

The Carryover Effect

Improving the Omega-6 to Omega-3 balance with Strata G113 early lactation yields milk over entire lactation.

Agenda


- 1) Quick review of linear milk response data (Greco, 2013, University of Florida)
- 2) “New” Milk Data from the University of Florida (Garcia, 2014) showing carryover milk response from balancing omega-6s and omega-3s with Strata early lactation.
- 3) Conclusions & Field Application

M. Garcia, UFL 2014

Abstract and Poster, ADSA in Kansas City, July 22, 2014

Title:


Positive effect of fat supplementation in early postpartum period can continue throughout lactation after fat withdrawal



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Positive effect of fat supplementation in the early postpartum period can continue throughout lactation after fat withdrawal

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Abstract # 1712
Poster # T325

Introduction

- Cows in early lactation undergo a series of metabolic changes to adapt to an increased demand of nutrients for milk production.
- Many studies have reported that supplementation with fatty acids (FA) improved milk production of dairy cows in early lactation.
- Information on the long-term effect of fat supplementation after withdrawal from diets is lacking.

Hypothesis

- Improvement of milk yield by fat supplementation during early lactation has a positive carryover effect throughout the lactation period.

Objective

- To determine whether increased milk yield detected during the period of fat supplementation in early lactation would continue throughout lactation after supplemental fat was removed from the diet.

Materials and Methods

Dietary treatments, Experiment III:
Dietary ratios of n-6 to n-3 FA were adjusted by feeding different proportions of Ca salts of fatty acids (Virtus Nutrition) enriched in palm (PO), safflower (SO), or fish (FO) oils (% dietary DM)
 □ 6:1 - 0.53% PO, 0.70% SO, and 0.20% FO
 □ 5:1 - 0.55% PO, 0.37% SO, and 0.41% FO
 □ 4:1 - 0.73% PO, 0.00% SO, and 0.70% FO

Statistical Analysis:
 Analyzed using Mixed procedure of SAS as repeated measures (week of lactation)
 Experiments II and III used milk production from 4 to 10 DIM as covariate
 Orthogonal contrasts used to test treatment effects (Experiments I and II)
 Linear and quadratic effect of treatments were tested (Experiment III)

Results

	Nutritional composition of experimental diets								
	Experiment I			Experiment II			Experiment III		
	CTL	SFA	EFA	CTL	SFA	EFA	6:1	5:1	4:1
NEL, Mc/kg	1.59	1.67	1.67	1.63	1.68	1.68	1.62	1.62	1.62
CP, %	16.7	16.3	16.4	16.6	16.6	16.5	16.5	16.6	16.6
Starch, %	16.4	16.4	16.4	17.8	16.3	16.0	17.3	17.3	17.3
NDF, %	29.5	29.1	29.9	28.5	28.3	28.3	28.1	28.4	28.4
NDF for forage, %	19.0	19.0	19.0	17.8	17.8	17.8	17.1	17.1	17.1
ADF, %	16.6	16.3	16.8	15.9	15.9	15.3	15.6	15.9	16.0
Total FA, %	1.98	3.79	3.96	2.68	3.99	4.14	3.88	3.82	3.66
Ca, %	1.36	1.29	1.60	0.76	0.76	0.32	0.90	0.89	0.87
P, %	0.34	0.34	0.32	0.33	0.33	0.33	0.33	0.33	0.32

	Milk yield (kg/d) in each experiment				P value
	Treatments			BEM	
	CTL	SFA	EFA	BEM	EFA vs. Control
Exp. I Fat supplementation	31.8	31.3	34.3	1.0	0.28
Exp. II Fat supplementation	28.1	28.9	30.6	1.8	0.85
Exp. III Fat supplementation	37.7	39.9	42.8	1.1	0.01
Full lactation	21.5	24.5	24.1	1.3	0.06

	Treatments			BEM	P value	
	6:1	5:1	4:1		Linear	Quadratic
Exp. III Fat supplementation	43.0	44.7	46.4	1.0	0.02	0.98
Full lactation	33.5	35.2	36.7	1.3	0.10	0.97

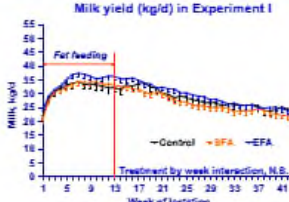
Materials and Methods

Animals (Holstein cows):
 Experiment I: n = 74, enrolled at 56 d prior to calving and maintained on treatments until 90 DIM
 Experiment II: n = 29, maintained on treatments from 15 to 106 DIM
 Experiment III: n = 39, maintained on treatments from 15 to 105 DIM
 For all experiments and after withdrawal of the fat supplements, all cows were fed a similar balanced diet ad libitum amounts.

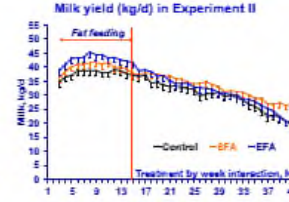
Dietary treatments, Experiment I and II:
 □ Control (CTL) - no fat supplement
 □ Saturated fat (SFA, "Energy Booster 100", Milk Specialties) fed at 1.7 and 1.9% of dietary DM pre- and postpartum, respectively in Exp. 1 and at 1.6% of dietary DM in Exp. 2
 □ Ca salts of essential fatty acids (EFA, "Megalac-R", Arm & Hammer) fed at 2.0 and 2.4% of dietary DM pre- and postpartum, respectively in Exp. 1 and at 1.8% of dietary DM in Exp. 2.

Results

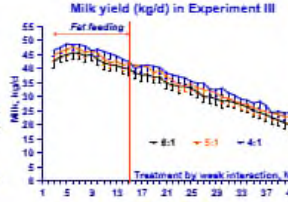
Milk yield (kg/d) in Experiment I



Milk yield (kg/d) in Experiment II



Milk yield (kg/d) in Experiment III



Summary

- When milk yield was increased because of supplementation with more FA or with particular FA for approximately 90 days in early lactation, mean daily milk yield measured over 43 weeks of lactation also was greater or tended to be greater by cows fed additional FA in early lactation in 3 of 4 instances. The exception occurred in Experiment II in which EFA-fed cows produced more milk compared with SFA-fed cows during the fat-supplementation period but that milk advantage did not carry through when the whole lactation period was evaluated.

Acknowledgments

- Experiments were partially funded by Virtus Nutrition, Corcoran, CA and Church & Dwight, Princeton, NJ.

Let's break it down...

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The Carryover Effect

Hypothesis & Objectives

Hypothesis¹

Improvement of milk yield by fat supplementation during early lactation has a positive carryover effect throughout the lactation period.

Objective¹

To determine whether increased milk yield detected during the period of fat supplementation in early lactation would continue throughout lactation after supplemental fat was removed from the diet.

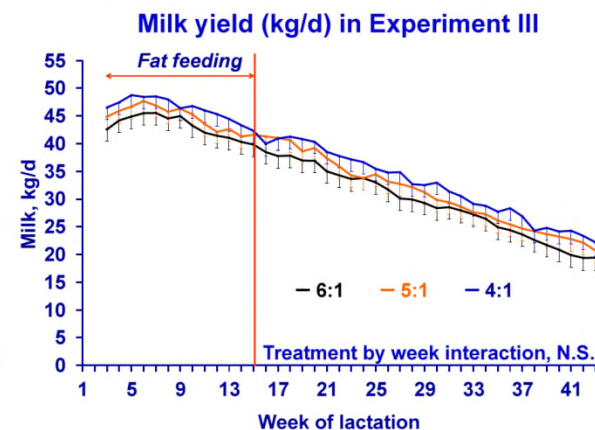
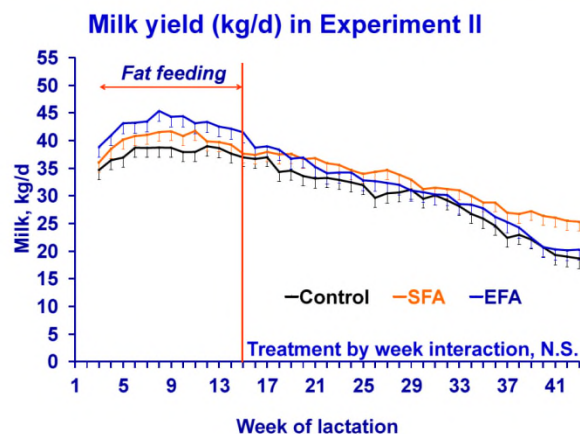
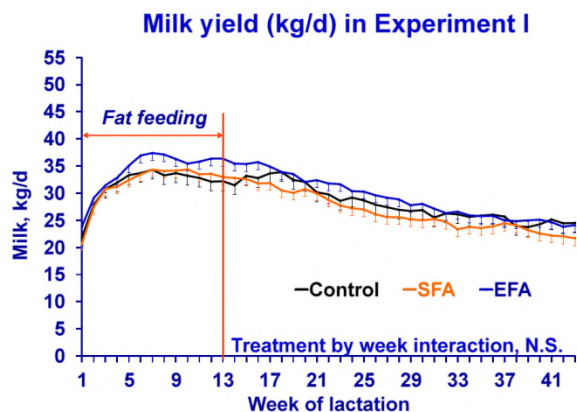
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The Carryover Effect

Experiment #3: Carryover effect from balancing omega fatty acids early lactation with Strata.¹



Results



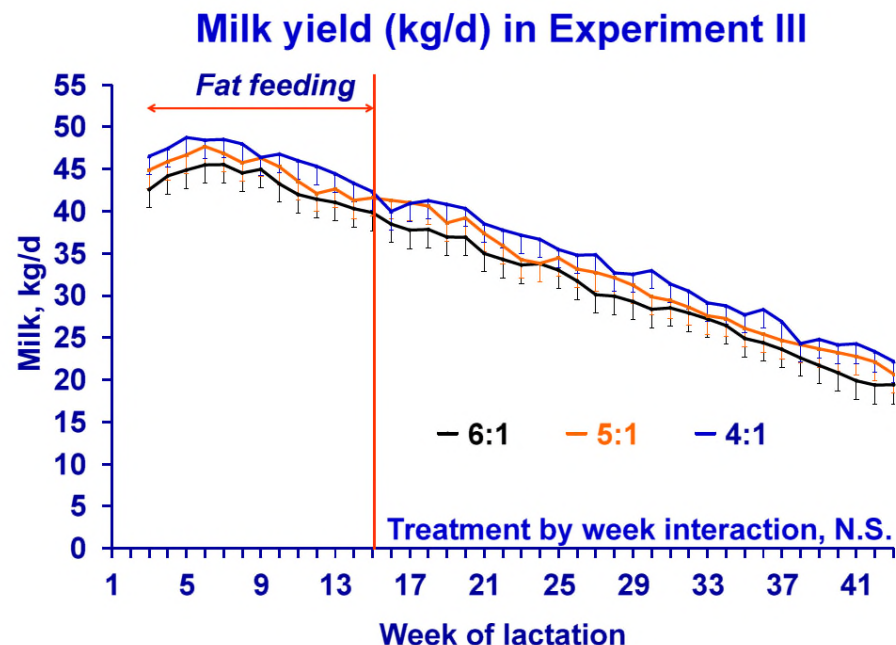
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The Carryover Effect

Initial Study Set-Up (Greco, 2013)²

Three Treatments with varying ratios of Omega:6 to Omega:3 in As Fed Diets (Iso-energetic & Iso-lipidic)

- 4:1 .4 lb. Strata
- 5:1 .22 lb. Strata
- 6:1 .1 lb. Strata



2. Greco et al. 2013, University of Florida

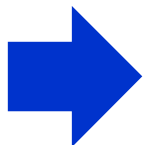
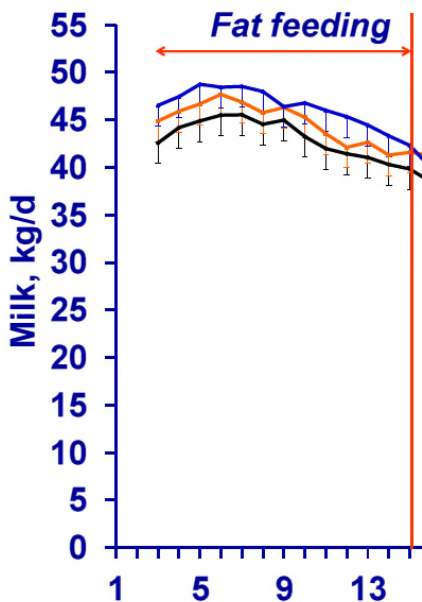
Initial Study Results

Milk Response Early Lactation

.1 vs. .4 lb. Strata Fed

**7.4 LB
Milk**

**10.1 LB
FCM**

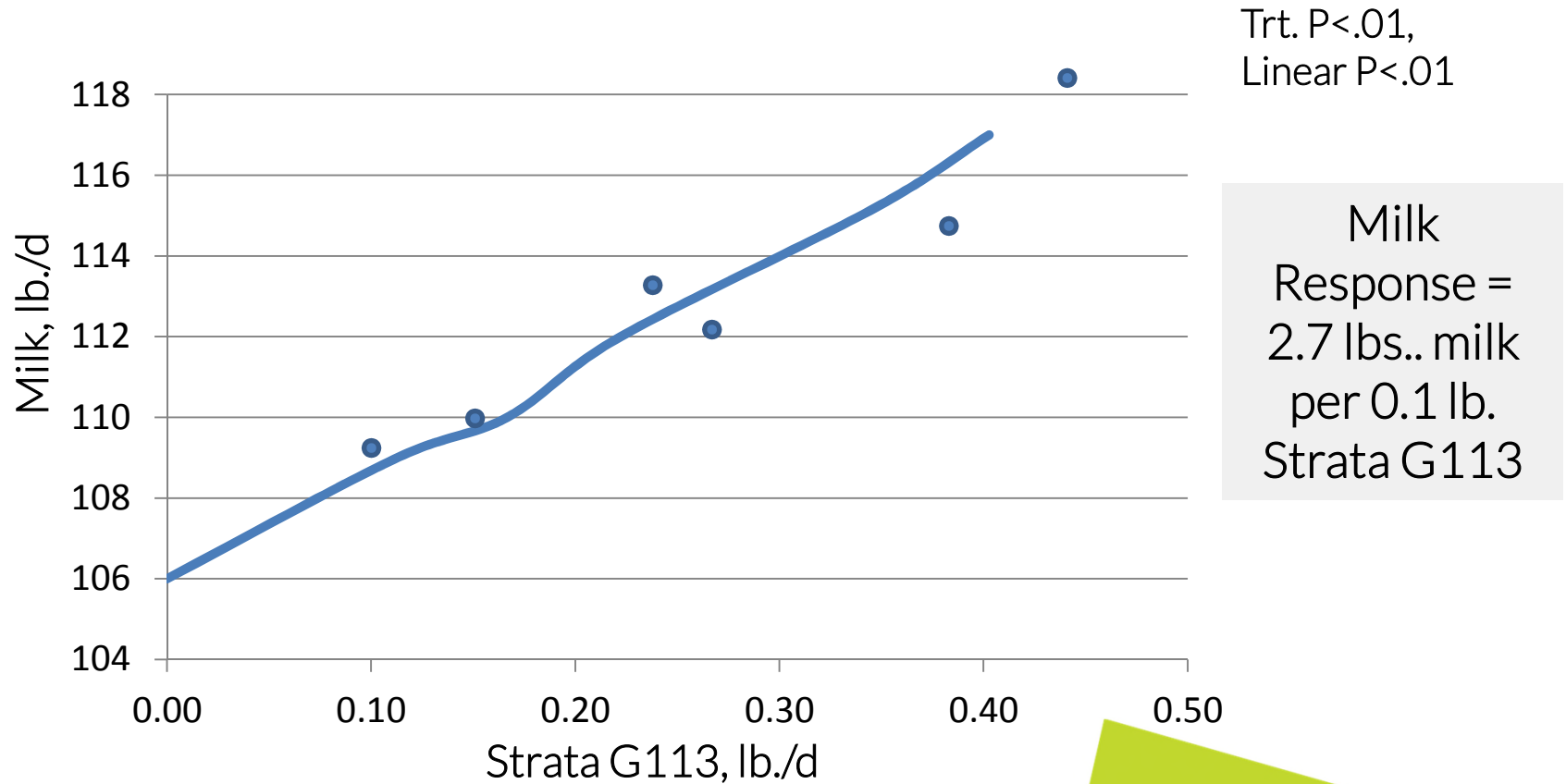


	4:1 (.4 lb. Strata)	5:1 (.22 lb. Strata)	6:1 (.1 lb. Strata)
Milk	103.2	98.8	95.7
FCM	105.8	100.1	95.7
3.5% Fat	3.64	3.58	3.55

2. Greco et al. 2013, University of Florida



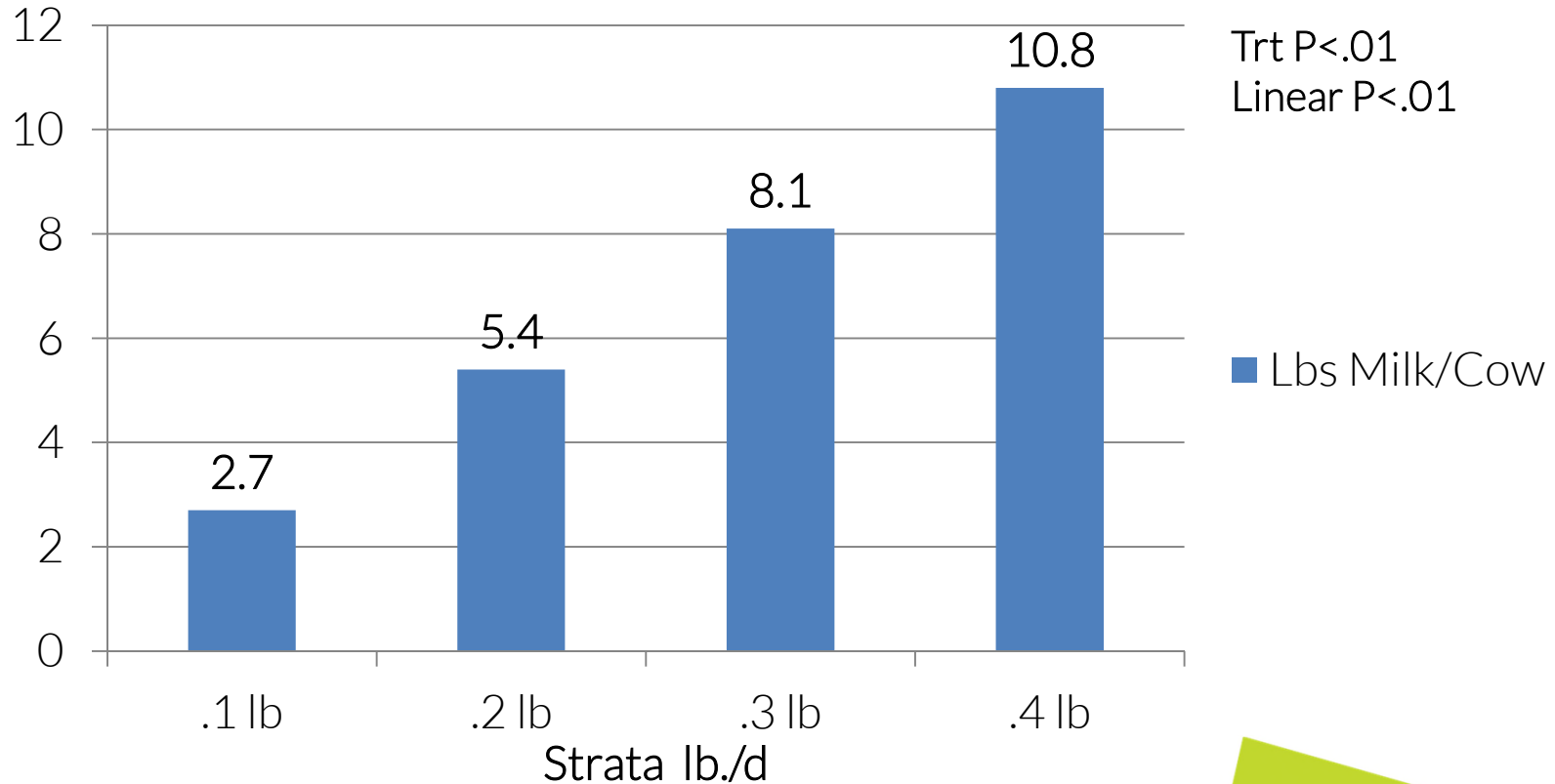
Effect of Strata with EPA/DHA Omega-3s on Milk Production



Adapted from Bilby et al, 2006; Moussavi et al, 2007, Greco et al. 2013

Linear Milk Response

2.7 lbs. Milk Per .1 lb. Strata Fed, up to .4 lb.



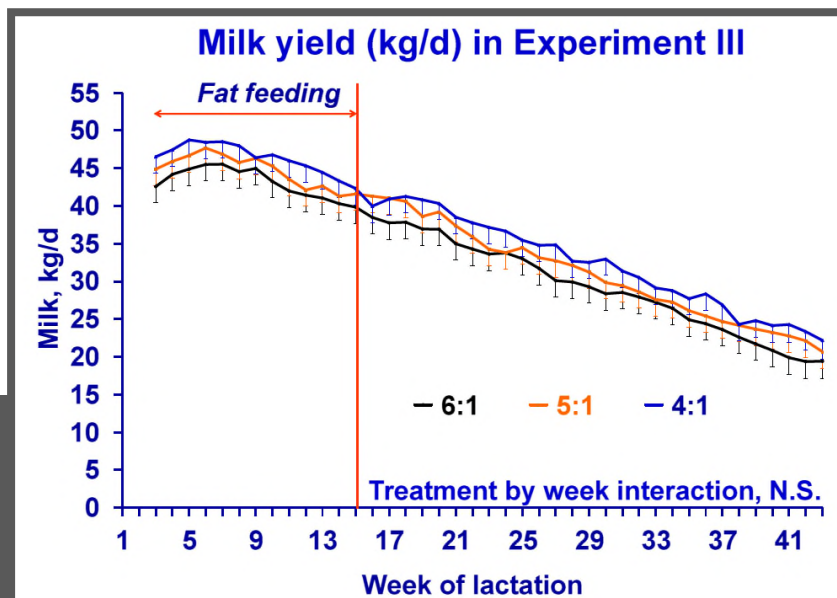
Bilby, et. al., 2006; Moussavi, et. al., 2007; Greco, et. al., 2013

The Carryover Effect

How much milk was maintained over the rest of the lactation?

	4:1 (.4 lb. Strata)	5:1 (.22 lb. Strata)	6:1 (.1 lb. Strata)	P Value
During Fat Supplementation¹	102.2	98.5	94.8	.02
Full Lactation¹	80.9	77.6	73.9	.10

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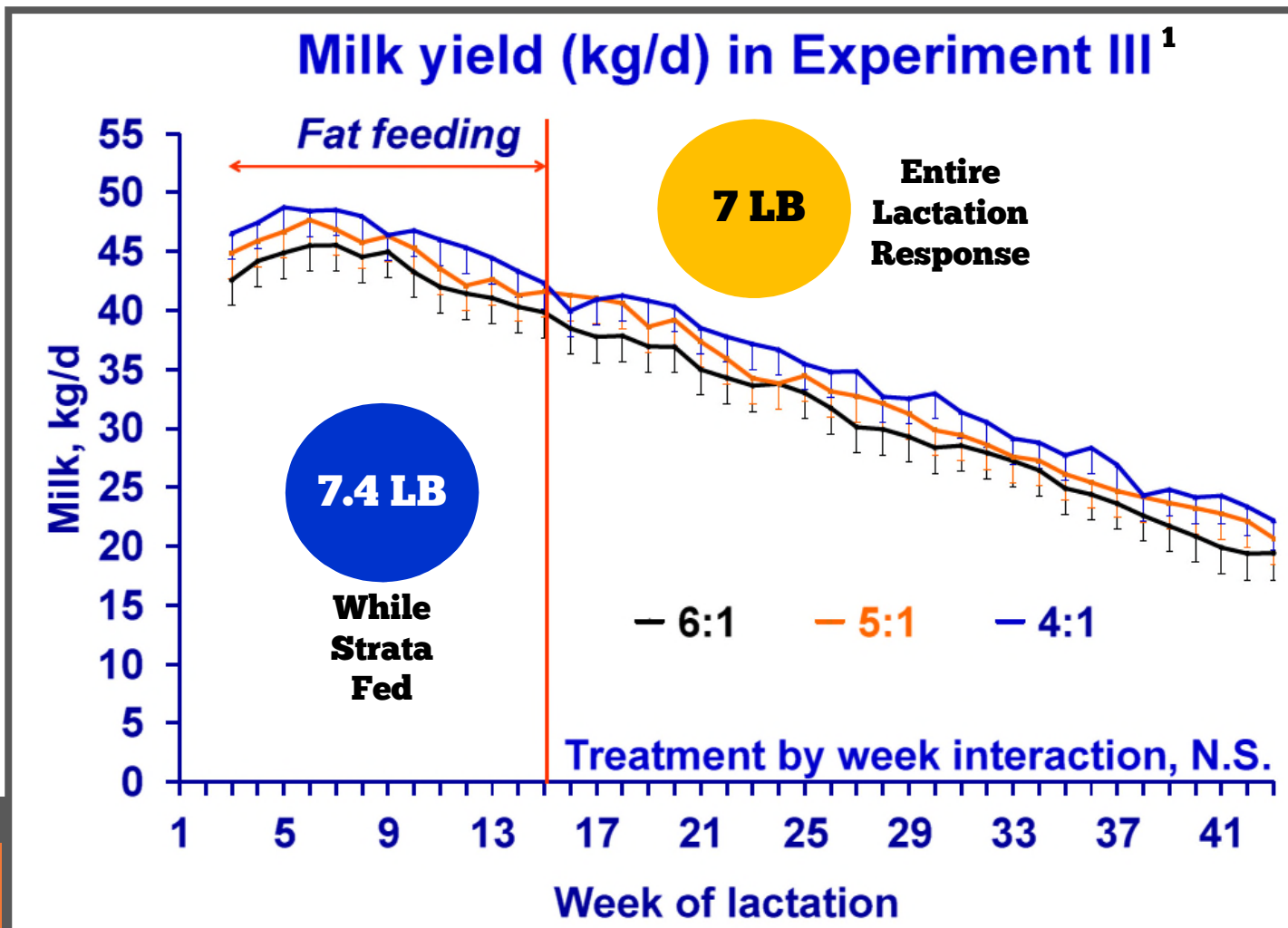
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Research Updates by

The Carryover Effect

How much milk was maintained?

95%



OMEGA-3S



IFAS Extension

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The Carryover Effect

Points to Remember

- The linear milk response to balancing with EPA/DHA omega-3s early lactation does carry over into later lactation.
- 7.4 pound milk response early lactation (.1 lb. vs. .4 lb. of Strata), and 7 pound milk response over the entire lactation.
- Improving the ratio of omega-6s to omega-3s yields not only milk and reproductive responses early lactation, but significantly shifts entire lactation performance.

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