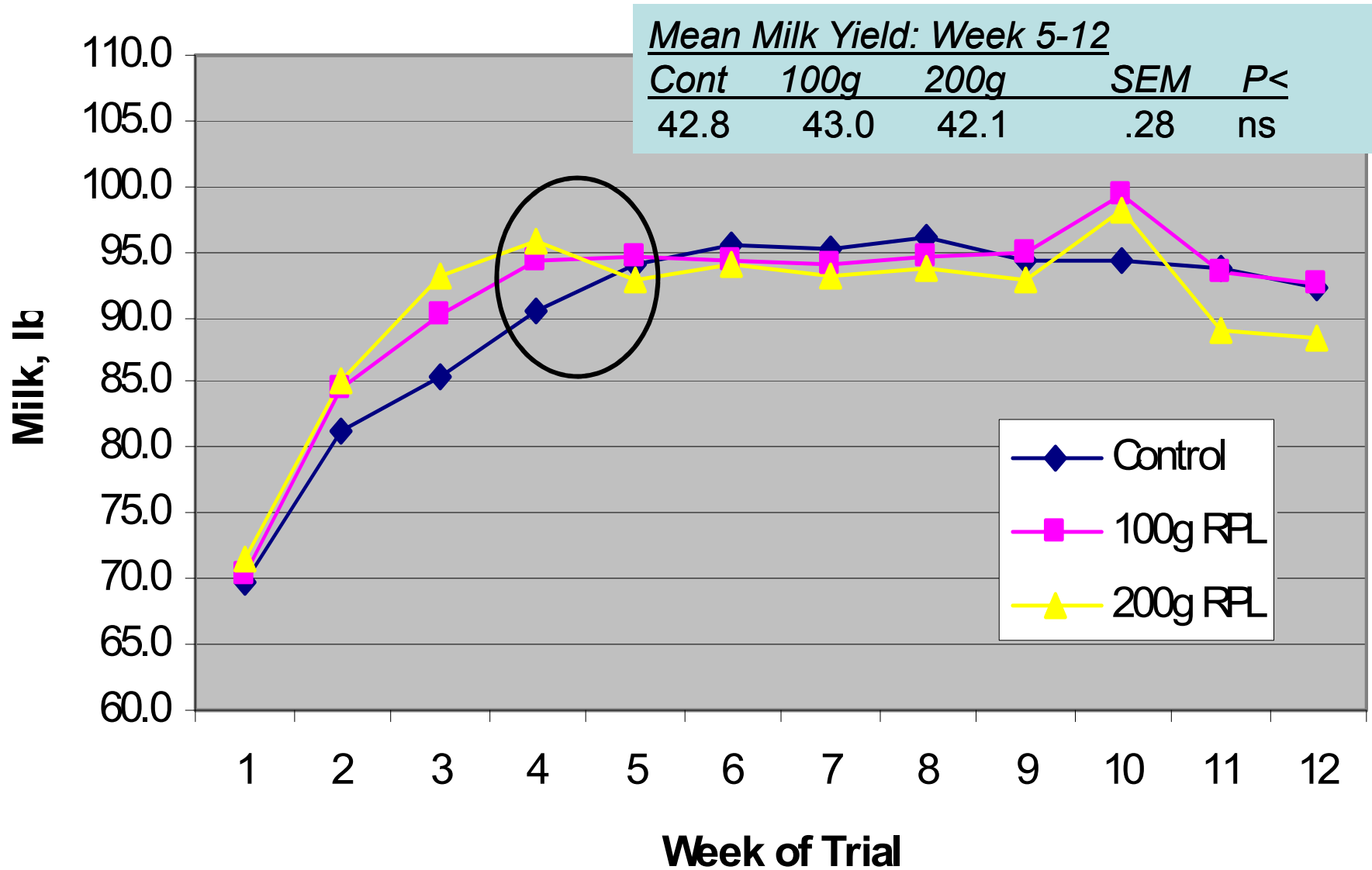


Figure 2. 3.5 FCM: Week 1-12

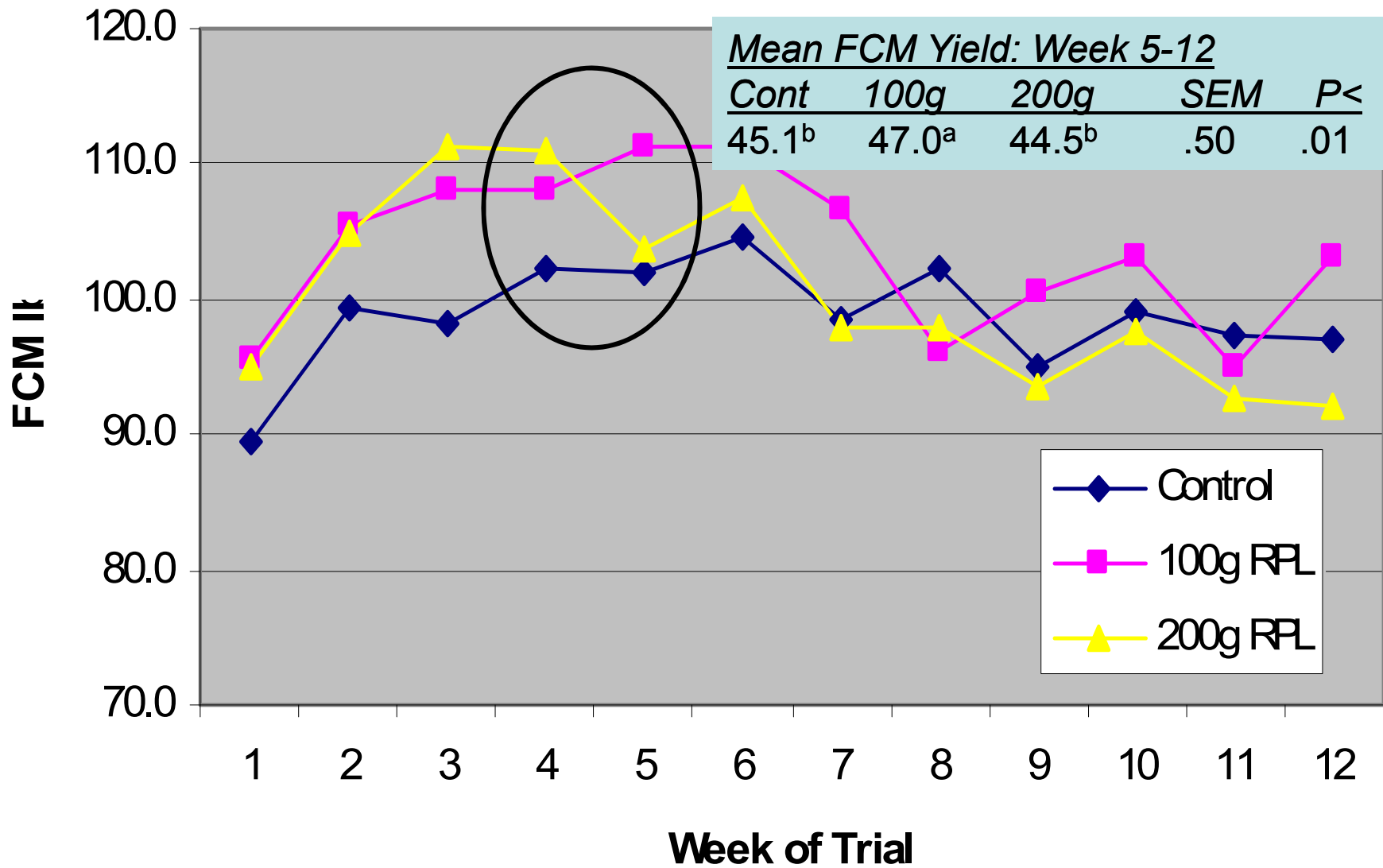


Figure 3. Fat Percentage Week 1-12

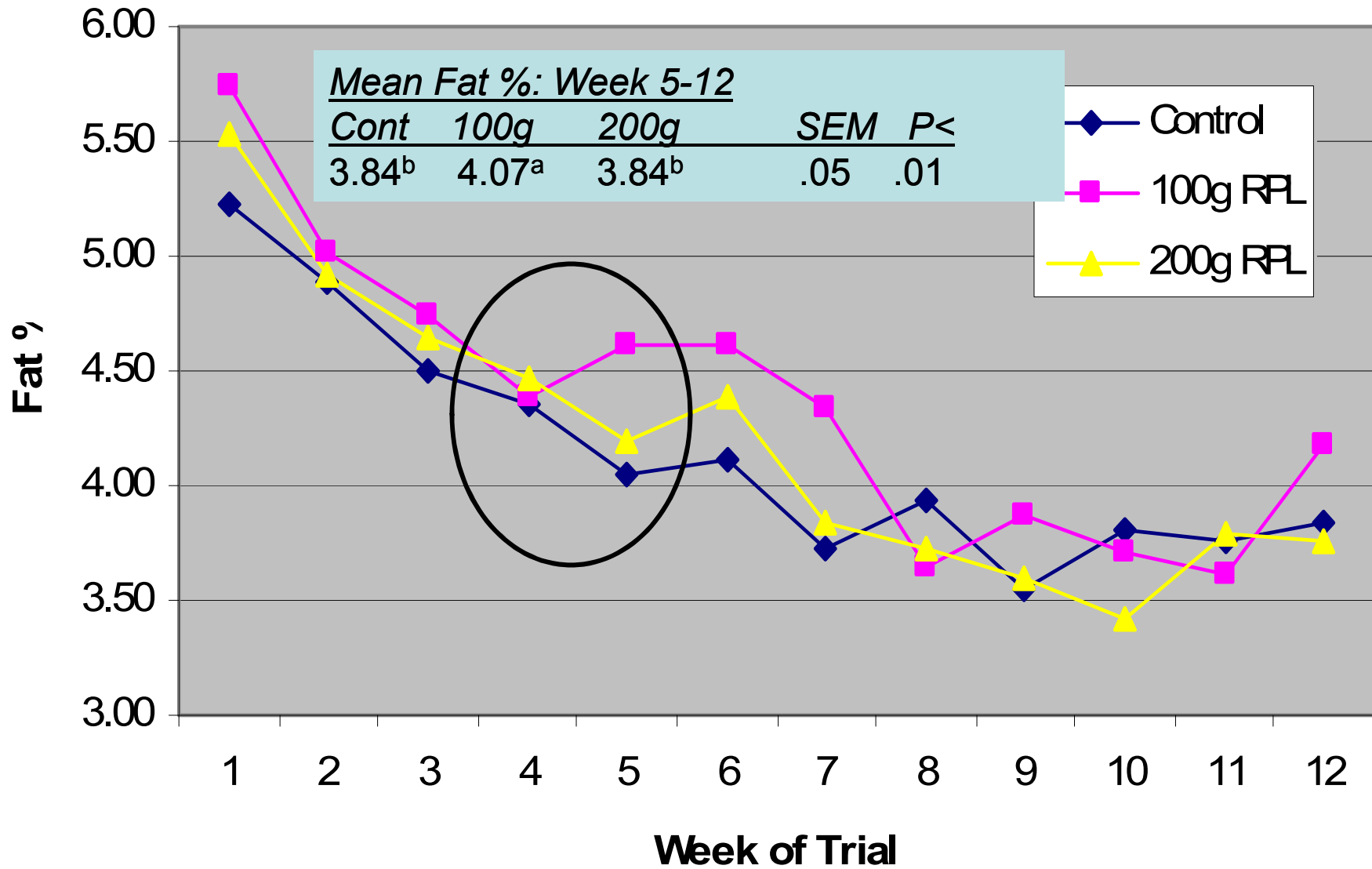


Figure 4 Protein Percentage Wk 1-12

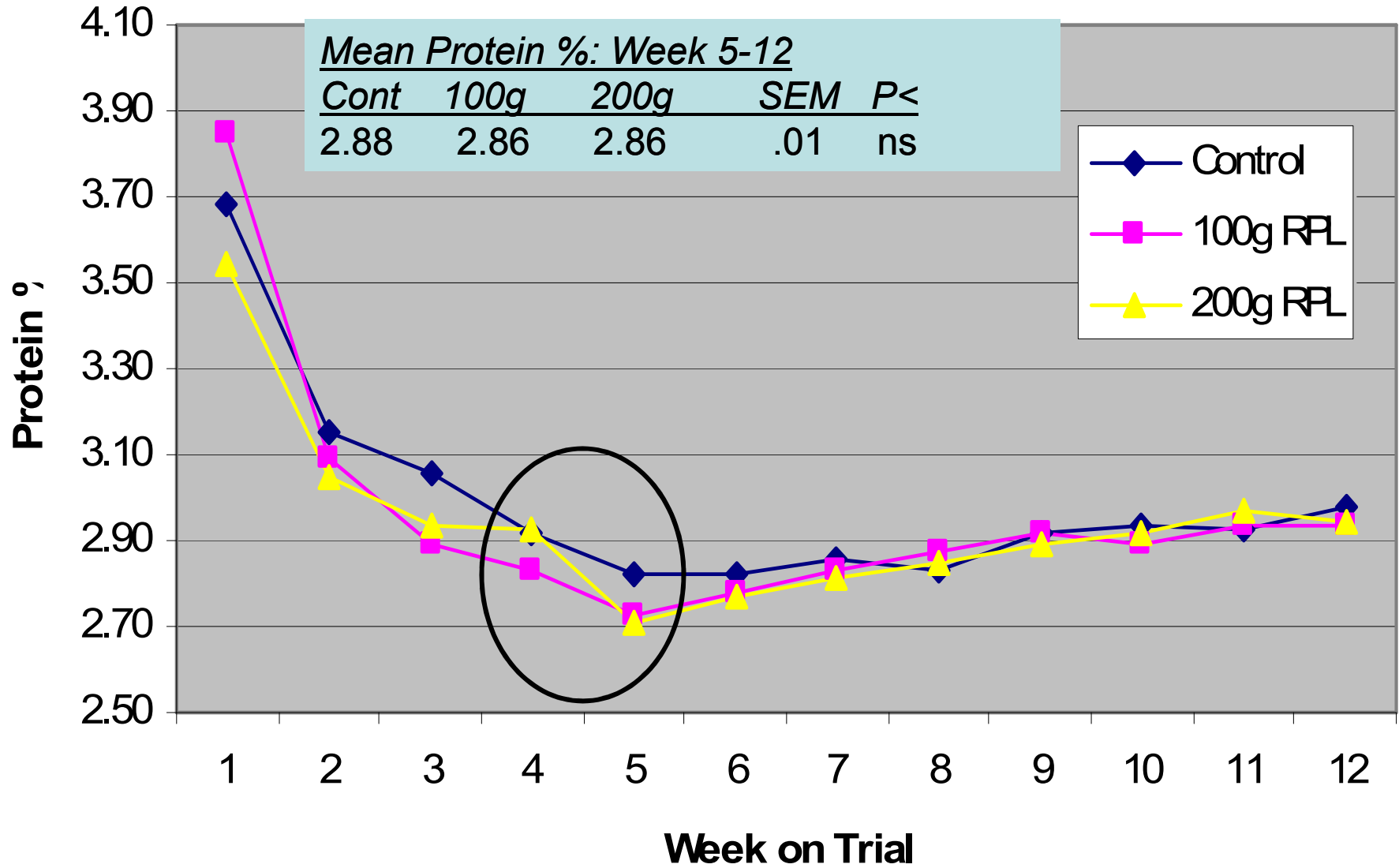


Figure 5 Fat Yeild Week 1-12

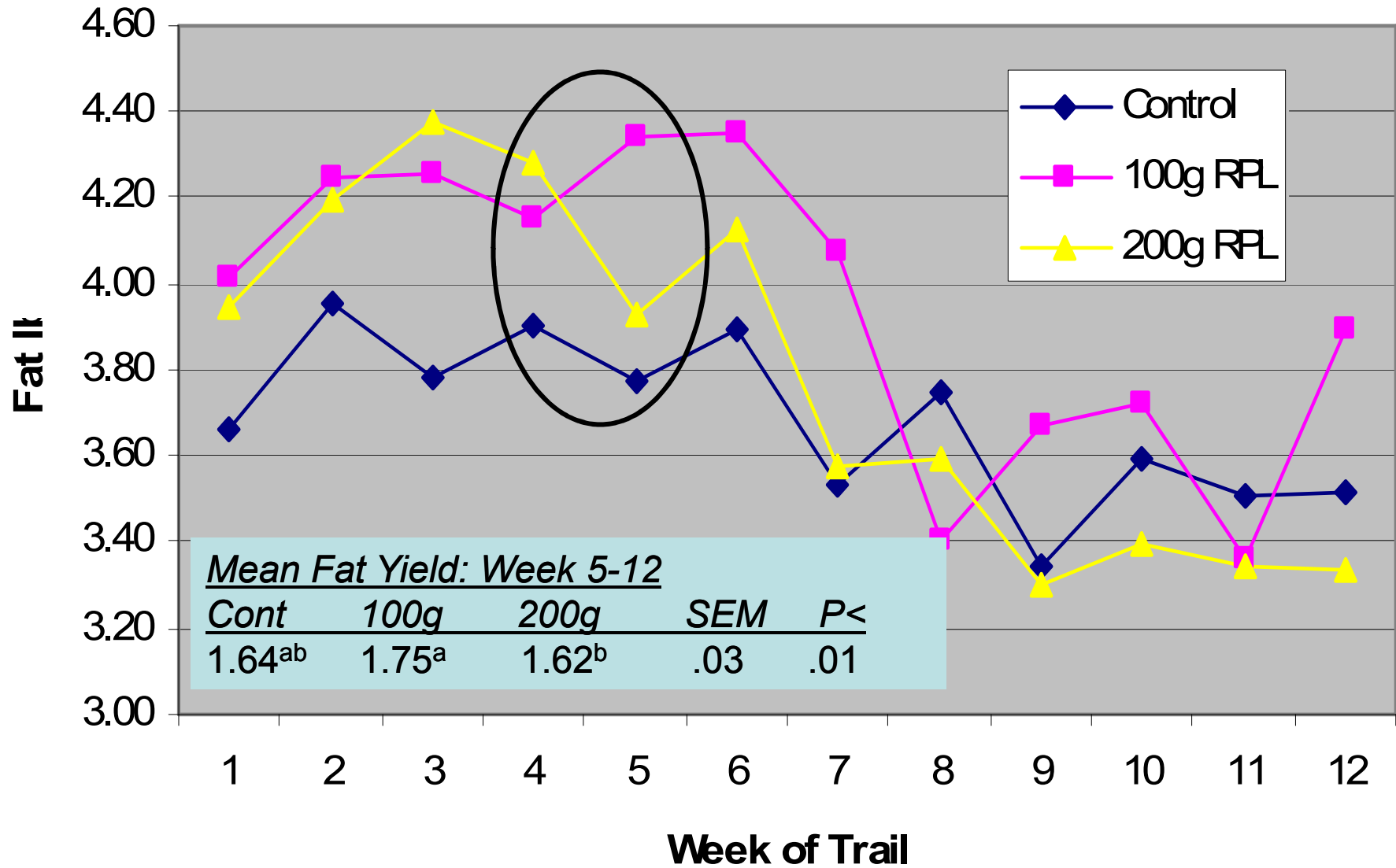
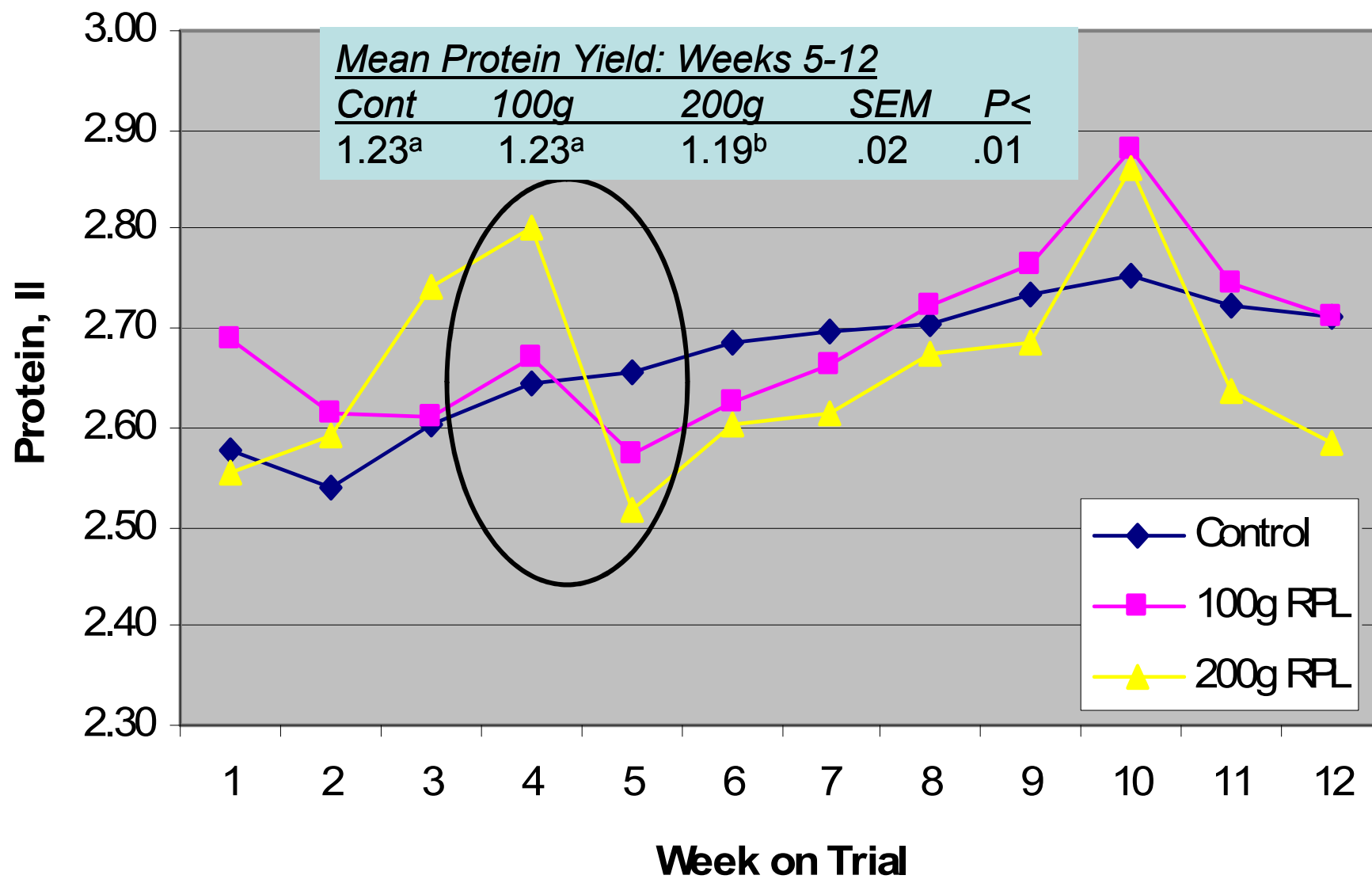
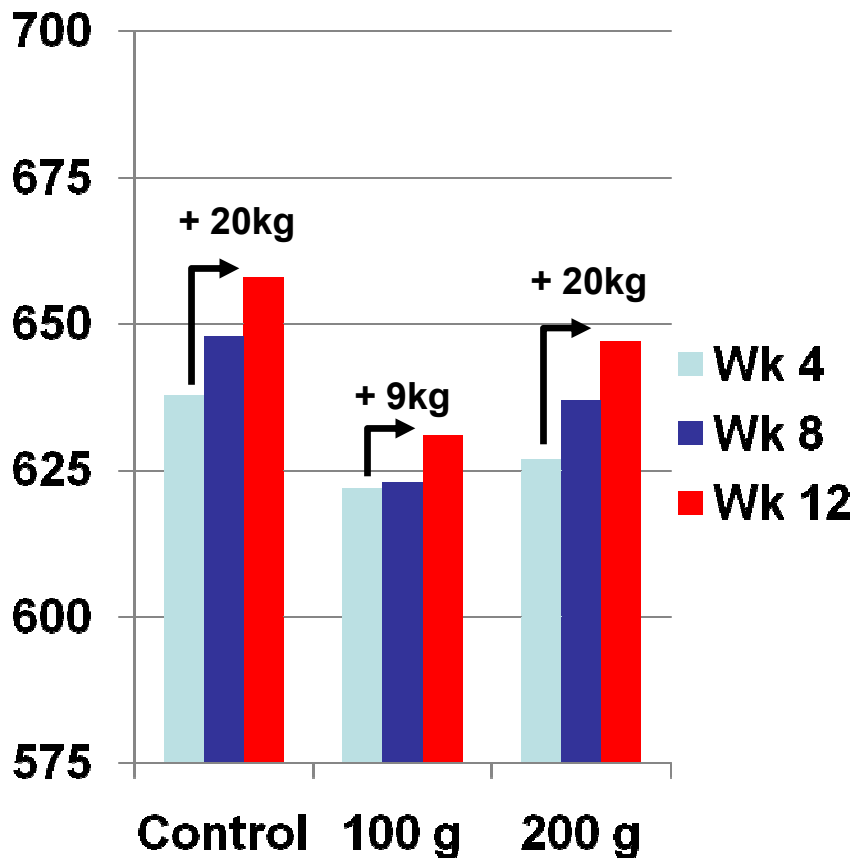


Figure 6 Protein Yeild Week 1-12

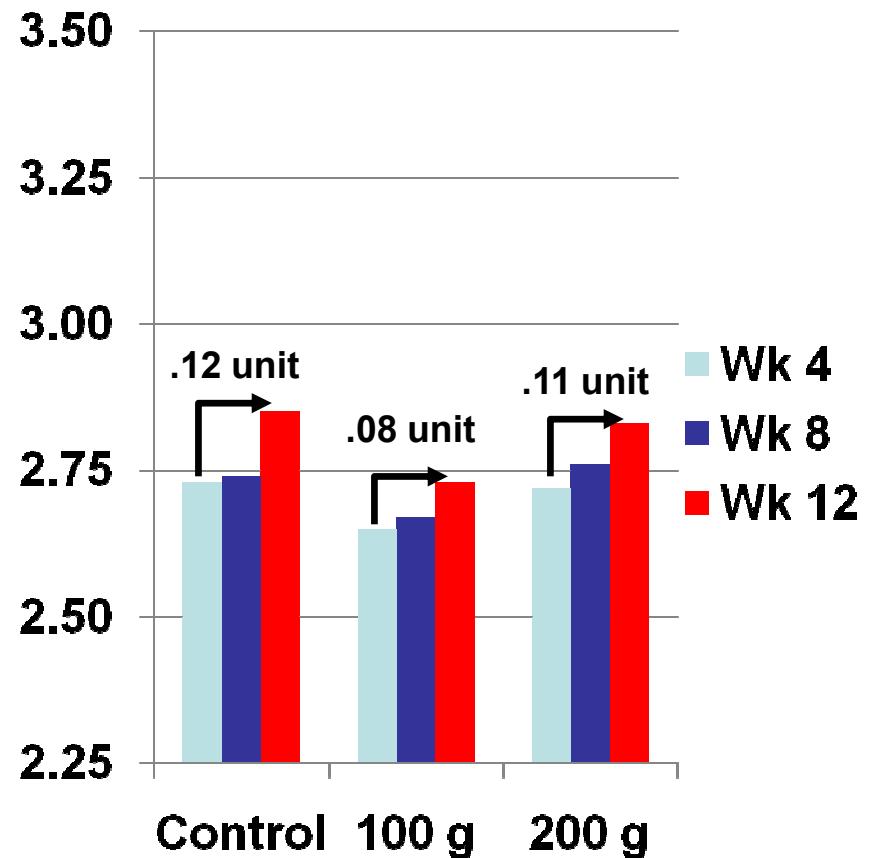


Effect of Rumen Protected Lys (AjiPro-L) on Body Weight and Body Condition from 5-12 Weeks of Lactation

BW change



BCS change



Phase 1: Week 1-4 postpartum

1. DMI was not affected by AjiPro-L; either absolute or as a percentage of body weight.
2. Supplementing AjiPro-L at either 100 or 200g increased milk yield, 3.5 FCM and fat yield compared to Control
3. During week 1 and 4 postpartum, cows supplemented with 100g AjiPro-L tended to lose less BW and BCS compared to 200g AjiPro-L.
4. There were no apparent health (metabolic or infectious) related challenges associated with supplementing AjiPro-L at either 100 or 200g/cow/d.

Phase 2: Week 5-12 postpartum and the immediate transition off AjiPro-L:

Upon removal of AjiPro-L:

Control and 200g cows continued a decline in milk fat % (.4 percentage units), however, those receiving 100g immediately increased by a mean of .2 percentage units.

Cows receiving 100g and Control dropped in milk protein by .1 percentage units, where 200g cows dropped .2 percentage units in protein.

During week 5-12 postpartum, cows supplemented with 100g AjiPro-L tended to recover BW and BCS more slowly compared to Control or 200g AjiPro-L while maintaining higher 3.5% FCM.

Conclusion

- Optimal lysine supplementation in a given dietary scenario maybe involved with “triggering” nutrient (both energy and protein) partitioning .