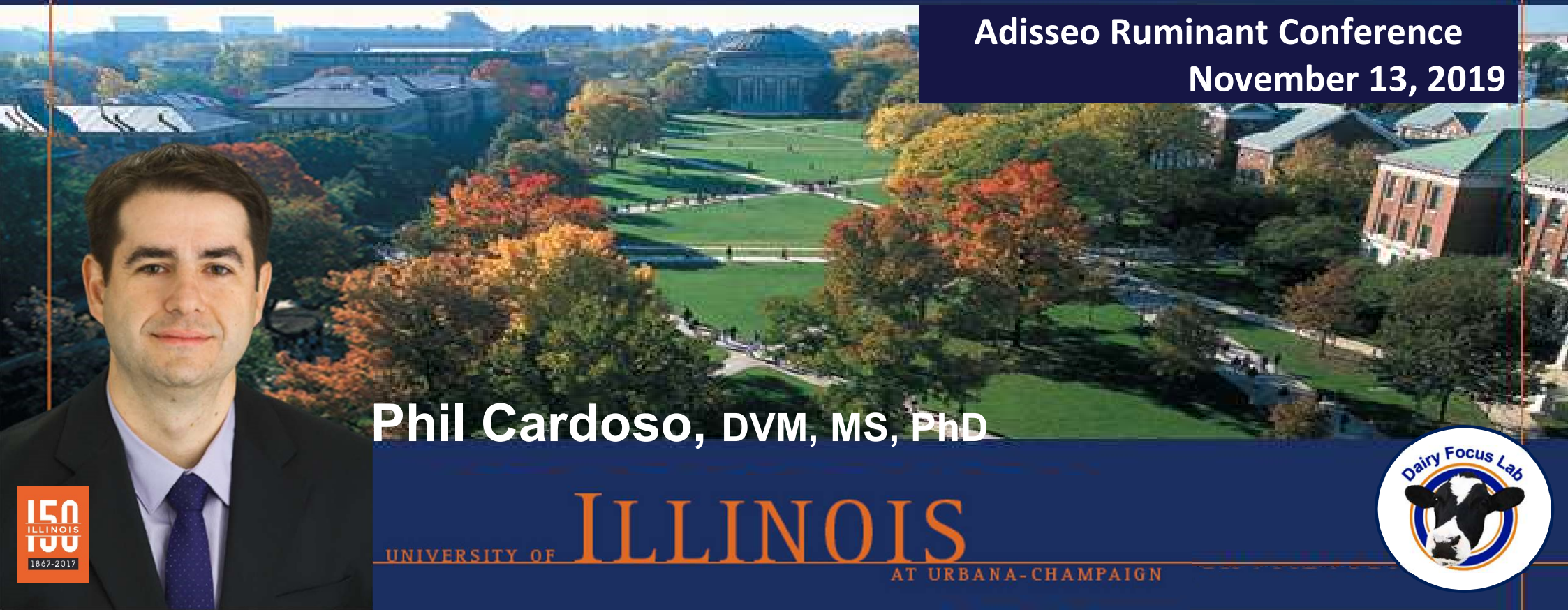
THE TRANSITION COW: PERFORMANCE, HEALTH & REPRODUCTION

Adisseo Ruminant Conference
November 13, 2019



Phil Cardoso, DVM, MS, PhD

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

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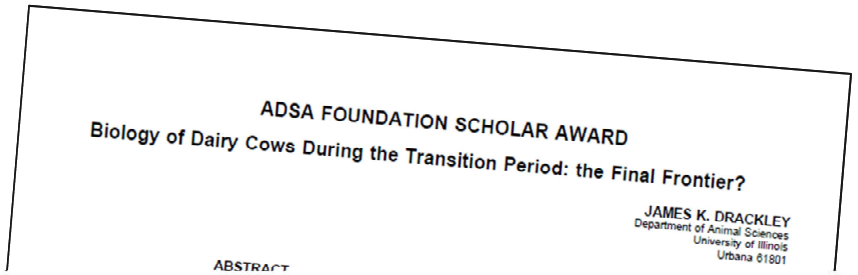
You don't choose who you fall in love with.

But your car you can.

Papers


ADSA FOUNDATION SCHOLAR AWARD

Biology of Dairy Cows During the Transition Period: the Final Frontier?

JAMES K. DRACKLEY
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Urbana 61801

ABSTRACT

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Biology of Dairy Cows During the Transition Period: the Final Frontier?

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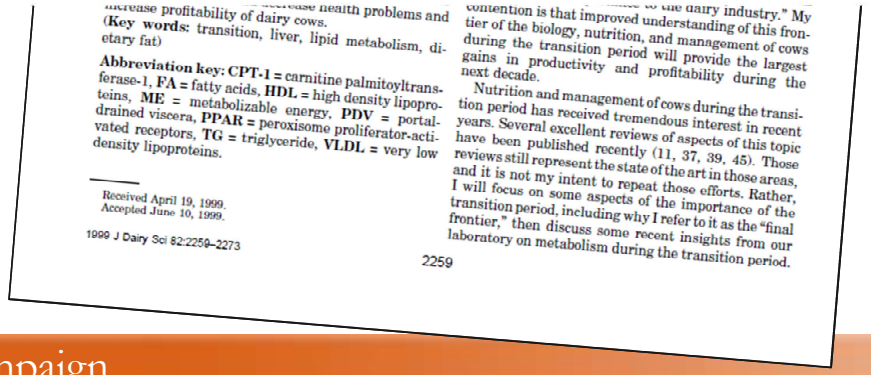
356 results in JDS

825 citations


increase profitability of dairy cows.
(Key words: transition, liver, lipid metabolism, dietary fat)

Abbreviation key: CPT-1 = carnitine palmitoyltransferase-1, FA = fatty acids, HDL = high density lipoproteins, ME = metabolizable energy, PDV = portal-drained viscera, PPAR = peroxisome proliferator-activated receptors, TG = triglyceride, VLDL = very low density lipoproteins.

Received April 19, 1999.
Accepted June 10, 1999.

1999 J Dairy Sci 82:2259–2273

2259

contention is that improved understanding of this frontier of the biology, nutrition, and management of cows during the transition period will provide the largest gains in productivity and profitability during the next decade.

Nutrition and management of cows during the transition period has received tremendous interest in recent years. Several excellent reviews of aspects of this topic have been published recently (11, 37, 39, 45). Those reviews still represent the state of the art in those areas, and it is not my intent to repeat those efforts. Rather, I will focus on some aspects of the importance of the transition period, including why I refer to it as the "final frontier," then discuss some recent insights from our laboratory on metabolism during the transition period.

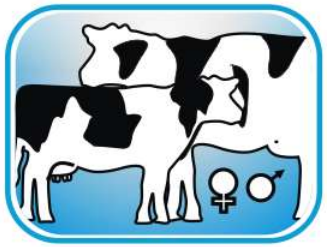
So, What do we want from this cow?

We should feed and manage dry and transition cows to:

1. Minimize health disorders

2. Maximize production

3. Maximize reproduction



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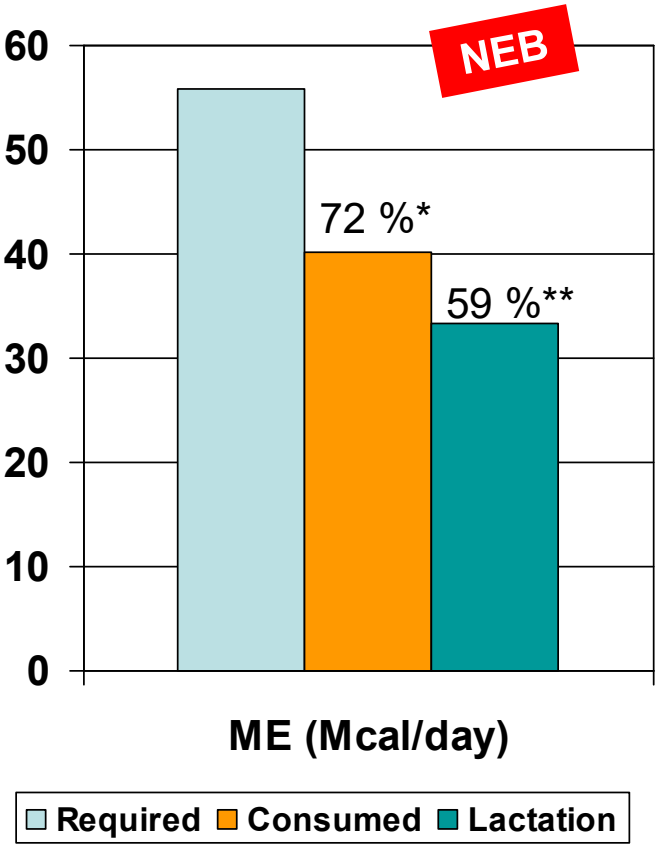
Rx

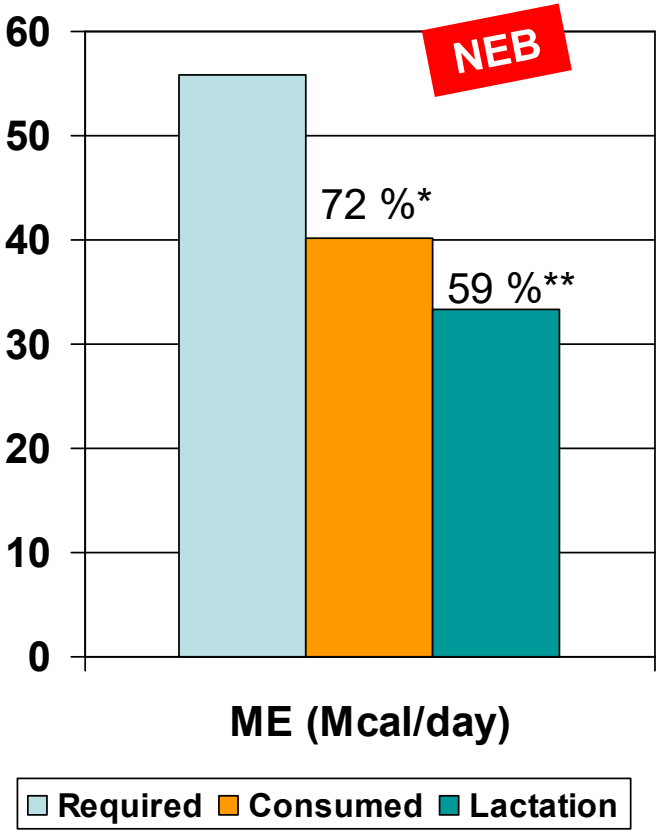


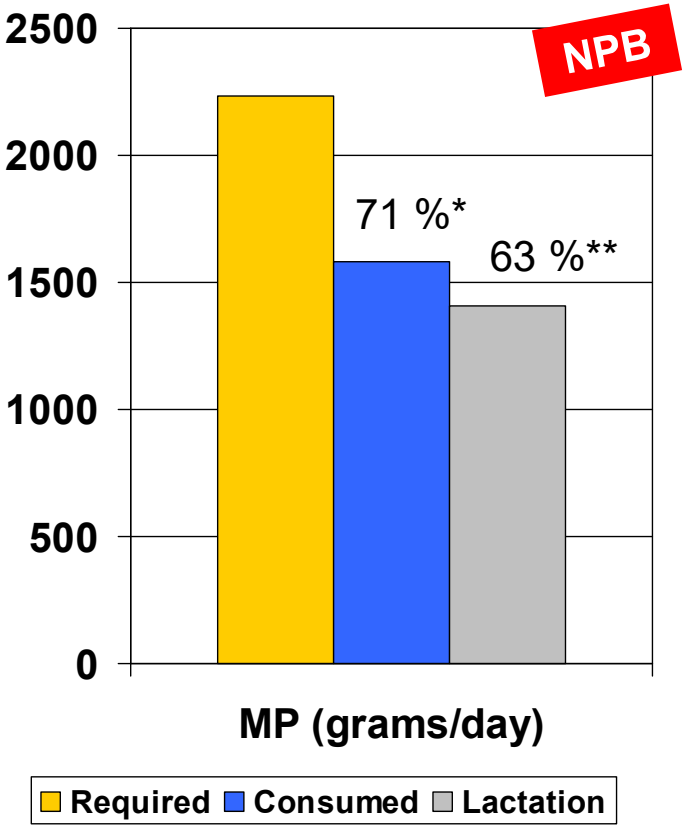
Metabolizable Energy (*ME*; Mcal/day) required and consumed at 7 days in milk

From CNCPS V6 – Assumes BW 700 kg, 15.5 kg DMI, 30 kg milk 3.8% fat, 3.2% prot.; * Percent of required; ** Percent of consumed

Adapted from J.K. Drackley

ME and metabolizable protein (MP; g/d) required and consumed at 7 days in milk





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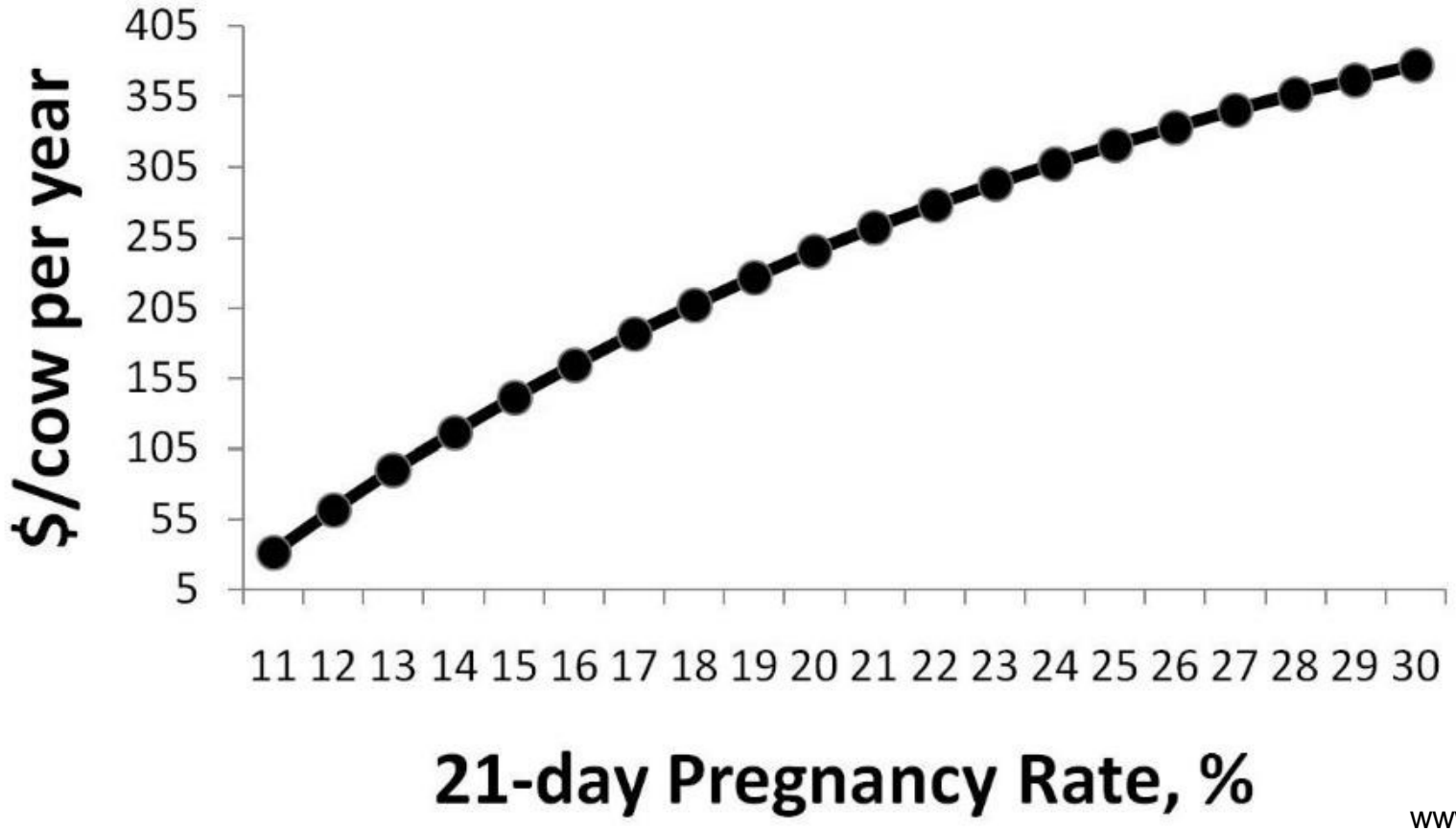
Economic Impact of Reproduction



www.DairyMGT.uwex.edu

Cabrera, V. E. 2011

Reproduction: Early Embryonic Loss

Courtesy of Wiltbank

Reproduction: Early Embryonic Loss

Reference	Cows	Days 1st Check	Days last Check	Days	Loss %	Loss/ Day %
Chebel et al., 2002a	195	28	42	14	17.9	1.28
Moreira et al., 2000a	139	27	45	18	20.7	1.15
Chebel et al., 2002b	1,503	31	45	14	13.2	0.94
Stevenson et al., 2000	203	28	45	17	15.8	0.93
Santos et al., 2002b	360	31	45	14	11.1	0.79
Santos et al., 2002a	220	27	41	14	10	0.71
Cerri et al., 2002	176	31	45	14	9.7	0.70
Juchem et al., 2002	167	28	39	11	11.4	1.03

Daily embryonic loss in the first 50 days of pregnancy = 0.9%

Adapted from Santos et al., *Anim.Repro.Sci.* 2004

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$152 to $361 pregnancy loss - 1st month of pregnancy. DeVries et al., 2006

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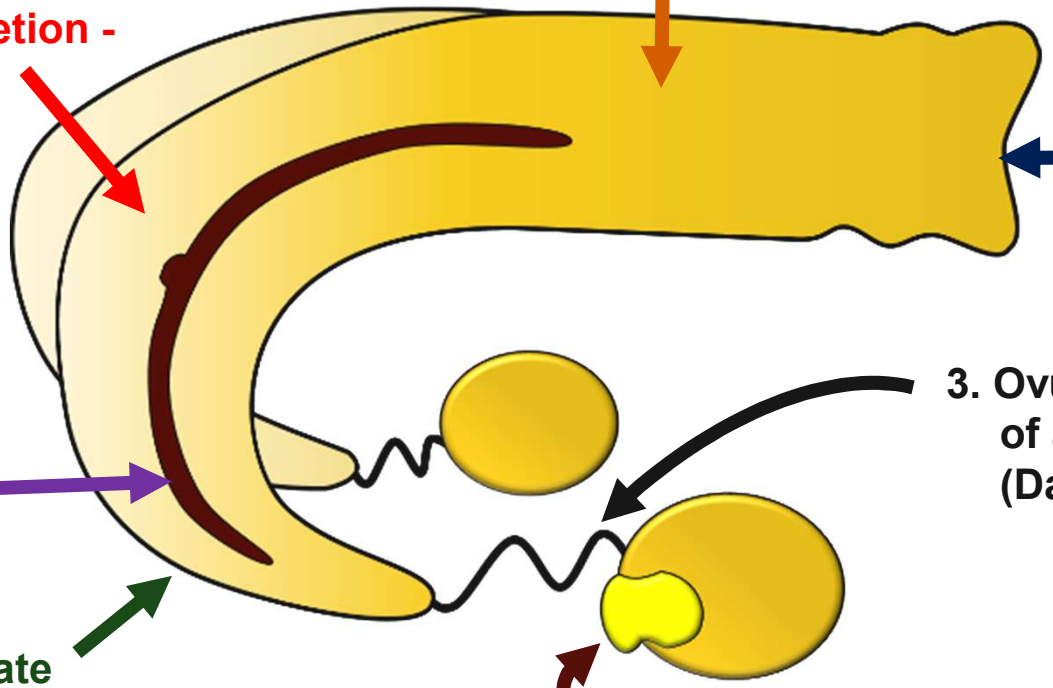
Factors Affecting Pregnancy in Dairy Cows



1. Minimize BCS loss & resolve postpartum uterine infection
2. Detect heat & inseminate at the correct time (Day 0)
3. Ovulation & fertilization of a high quality oocyte (Day 1)
4. Have an early increase in P4 secretion (Day 3 to 7)
5. Have early & appropriate uterine histotroph production (Day 6 to 13)
6. Have a large embryo producing adequate quantities of Interferon tau (Day 14 to 18)
7. Maternal recognition of pregnancy (alter uterine prostaglandin secretion - Day 16 to 18)

Walsh et al., 2011

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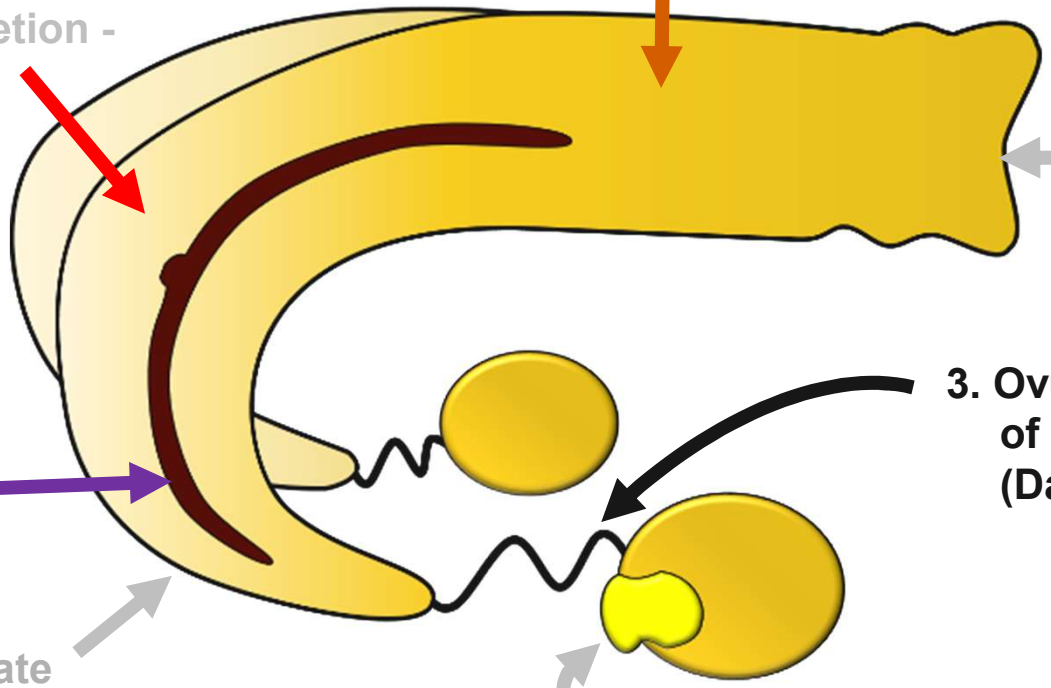

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The right diet

Dietary Recommendations for Dry Cows

- **NEL:** Control energy intake at 14 to 16 Mcal daily [diet ~ 1.32 Mcal/kg (0.60 Mcal/lb) DM] for mature cows
- **Crude protein:** 12 – 14% of DM
- **Metabolizable protein (MP):** > 1,200 g/d
- **Starch content:** 12 to 15% of DM (NFC < 26%)
- **NDF from forage:** 40 to 50% of total DM or 4.5 to 6 kg per head daily (~0.7 – 0.8% of BW). Target the high end of the range if more higher-energy fiber sources (like grass hay or low-quality alfalfa) are used, and the low end of the range if straw is used (2-5 kg)
- **Total ration DM content:** <50% (add water if necessary)
- **Minerals and vitamins:** follow guidelines (For close-ups, target values are 0.40% magnesium (minimum), 0.35 – 0.40% sulfur, potassium as low as possible (Mg:K = 1:4), a DCAD of near zero or negative, calcium without anionic supplementation: 0.9 to 1.2% (~125g) calcium with full anion supplementation: 1.5 to 2.0% (~200g), 0.35 – 0.42% phosphorus, at least 1,500 IU of vitamin E, and 25,000 – 30,000 IU of Vitamin D (cholecalciferol)

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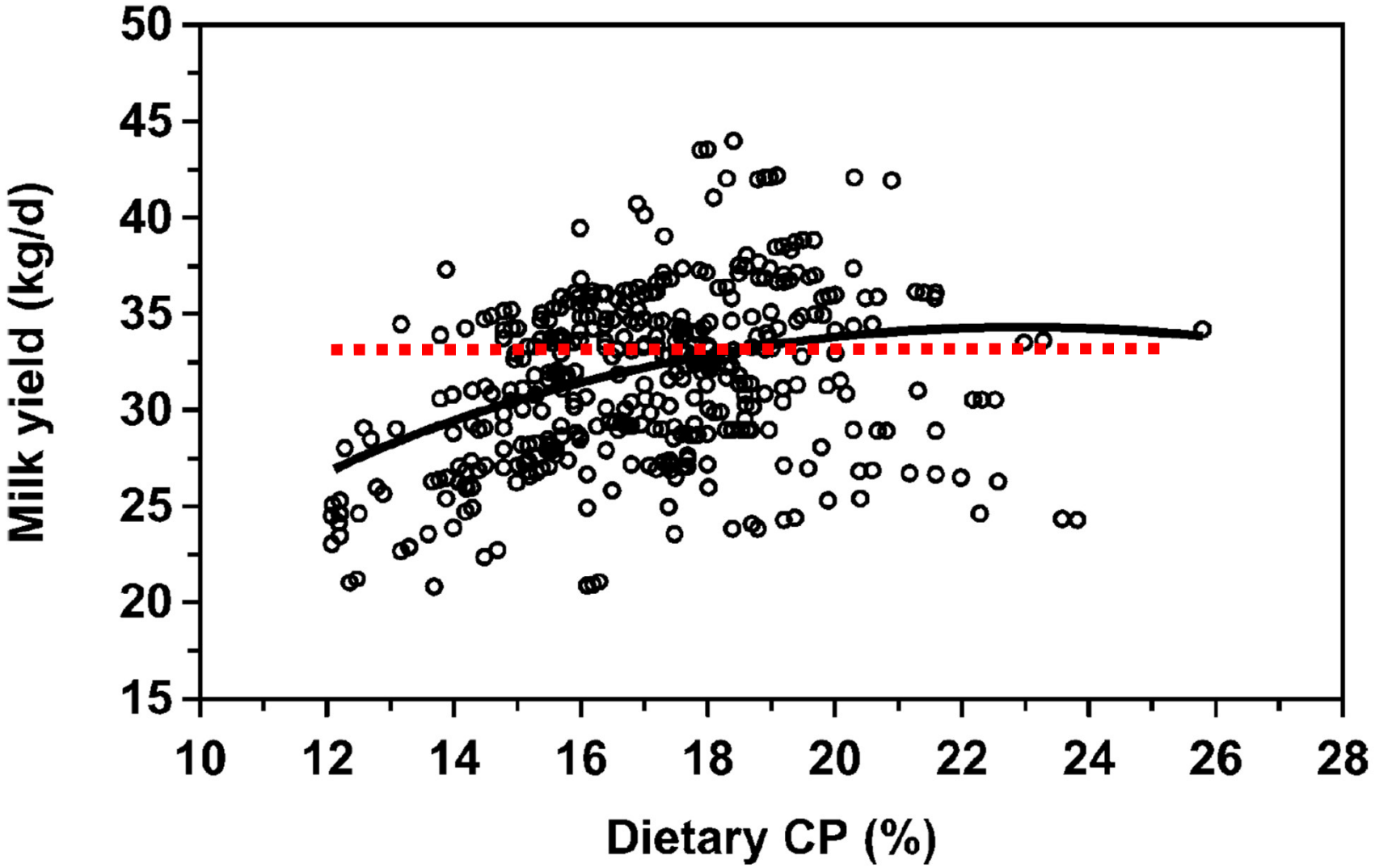
Relationship between milk yield and dietary CP (%) for lactating dairy cows



Ipharraguerre and Clark, 2005

MUN is Negatively Associated with the First AI Conception Rate in Lactating Dairy Cows

No effect on subsequent AI

Guo et al., 2004

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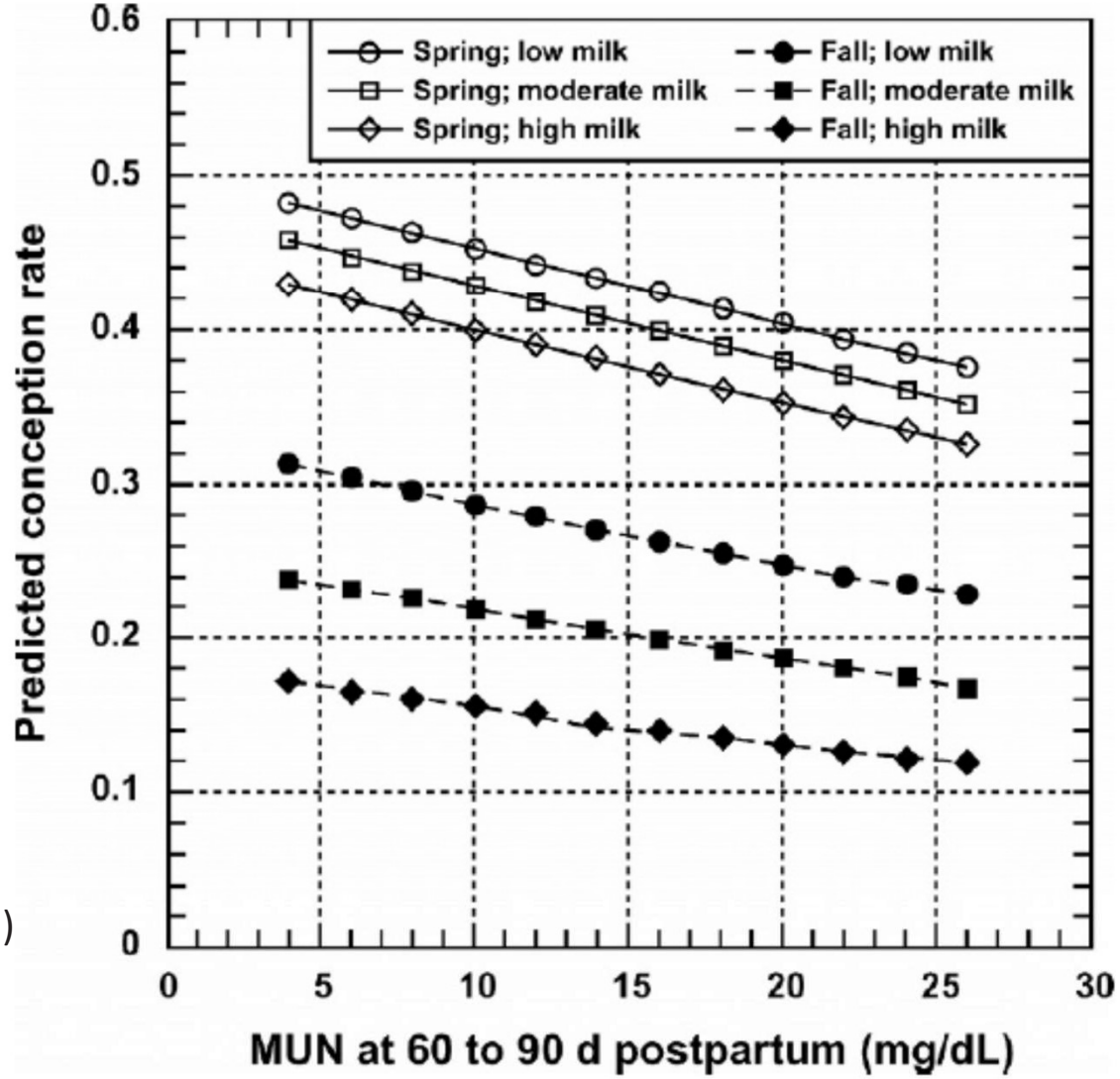
Low milk production = 56 lb/d (25.4 kg/d)
Moderate milk production = 83 lb/d (37.6 kg/d)
High milk production = 113 lb/d (51.2 kg/d)



A total of 10,271 cows from 713 herds were selected

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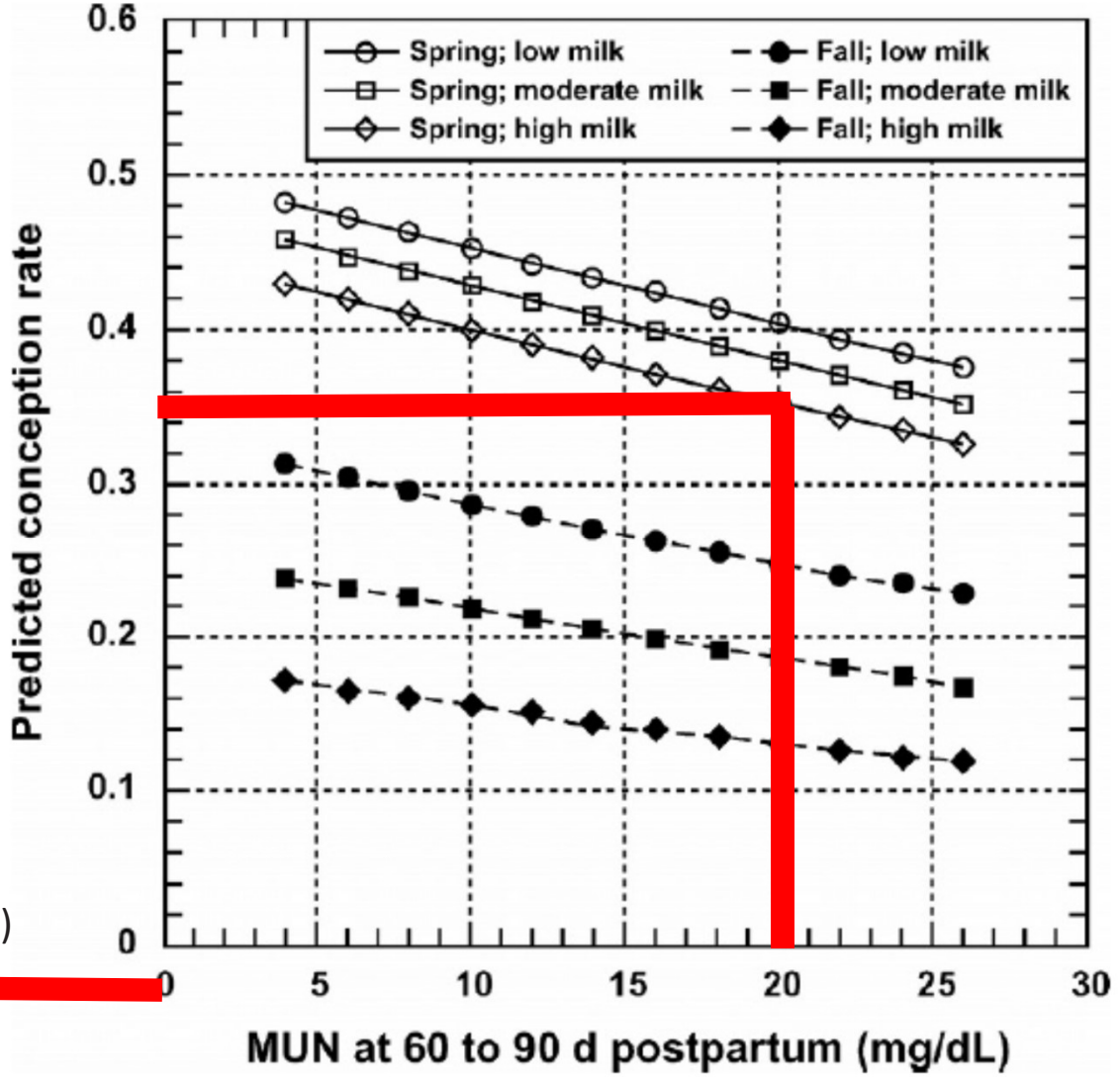

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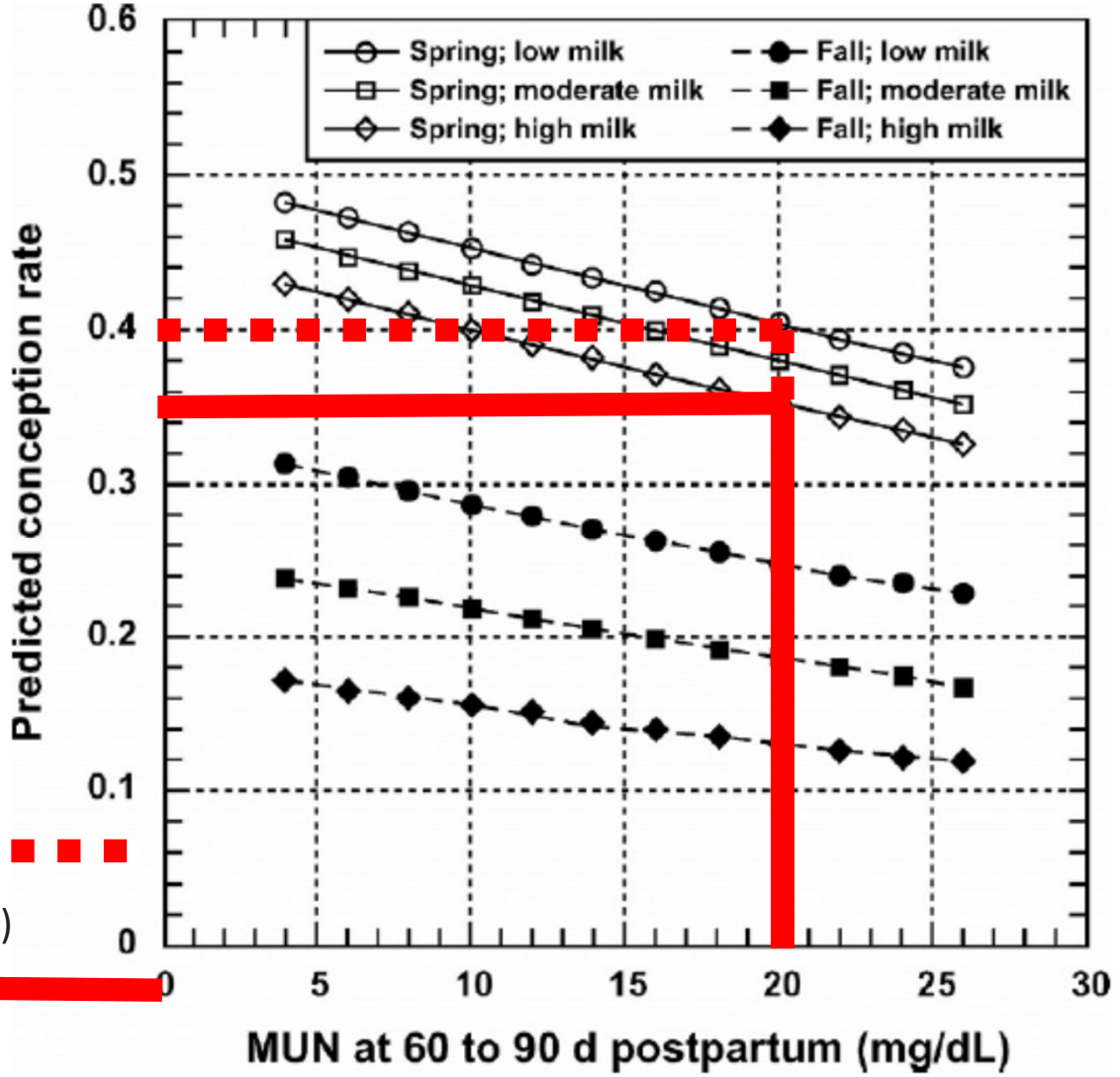

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Can Methionine Prevent Embryonic Losses?

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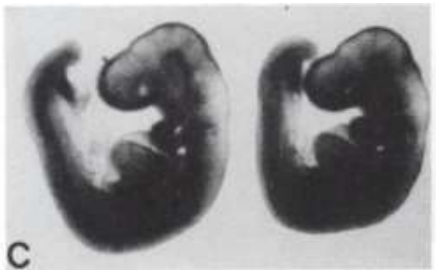
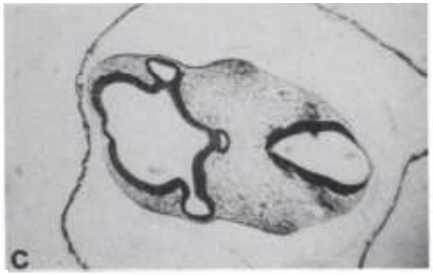
Whole Rat Embryos Require Methionine for Neural Tube Closure when Cultured on Cow Serum[1-4]

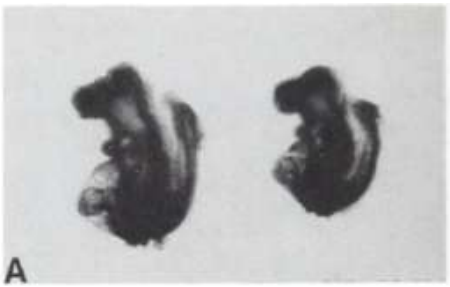
CAROLINE N. D. COELHO,*†‡[5] JAMES A. WEBER,*‡[6] NORMAN W. KLEIN,*†‡[7]
WILLARD G. DANIELS,§ AND THOMAS A HOAGLAND†

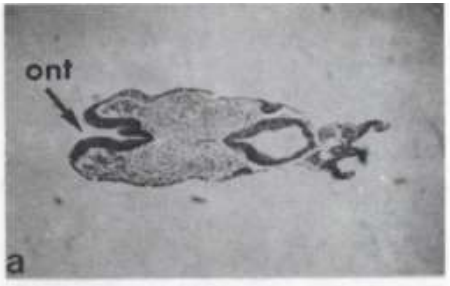
Center for Environmental Health, Department of Animal Science,† Department of Molecular and Cell Biology‡ and Department of Pathobiology,§ University of Connecticut, Storrs, CT 06269*





Culture in Rat Serum





Culture in Bovine Serum

Cow serum with:	Embryo Protein	% Abnormal
None	73.7 ± 8.6[a]	100%

Coelho et al., 1989

Cow serum with:	Embryo Protein	% Abnormal
None	73.7 ± 8.6^{a}	100%
Amino acids + vitamins	130.0 ± 7.7^{b}	0%

Coelho et al., 1989

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Cow serum with:	Embryo Protein	% Abnormal
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Vitamins	56.6 ± 5.76^{a}	100%

Coelho et al., 1989

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Amino acids w/o methionine	82.9 ± 8.7^{a}	100%

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J. Dairy Sci. 99:1–17
http://dx.doi.org/10.3168/jds.2015-10525

Better postpartal performance in dairy cows supplemented with rumen-protected methionine compared with choline during the peripartal period

Z. Zhou,* M. Vailati-Riboni,* E. Trevisi,† J. K. Drackley,* D. N. Luchini,‡ and J. J. Loor*[1]
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‡Adisseo NA, Alpharetta, GA 30022

Effects of Rumen-Protected Methionine or Choline Supplementation on the First Dominant Follicle

- 72 Holstein cows entering 2nd or greater lactation
- Experimental design was a randomized block design
- Housed in tie stalls with sand bedding
- Milked 3x per day
- Fed same basal TMR to meet but not exceed 100% of the energy requirements as outlined by NRC, 2001
  - From -34 d to calving: prepartum diet
  - From 0 to 30 DIM: fresh cow diet
  - From 31 to 72 DIM: high cow diet
- Treatments were given as top-dress

Acosta et al., 2016

Effects of Rumen-Protected Methionine or Choline Supplementation on the First Dominant Follicle

1. Rumen-protected methionine (**MET**; n = 20, received 0.08% of the DM of the diet/d as methionine, Smartamine M®, Adisseo, Alpharetta, GA, USA, to a Lys:Met = 2.9:1)
2. Rumen-protected choline (**CHO**; n = 17, received 60 g/d choline, Reassure, Balchem Corporation, New Hampton, NY)
3. Both rumen protected methionine and choline (**MIX**; n = 19, received 0.08% of the DM of the diet/d as methionine to a Lys:Met = 2.9:1 and 60 g/d choline)
4. No supplementation to serve as control (**CON**; n = 16, fed TMR with a Lys:Met = 3.5:1)

Acosta et al., 2016

Diets

Ingredients	Pre-Fresh -21 d to calving	Fresh Calving to 30 DIM	High 31 to 73 DIM
	% DM		
Alfalfa silage	8.35	5.07	6.12
Alfalfa hay	4.29	2.98	6.94
Corn silage	36.40	33.41	35.09
Wheat straw	15.63	2.98	---
Cottonseed	---	3.58	3.26
Wet brewers grain	4.29	9.09	8.16
Soy hulls	4.29	4.18	4.74
Concentrate mix	26.75	38.71	35.69

Acosta et al., 2016

Milk Yield and Components

Parameter	MET		SEM	*P*-value			
	With	Without		MET	Parity	Time	M × T
Milk composition (%)							
Fat	3.72	3.74	0.11	0.92	-	<0.01	0.58
Protein	3.32[a]	3.14[b]	0.05	<0.01	-	<0.01	0.67
SCC	1.86	1.81	0.07	0.55	-	<0.01	0.85
Lactose	4.70	4.69	0.03	0.79	<0.01	<0.01	0.90
Total solids	12.65	12.39	0.12	0.13	-	<0.01	0.24
Other solids	5.62	5.60	0.03	0.58	<0.01	<0.01	0.82
MUN	12.80	12.94	0.30	0.75	-	0.50	0.92
Milk production (kg/day)							
Milk yield	44.32[a]	40.32[b]	1.29	0.03	-	<0.01	0.60
Milk fat yield	1.67[a]	1.53[b]	0.05	0.04	-	<0.01	0.47
Milk protein yield	1.51[a]	1.33[b]	0.05	<0.01	-	<0.01	0.73
ECM	44.81[a]	40.25[b]	1.05	<0.01	-	<0.01	0.16

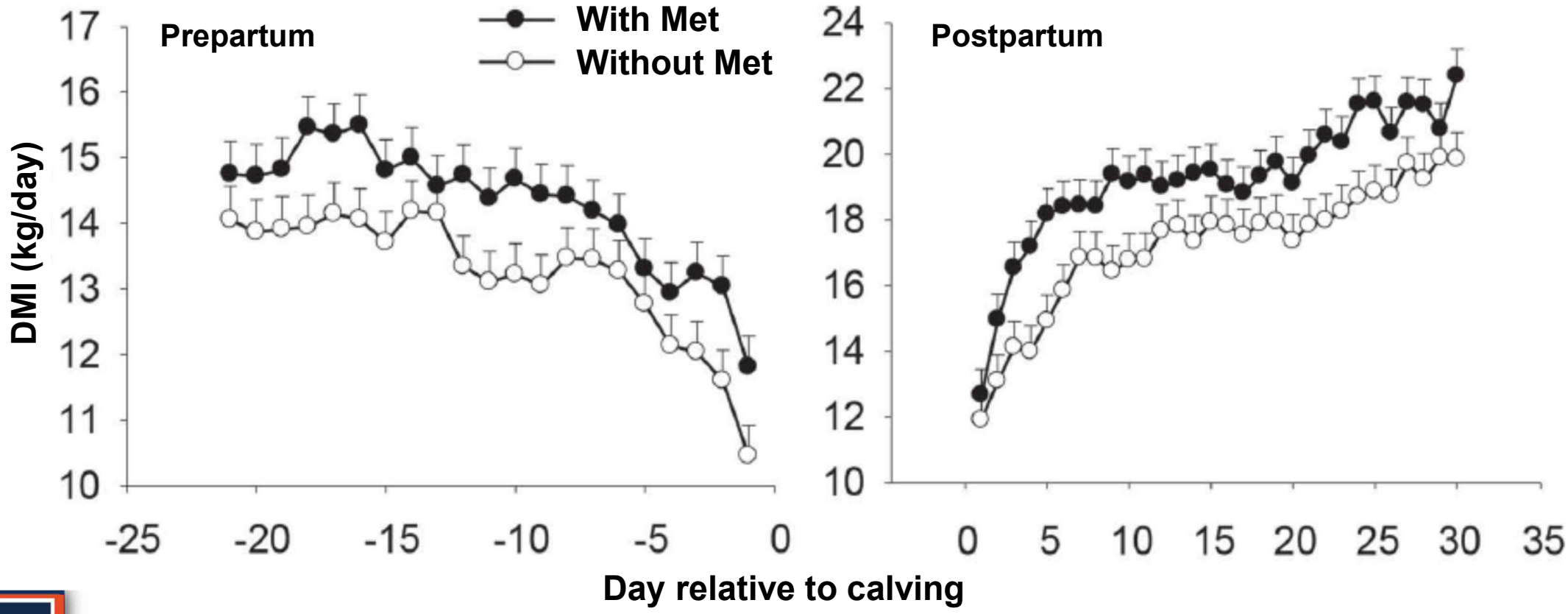
Zhou et al., 2016

Milk Yield and Components

Parameter	MET		SEM	*P*-value			
	With	Without		MET	Parity	Time	M × T
Milk composition (%)							
Fat	3.72	3.74	0.11	0.92	-	<0.01	0.58
Protein	3.32[a]	3.14[b]	0.05	<0.01	-	<0.01	0.67
SCC	1.86	1.81	0.07	0.55	-	<0.01	0.85
Lactose	4.70	4.69	0.03	0.79	<0.01	<0.01	0.90
Total solids	12.65	12.39	0.12	0.13	-	<0.01	0.24
Other solids	5.62	5.60	0.03	0.58	<0.01	<0.01	0.82
MUN	12.80	12.94	0.30	0.75	-	0.50	0.92
Milk production (kg/day)							
Milk yield	44.32[a]	40.32[b]	1.29	0.03	-	<0.01	0.60
Milk fat yield	1.67[a]	1.53[b]	0.05	0.04	-	<0.01	0.47
Milk protein yield	1.51[a]	1.33[b]	0.05	<0.01	-	<0.01	0.73
ECM	44.81[a]	40.25[b]	1.05	<0.01	-	<0.01	0.16

Zhou et al., 2016

Improved postpartal performance in dairy cows supplemented with rumen-protected methionine during the peripartal period



Zhou et al., 2016

Theriogenology 96 (2017) 1–9

Contents lists available at ScienceDirect

Theriogenology

journal homepage: www.theriojournal.com

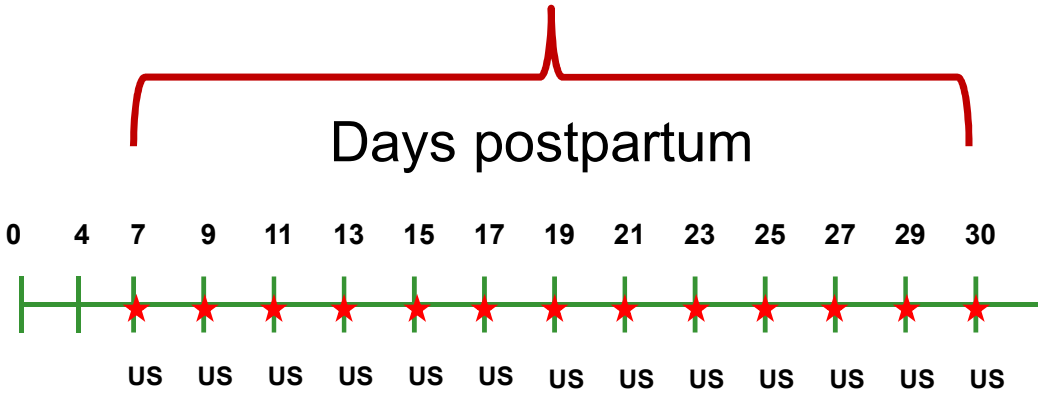
Effects of rumen-protected methionine and choline supplementation on steroidogenic potential of the first postpartum dominant follicle and expression of immune mediators in Holstein cows

D.A.V. Acosta [a, b, e], M.I. Rivelli [a], C. Skenandore [a], Z. Zhou [a], D.H. Keisler [c], D. Luchini [d], M.N. Corrêa [e], F.C. Cardoso [a, *]

[a] Department of Animal Sciences, University of Illinois, Urbana, IL, USA
[b] The Colombian Corporation for Agricultural Research (CORPOICA), Bogotá, Colombia
[c] Division of Animal Sciences, University of Missouri, Columbia, USA
[d] Adisseo, Alpharetta, GA, USA
[e] Department of Clinics, Faculty of Veterinary Medicine, Universidade Federal de Pelotas, Pelotas, RS, Brazil

Ovulation, first dominant follicle (n = 40)

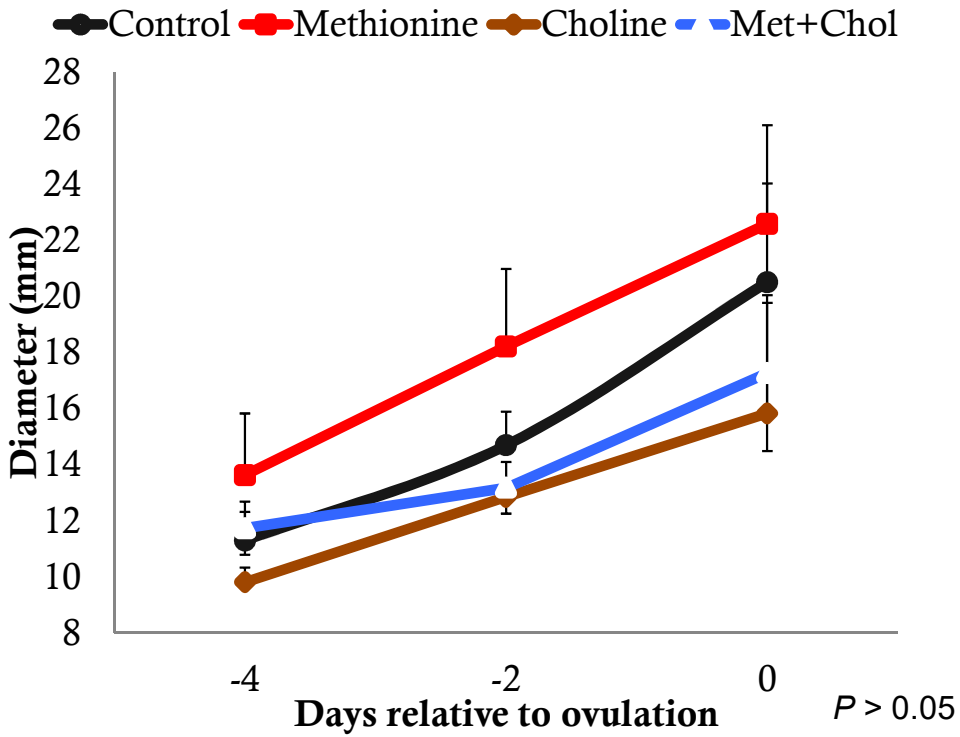
Follicular Aspiration, 16mm (n = 40)



★ Blood Samples

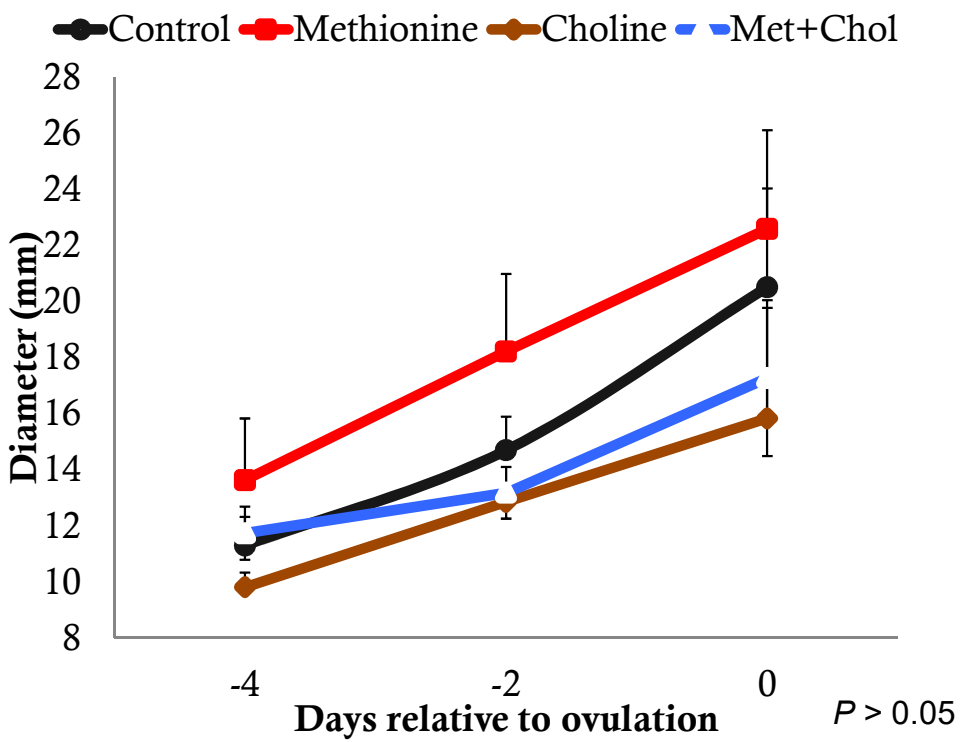
US: Ultrasonography

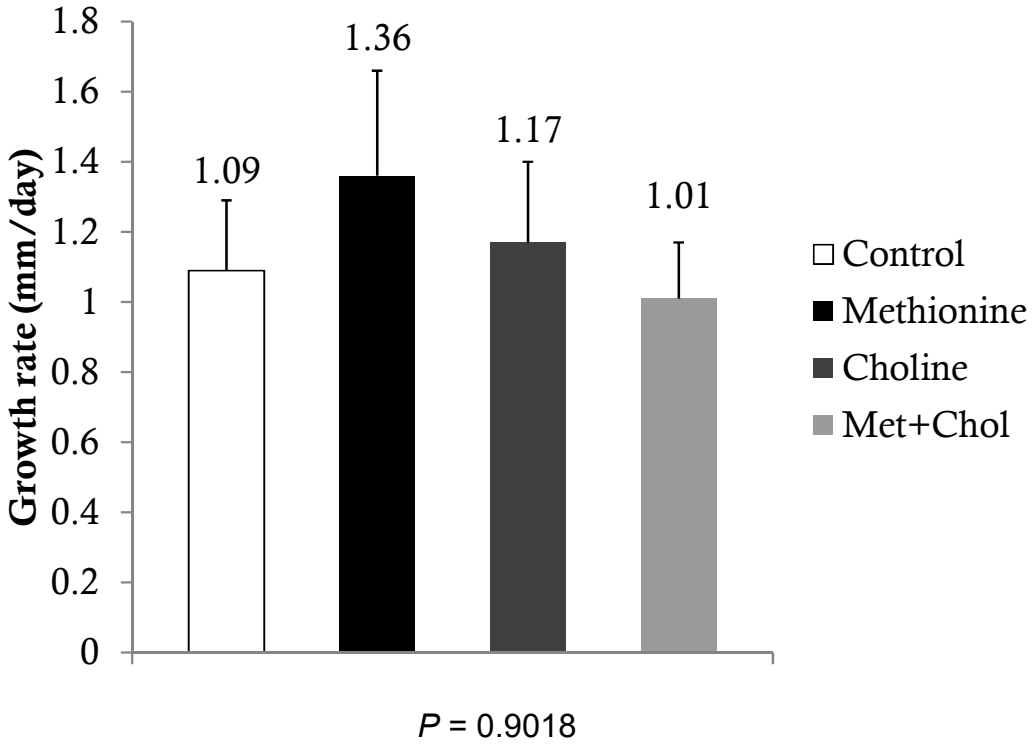
Acosta et al., 2017



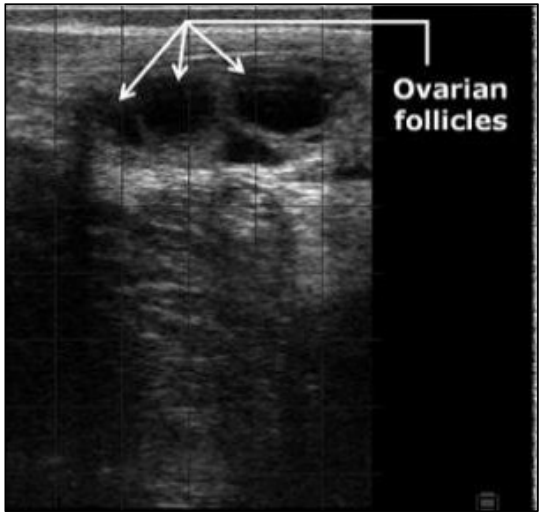
P > 0.05

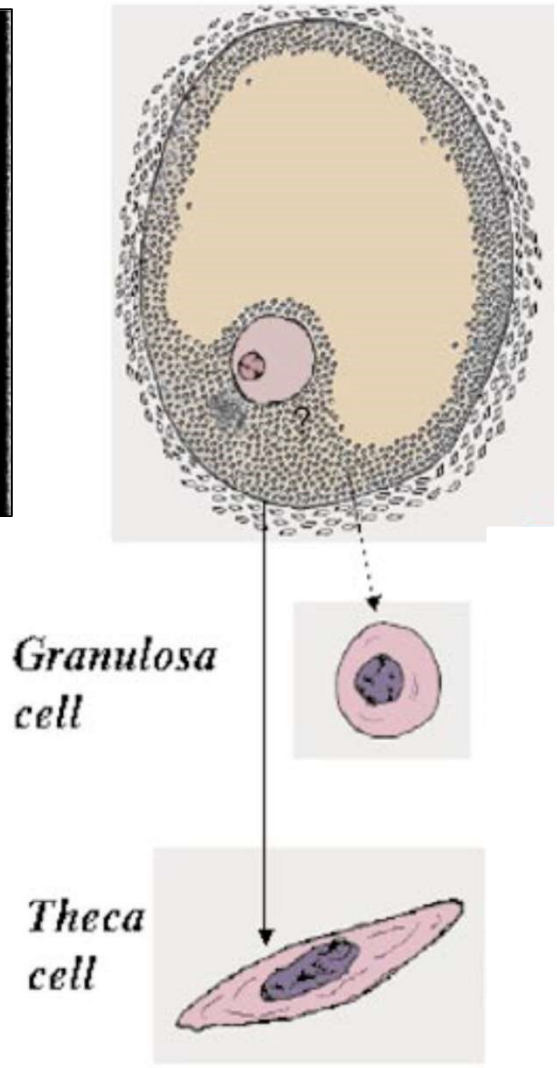
Acosta et al., 2017



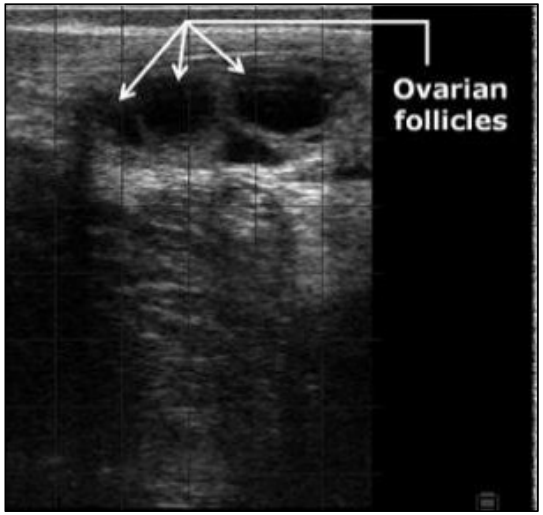


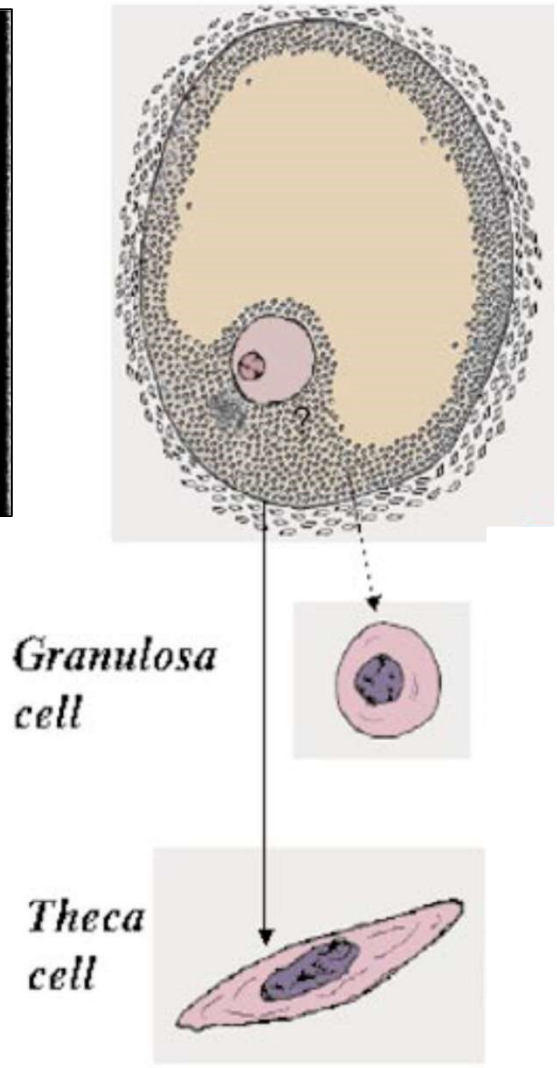
Acosta et al., 2017

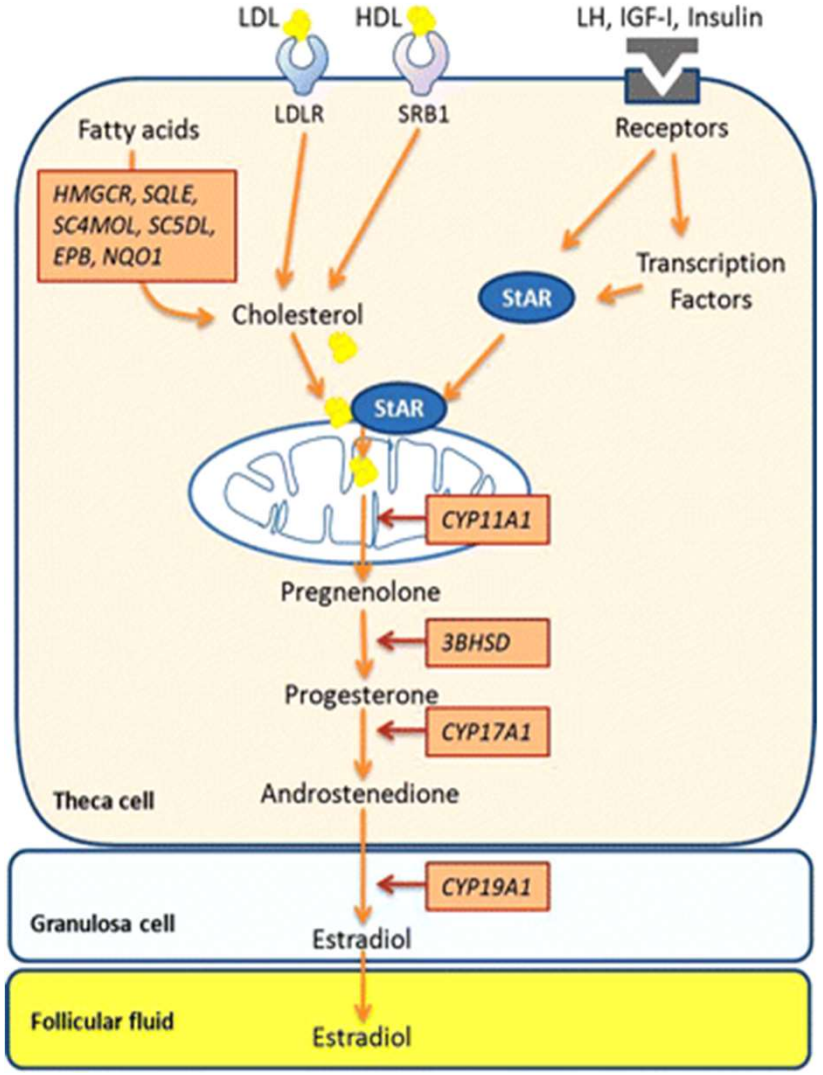




Walsh et al., 2012

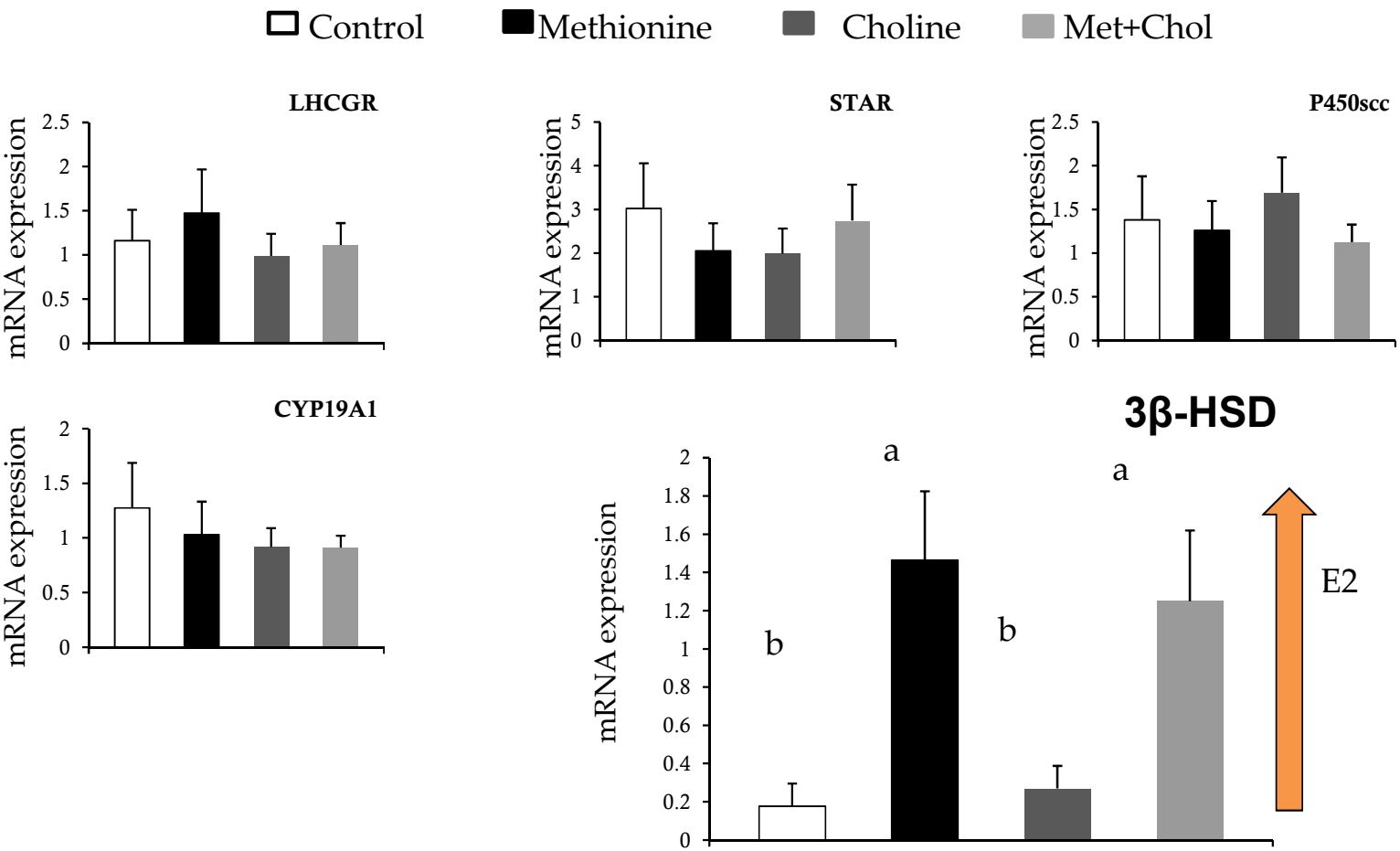






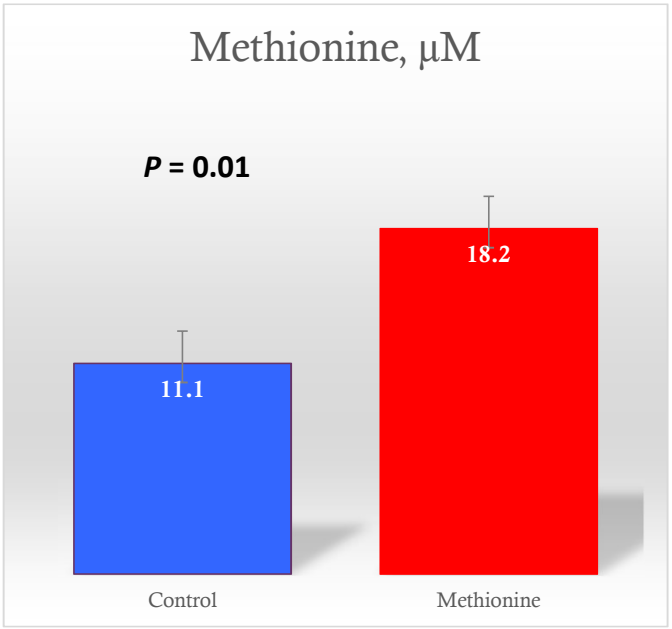
Walsh et al., 2012

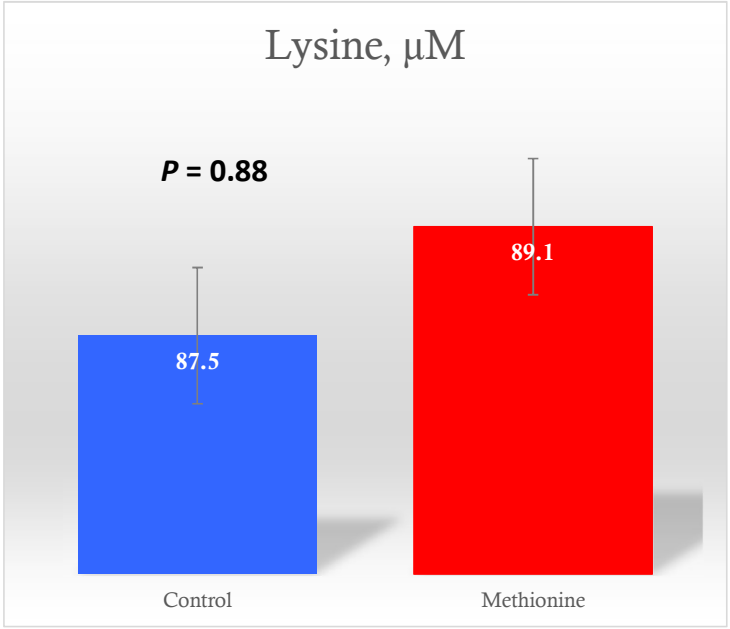
Steroidogenesis Pathway

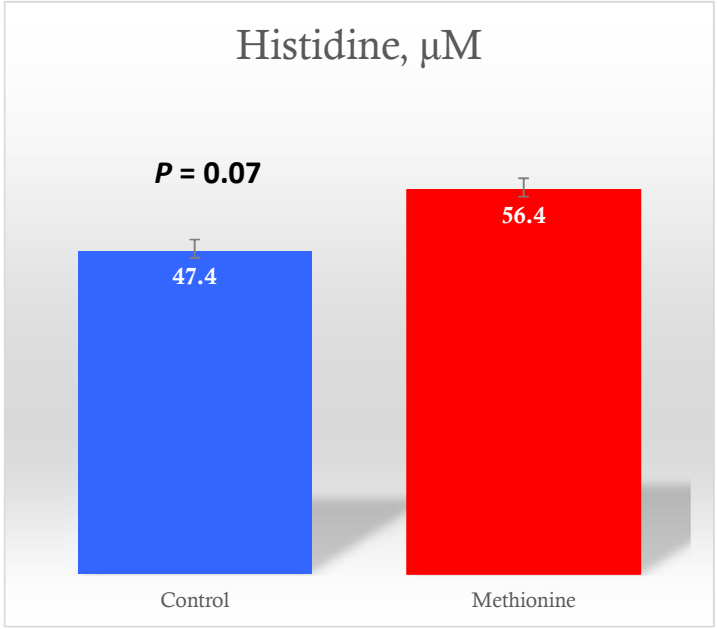


Acosta et al., 2018

Follicular Fluid AA Concentration from Cows at the Day of Follicular Aspiration of the Dominant Follicle of the 1st Follicular Wave Postpartum (~16 mm)



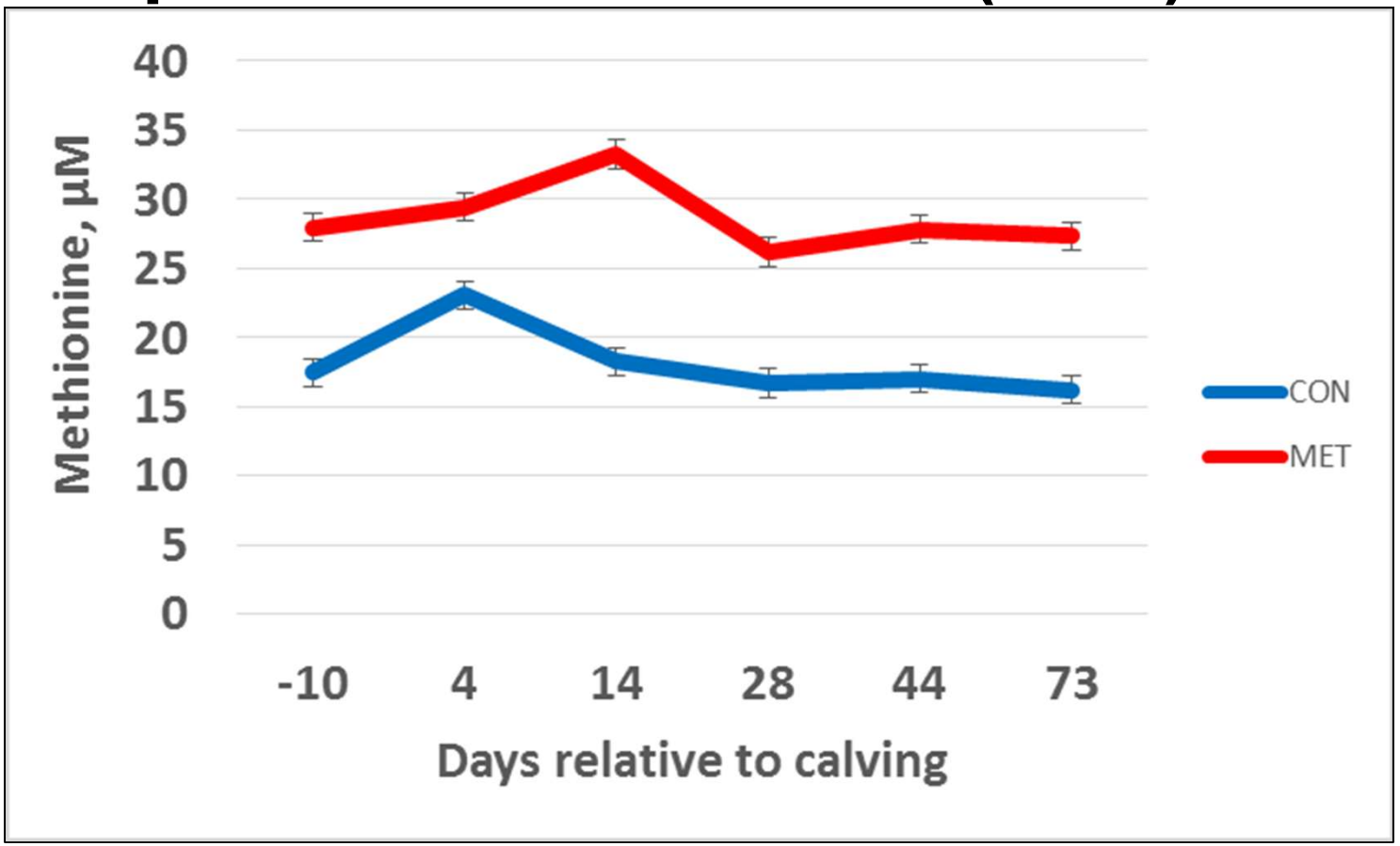




Control: n = 7; Methionine: n = 8

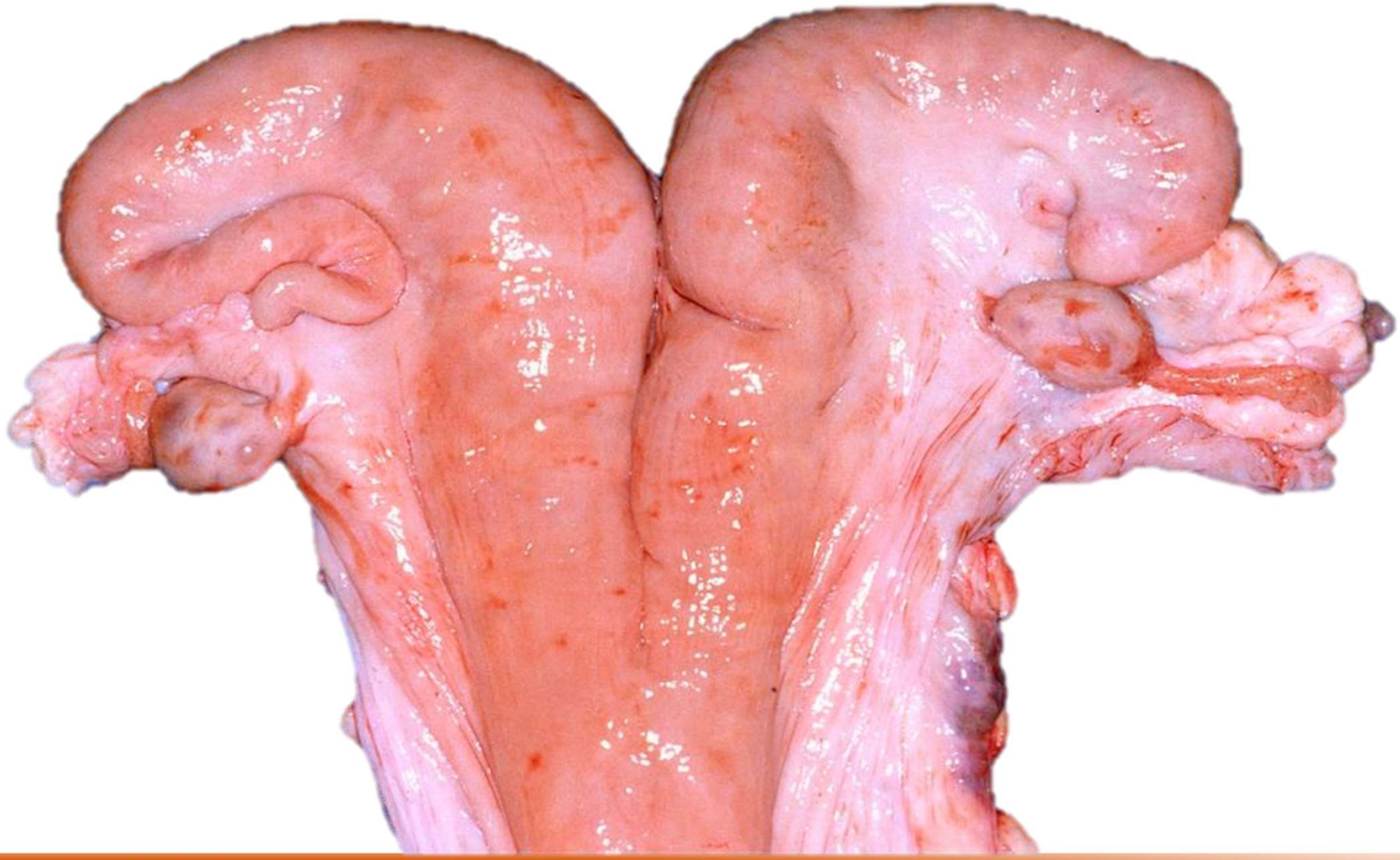
Acosta et al., 2017

Serum Methionine Concentration from Cows Fed rumen-protected methionine (MET) or not (CON)



Control: n = 7; Methionine: n = 10

Stella et al., 2018



http://loribovinesection.blogspot.com/2013_07_01_archive.html

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www.vet.cu.edu.eg

Full Length Article

Effects of rumen-protected methionine and choline supplementation on vaginal discharge and uterine cytology of Holstein cows

Cassandra S. Skenandore [a,b], Diego A. Velasco Acosta [a,c,d], Zheng Zhou [a], Maria I. Rivelli [a], Márcio N. Corrêa [c], Daniel N. Luchini [e], Felipe C. Cardoso [a,*]

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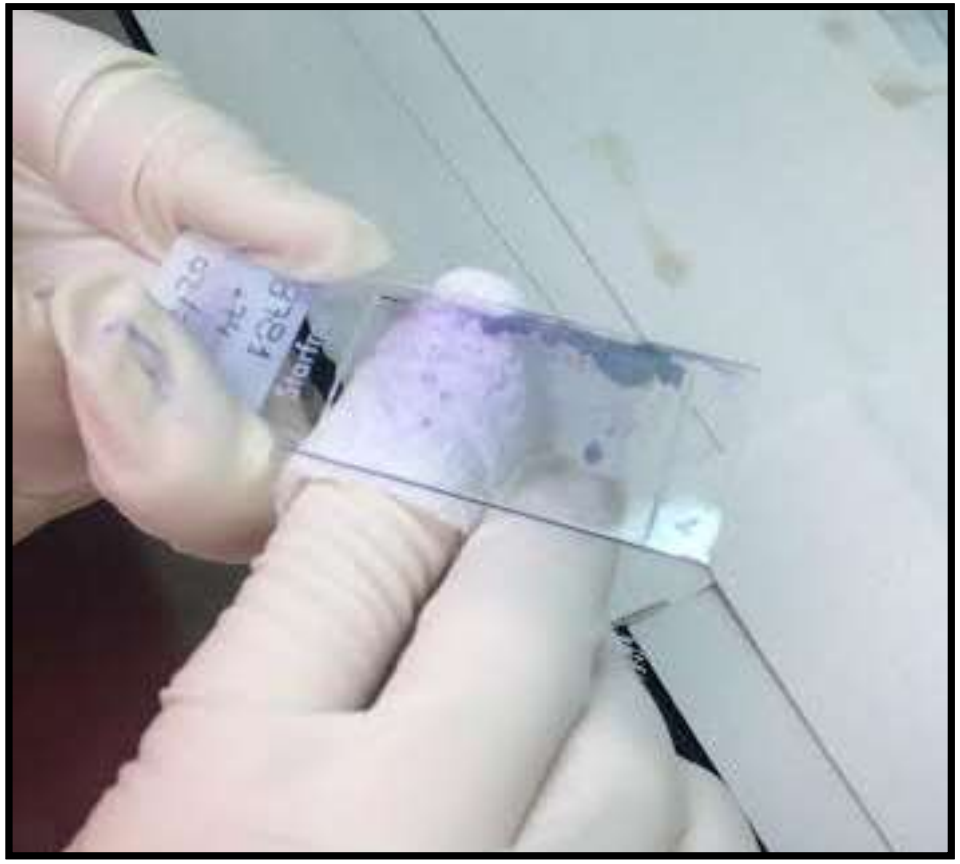
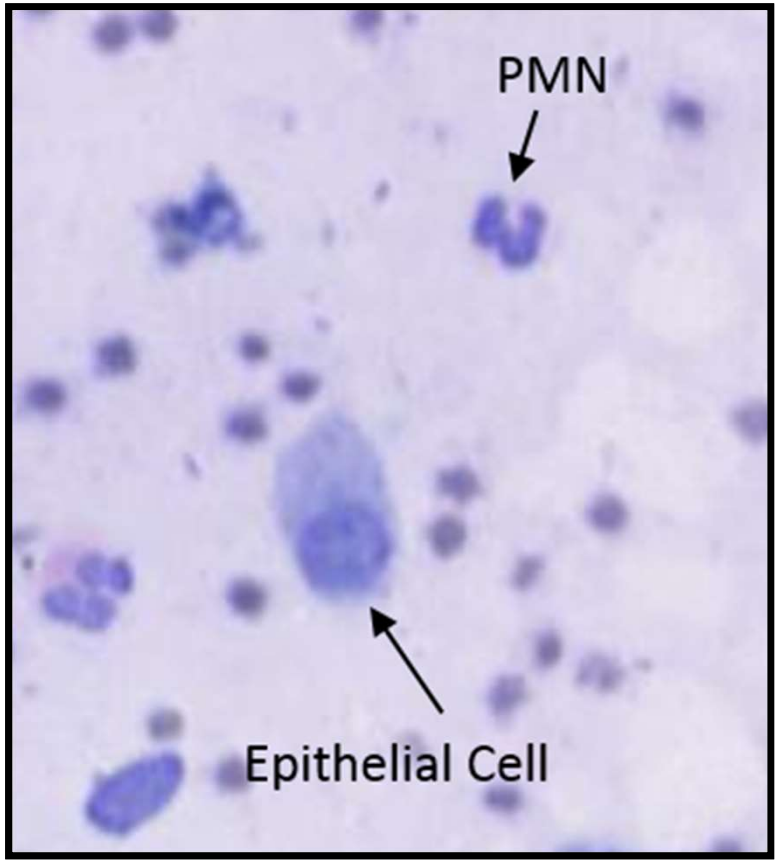
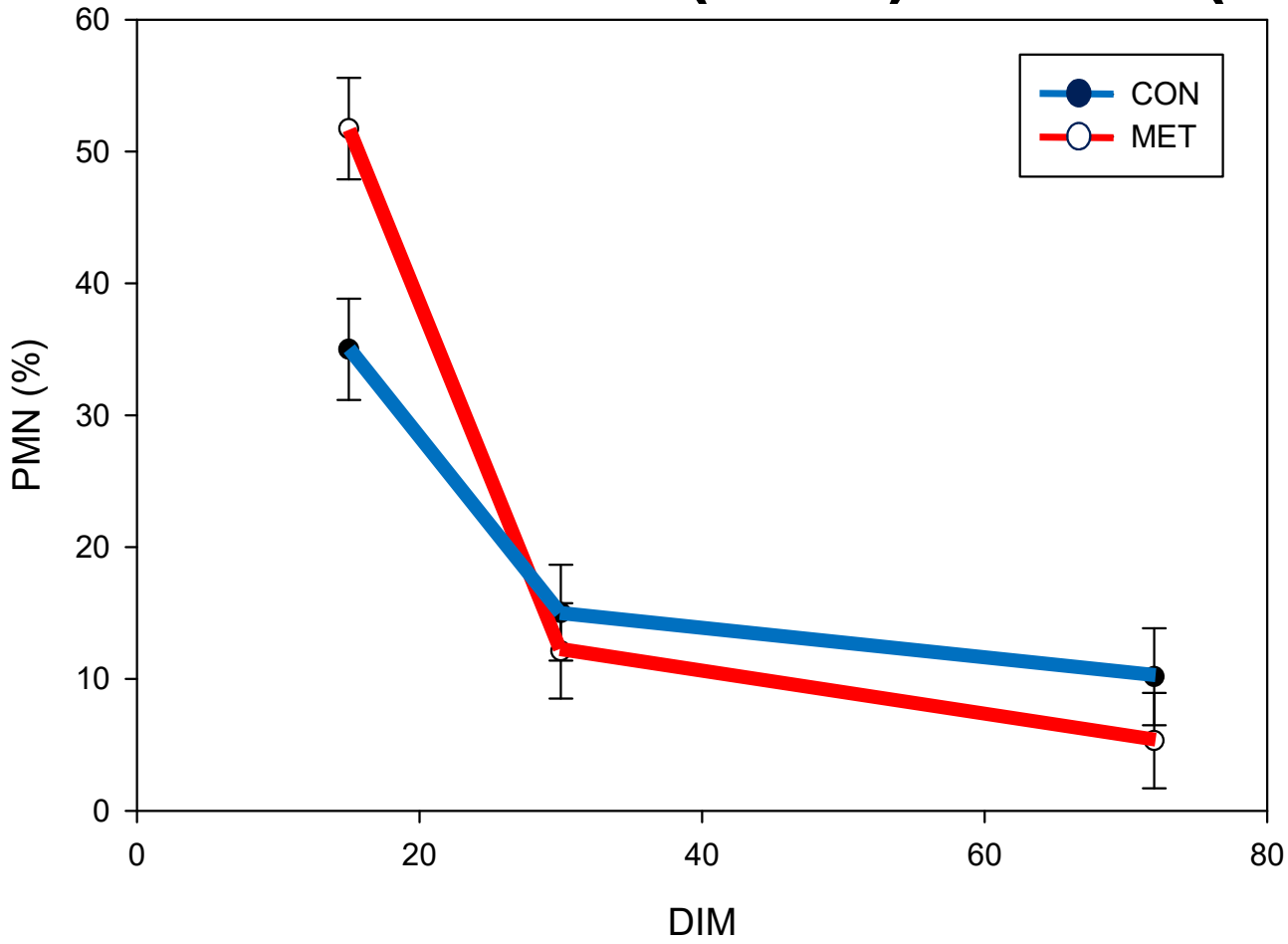
[b] Department of Veterinary Physiology and Pharmacology, Texas A&M University, 4466 TAMU, College Station, TX 77843, USA
[c] Federal University of Pelotas, Campus Universitário s/n, Capão do Leão, RS 96010-610, Brazil
[d] The Colombian Corporation for Agricultural Research (CORPOICA), Bogotá, Colombia
[e] Adisseo NACA, 4400 North Point Parkway, Alpharetta, GA 30022, USA

Uterine Cytology – Polymorphonuclear (PMN)





PMN in Uterus of Cows Fed rumen-protected methionine (MET) or not (CON)



Effect	*P*-Value
TRT	0.93
DIM	<0.001
TRT*DIM	0.01

Control: n = 36; Methionine: n = 36

Skenadore et al., 2017

Animal (2014), 8:s1, pp 54–63
doi:10.1017/S1751731114000524

animal

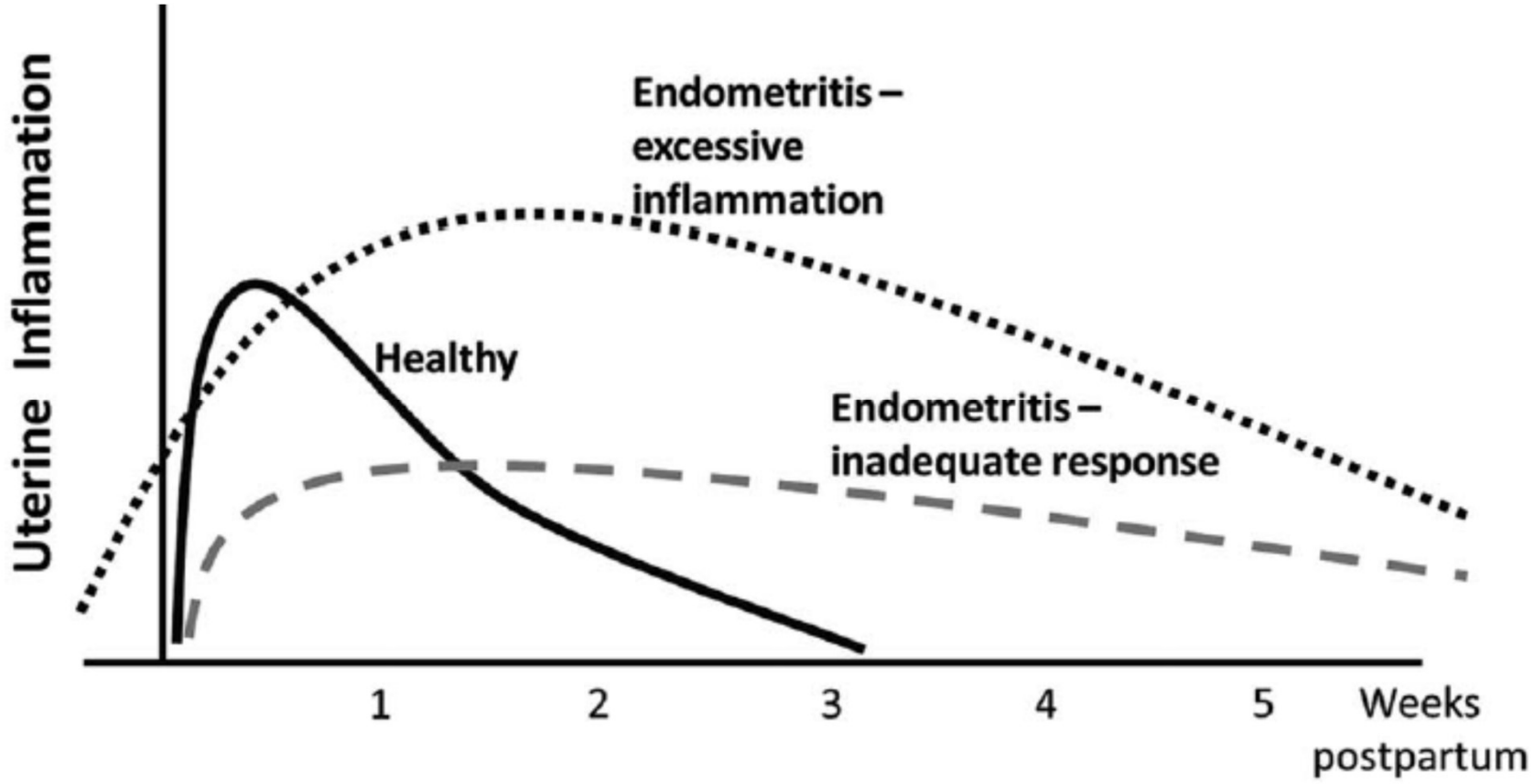
Reproductive tract inflammatory disease in *postpartum* dairy cows

S. J. LeBlanc†

Department of Population Medicine, University of Guelph, Guelph, ON, Canada N1G 2W1

(Received 23 October 2013; Accepted 10 February 2014; First published online 28 March 2014)

Schematic Representation of Concepts of the Patterns of Immune and Inflammatory Response in Dairy Cows in the Postpartum Period



LeBlanc, 2014

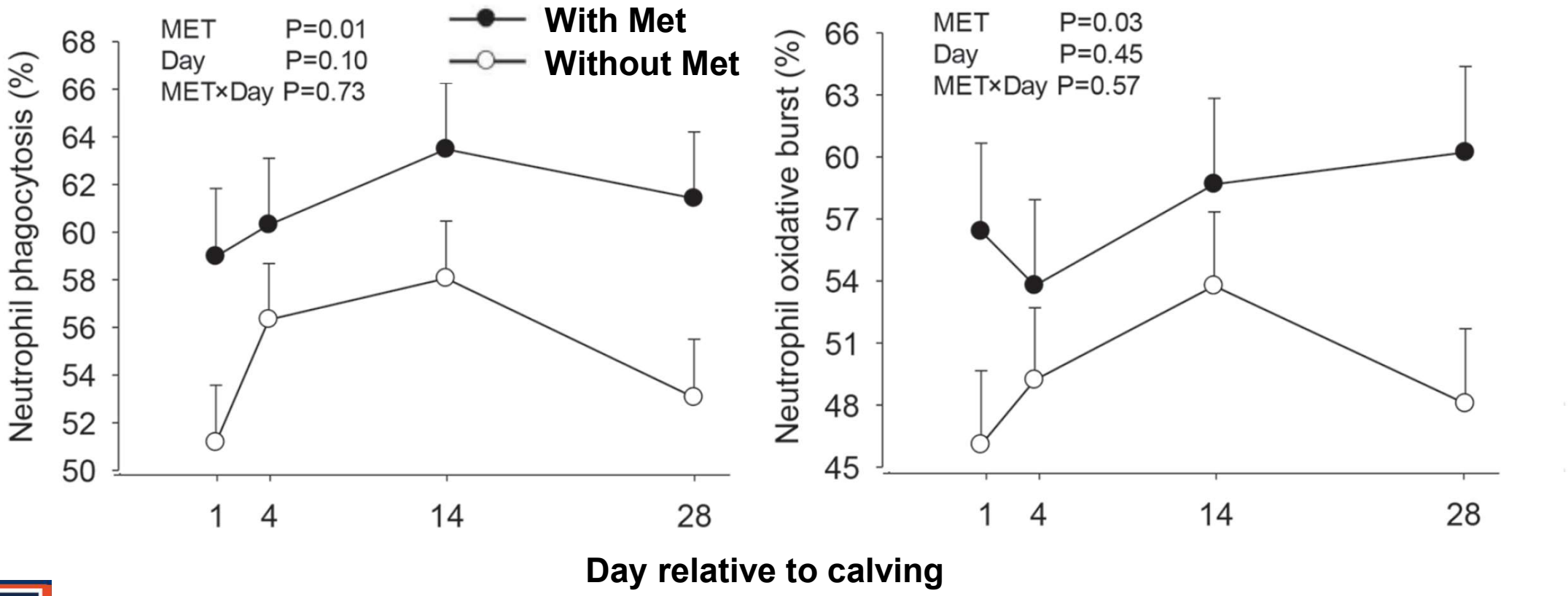
J. Dairy Sci. 99:1–14
http://dx.doi.org/10.3168/jds.2016-10986

Rumen-protected methionine compared with rumen-protected choline improves immunometabolic status in dairy cows during the peripartal period

Z. Zhou,* O. Bulgari,*† M. Vailati-Riboni,* E. Trevisi,‡ M. A. Ballou,§ F. C. Cardoso,* D. N. Luchini,# and J. J. Loor*[1]

*Mammalian NutriPhysioGenomics, Department of Animal Sciences and Division of Nutritional Sciences, University of Illinois, Urbana 61801
†Dipartimento di Medicina Molecolare e Traslazionale, Università degli Studi di Brescia, 25121 Brescia, Italy
‡Istituto di Zootecnica Facoltà di Scienze Agrarie, Alimentari e Ambientali, Università Cattolica del Sacro Cuore, 29122, Piacenza, Italy
§Department of Animal Sciences, Texas Tech University, Lubbock 79409
#Adisseo, Alpharetta, GA 30022

Rumen-protected methionine improves immunometabolic status in dairy cows during the peripartal period



Zhou et al., 2016

Theriogenology 85 (2016) 1669–1679

Contents lists available at ScienceDirect

Theriogenology

journal homepage: www.theriojournal.com

Effects of rumen-protected methionine and choline supplementation on the preimplantation embryo in Holstein cows

D.A.V. Acosta [a,b], A.C. Denicol [c,d], P. Tribulo [d], M.I. Rivelli [a], C. Skenandore [a], Z. Zhou [a], D. Luchini [e], M.N. Corrêa [b], P.J. Hansen [d], F.C. Cardoso [a,*]

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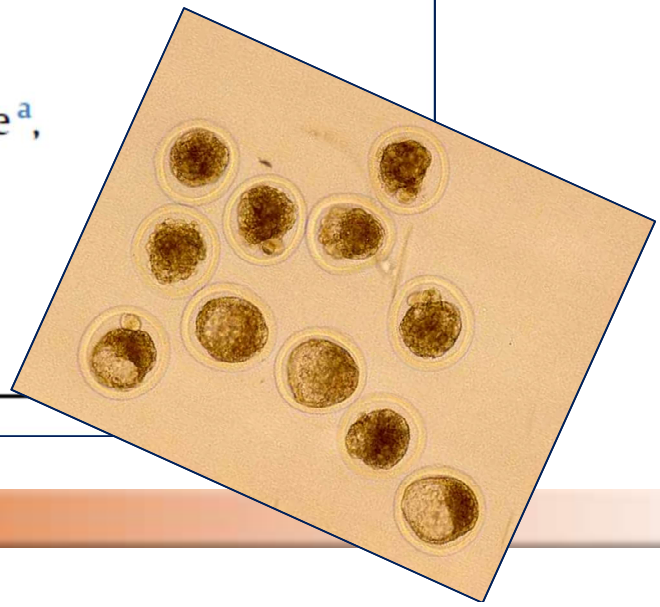
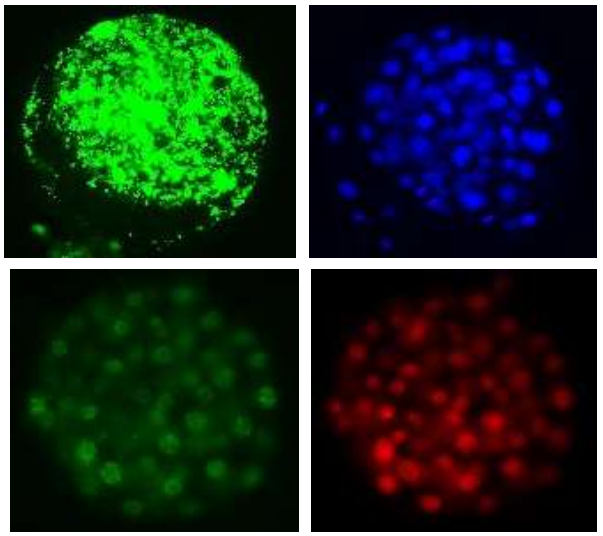
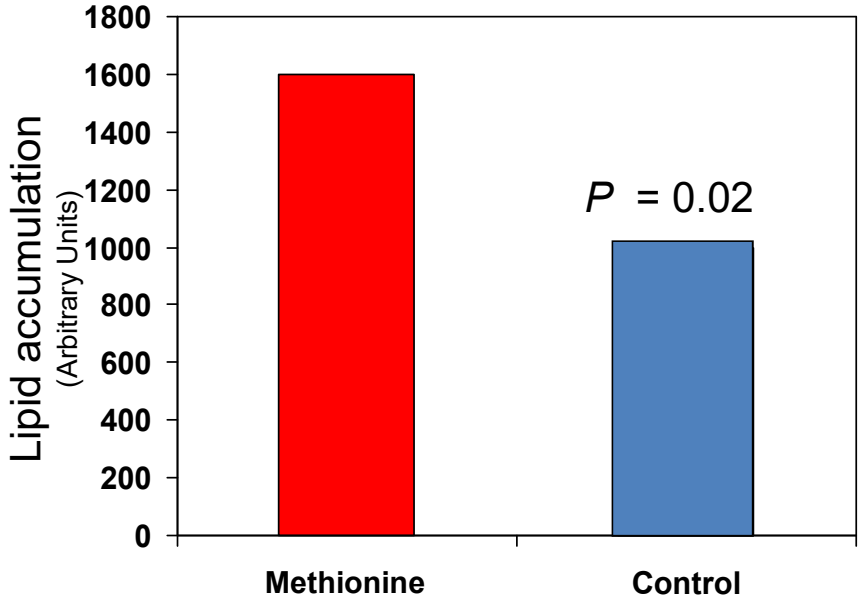
[c] Department of Biology, Northeastern University, Boston, Massachussets, USA
[d] Department of Animal Science, University of Florida, Gainesville, Florida, USA
[e] Adisseo NACA, Alpharetta, Georgia, USA



Effect of Methionine Supplementation from -21 to 72 Days relative to calving on Lipid Accumulation of Preimplantation Embryos

Embryos (n = 37) harvested 7 d after timed AI at 63 DIM from cows fed a control diet or the control diet enriched with rumen-protected methionine.

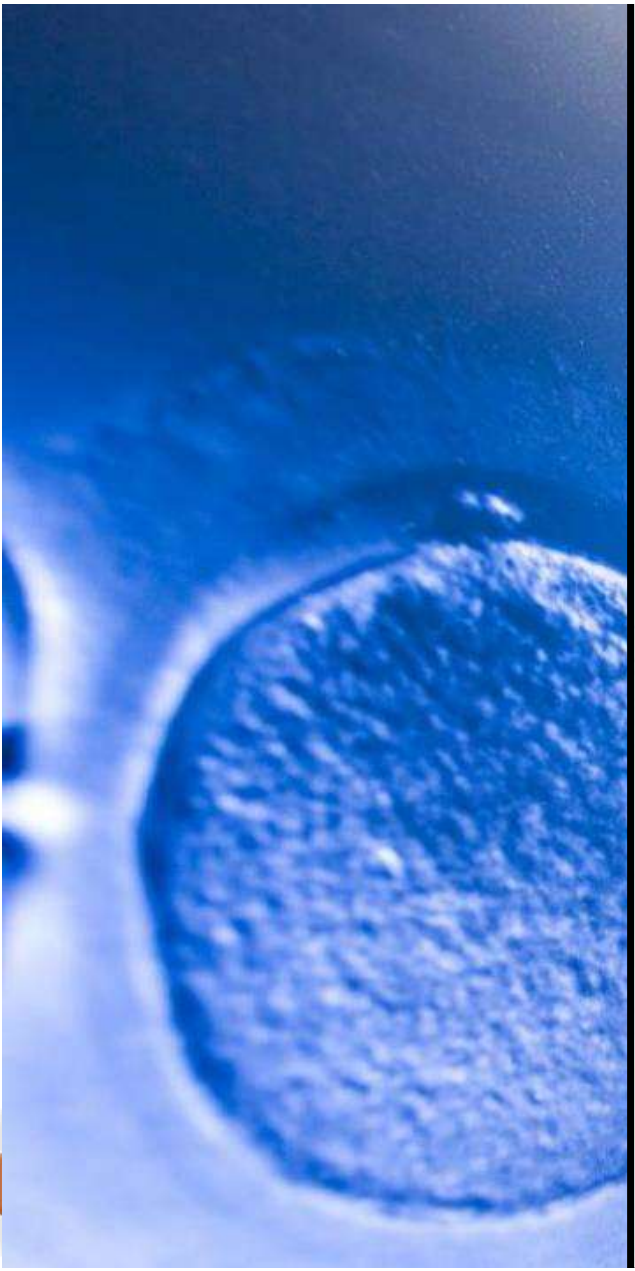




Fluorescence intensity of Nike Red staining

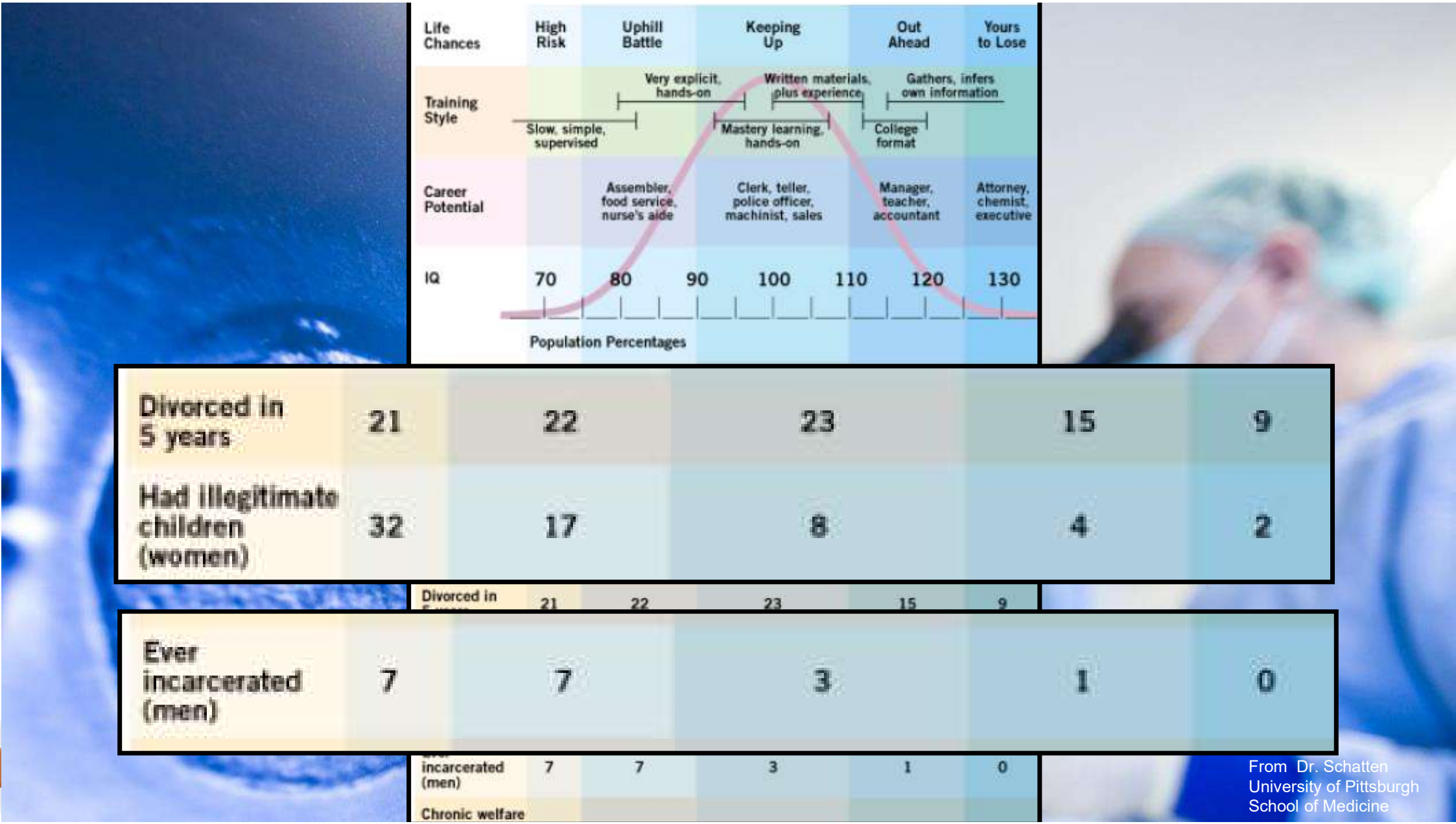
Acosta et al., 2016


This is happening…
Patients are seeking to genetically modify their embryos to improve their IQ
From Dr. Schatten
University of Pittsburgh
School of Medicine



Life Chances	High Risk	Uphill Battle	Keeping Up	Out Ahead	Yours to Lose
Training Style	Slow, simple, supervised	Very explicit, hands-on	Mastery learning, hands-on	Written materials, plus experience	College format / Gathers, infers own information
Career Potential		Assembler, food service, nurse's aide	Clerk, teller, police officer, machinist, sales	Manager, teacher, accountant	Attorney, chemist, executive
IQ	70	80 90	100	110	120 130
Population Percentages					
Total population distribution	5	20	50	20	5
Out of labor force more than 1 month out of year (men)	22	19	15	14	10
Unemployed more than 1 month out of year (men)	12	10	7	7	2
Divorced in 5 years	21	22	23	15	9
Had illegitimate children (women)	32	17	8	4	2
Lives in poverty	30	16	6	3	2
Ever incarcerated (men)	7	7	3	1	0
Chronic welfare					

From Dr. Schatten
University of Pittsburgh
School of Medicine


Life Chances
High Risk
Uphill Battle
Keeping Up
Out Ahead
Yours to Lose
Training Style
Very explicit, hands-on
Written materials, plus experience
Gathers, infers own information
Slow, simple, supervised
Mastery learning, hands-on
College format
Career Potential
Assembler, food service, nurse's aide
Clerk, teller, police officer, machinist, sales
Manager, teacher, accountant
Attorney, chemist, executive
IQ
70
80
90
100
110
120
130
Population Percentages
Divorced in 5 years
21
22
23
15
9
Had illegitimate children (women)
32
17
8
4
2
Ever incarcerated (men)
7
7
3
1
0
Chronic welfare
From Dr. Schatten
University of Pittsburgh
School of Medicine

PLOS ONE

RESEARCH ARTICLE

Effect of feeding rumen-protected methionine on productive and reproductive performance of dairy cows

Mateus Z. Toledo[1], Giovanni M. Baez[1¤a], Alvaro Garcia-Guerra[1,2¤b], Nelson E. Lobos[1], Jerry N. Guenther[1], Eduardo Trevisol[1], Daniel Luchini[3], Randy D. Shaver[1], Milo C. Wiltbank[1,2]*

1 Department of Dairy Science, University of Wisconsin-Madison, Madison, Wisconsin, Unites States of America, **2** Endocrinology and Reproductive Physiology Program, University of Wisconsin-Madison, Madison, WI, United States of America, **3** Adisseo USA Inc., Alpharetta, Georgia, Unites States of America

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* wiltbank@wisc.edu

Effect of Supplementation with Rumen-Protected Methionine (RPM) on Reproduction of Lactating Dairy Cows

Cows were fed a basal TMR (6.9% Lys of MP and 1.87% Met of MP) from 30 ± 2 to 128 ± 2 DIM and assigned to two treatments:

RPM: Basal TMR top dressed daily with RPM

CON: Basal diet top dressed daily with DDG

Toledo et al., 2017

Effect of Supplementation with Rumen-Protected Methionine (RPM) on Reproduction of Lactating Dairy Cows

RPM cows were top dressed with 50 g (29 g DDG and 21 g of Smartamine M)
CON cows were top dressed with 50 g of DDG

RPM

CON

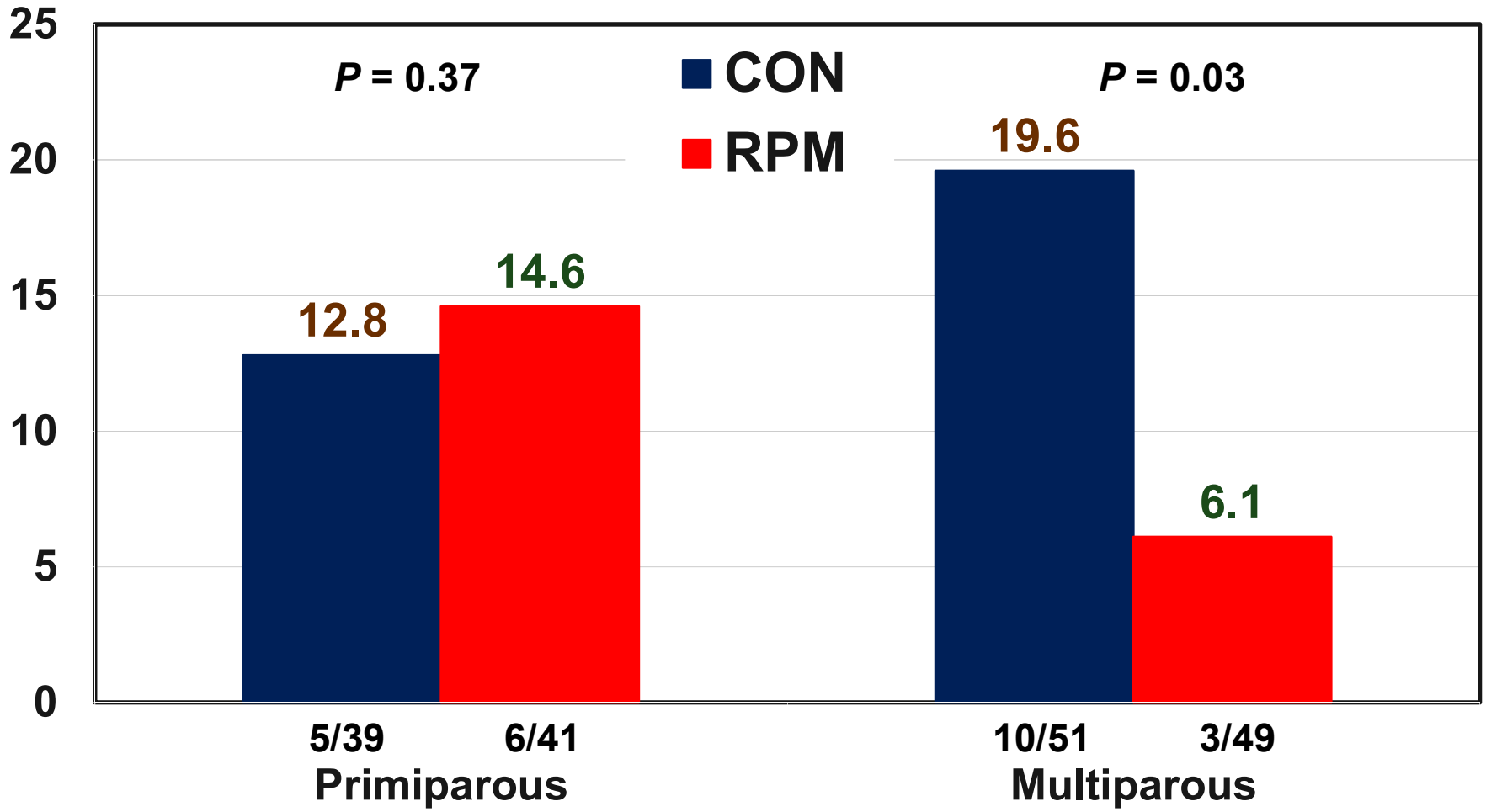
Toledo et al., 2017

Animals

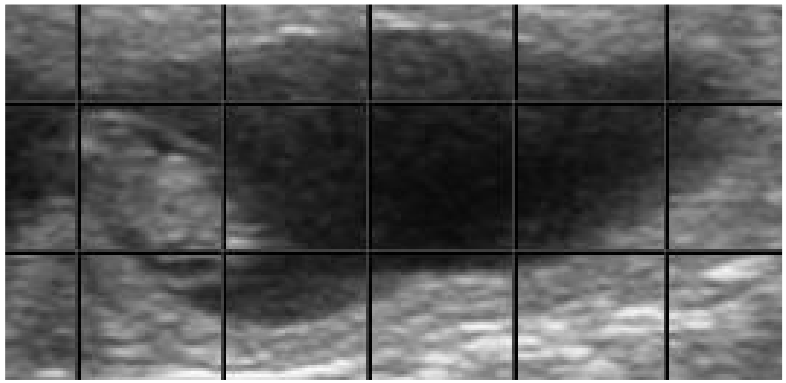
	CONTROL	RPM	TOTAL
Primiparous	68	70	138
Multiparous	85	86	171
TOTAL	153	156	309

Toledo et al., 2017

Pregnancy Losses (%) from 28 to 61 days after AI



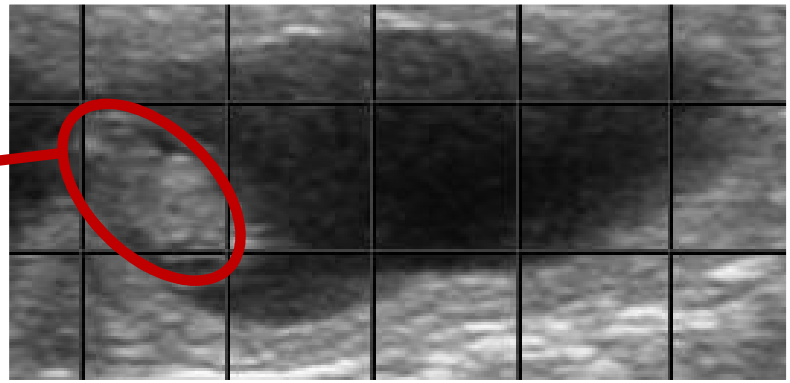
Toledo et al., 2017



Toledo et al., 2017

Amniotic vesicle size

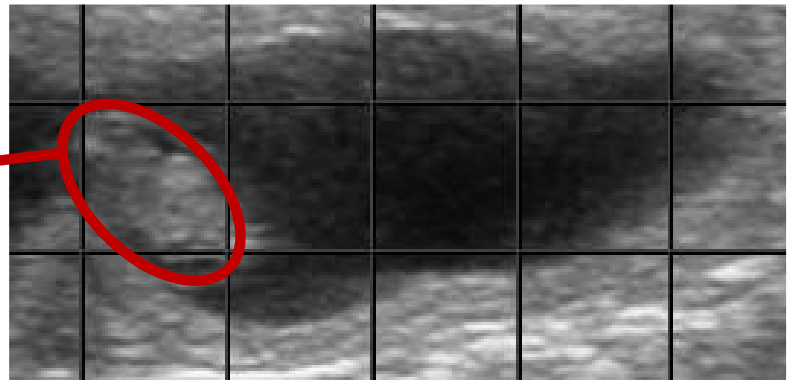
Ellipsoid Volume



Toledo et al., 2017

Amniotic vesicle size

Ellipsoid Volume



Day 33	n	Volume (mm^3) ± SEM
Primiparous		
Control	31	**610.6** ± 38.6
RPM	36	**596.0** ± 36.9
***P*-value**		**0.71**
Multiparous		
Control	35	**472.3** ± 28.6
RPM	45	**592.1** ± 46.0
***P*-value**		**0.05**

Toledo et al., 2017

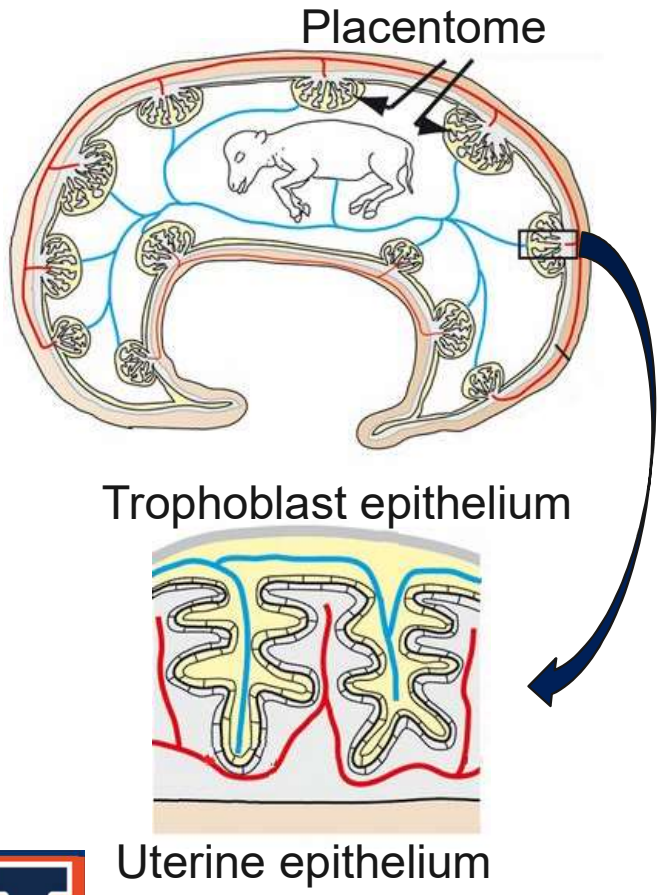
The Journal of Nutrition
Biochemical, Molecular, and Genetic Mechanisms

Placentome Nutrient Transporters and Mammalian Target of Rapamycin Signaling Proteins Are Altered by the Methionine Supply during Late Gestation in Dairy Cows and Are Associated with Newborn Birth Weight

Fernanda Batistel,[1] Abdulrahman SM Alharthi,[1] Ling Wang,[3] Claudia Parys,[4] Yuan-Xiang Pan,[2] Felipe C Cardoso,[1] and Juan J Loor[1]

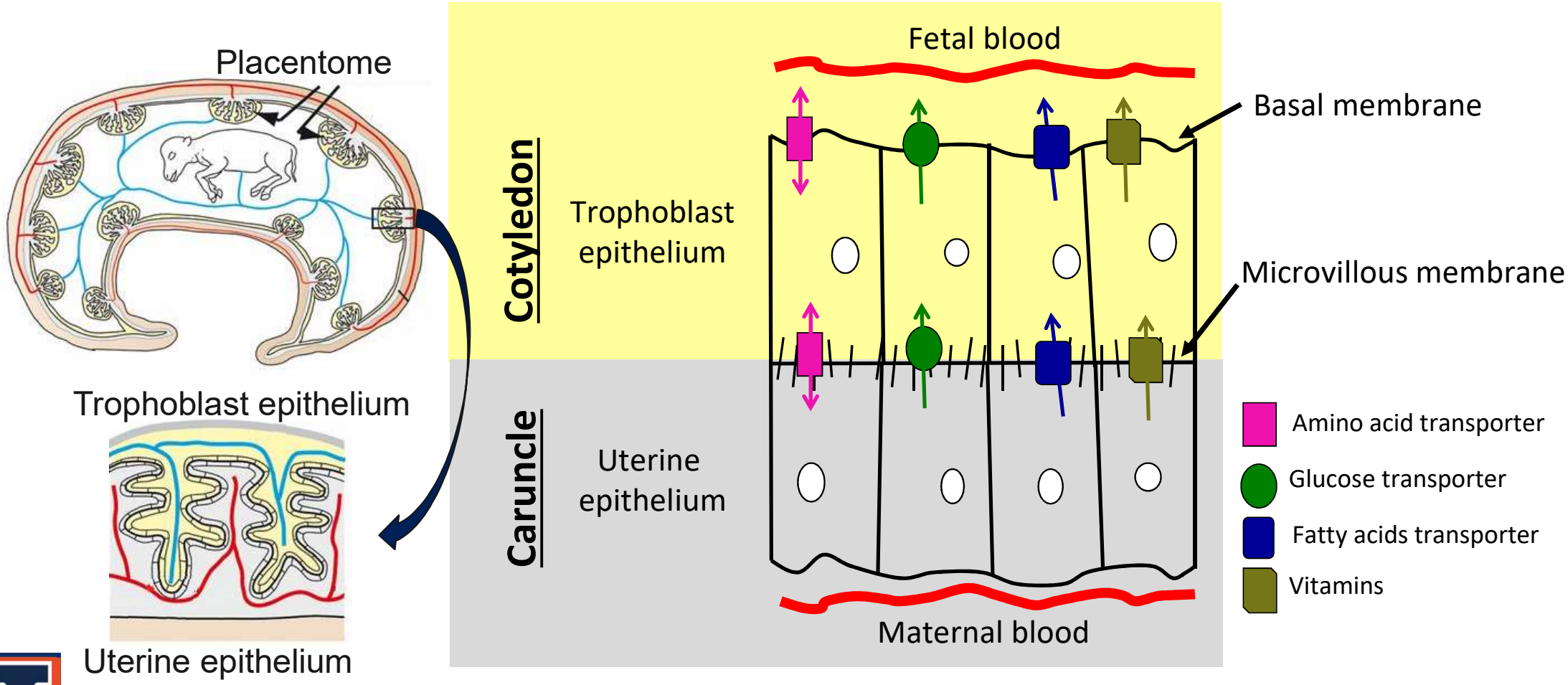
Division of Nutritional Sciences, Departments of [1]Animal Sciences and [2]Food Science and Human Nutrition, University of Illinois, Urbana, IL; [3]Department of Animal Science, Southwest University, Rongchang, China; and [4]Evonik Nutrition & Care GmbH, Hanau-Wolfgang, Germany

Effects of maternal nutrition on placenta



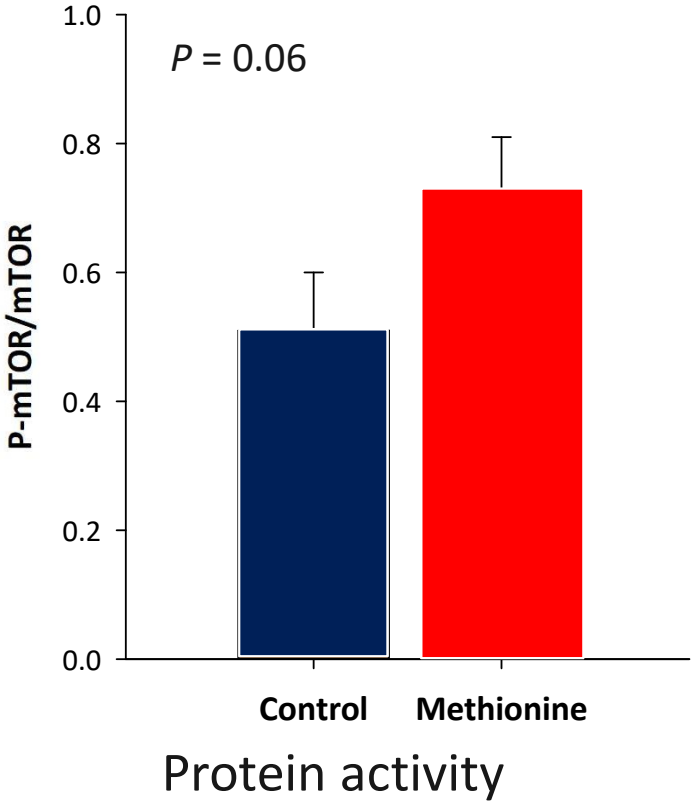
Batistel et al., 2017

Effects of maternal nutrition on placenta



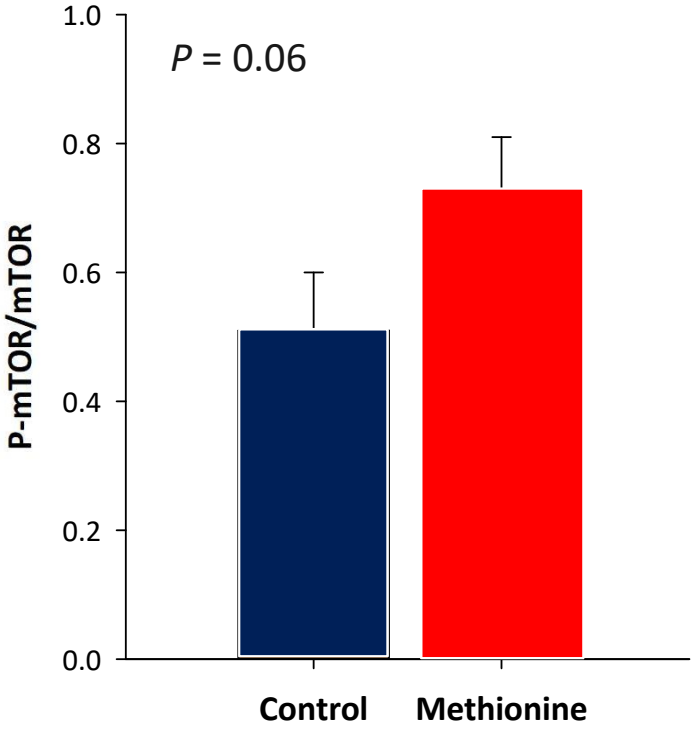
Batistel et al., 2017

Effects of maternal nutrition on placenta

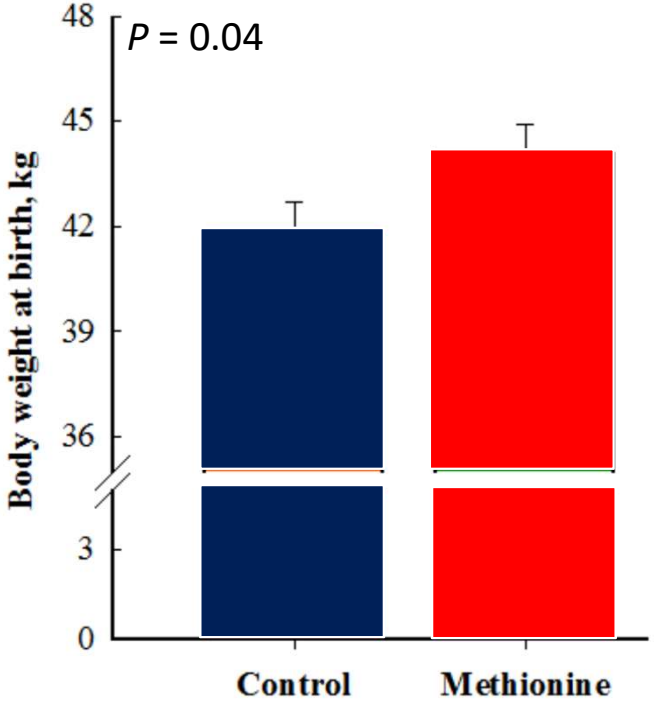


Batistel et al., 2017

Effects of maternal nutrition on placenta and calf



Protein activity



Calf body weight at birth

Batistel et al., 2017

Effect of Supplementation with Rumen-Protected Lysine (RPL) During the Transition Period of Holstein Cows

PRE (26 ± 5 d prepartum)

C (Control) no RPL.

L (Lysine) with RPL.
AjiproL top-dressed in 300g of molasses

Fehlberg et al., *unpublished*

Effect of Supplementation with Rumen-Protected Lysine (RPL) During the Transition Period of Holstein Cows

PRE (26 ± 5 d prepartum)

C (Control) no RPL.

L (Lysine) with RPL.

AjiproL top-dressed in 300g of molasses

POS (28 d postpartum)

C-C no RPL prepartum; no RPL postpartum. (n = 18)

C-L no RPL prepartum; with RPL postpartum. (n = 19)

L-C with RPL prepartum; no RPL postpartum. (n = 20)

L-L with RPL prepartum; with RPL postpartum. (n = 18)

According to AMTS prediction,

- **Prepartum:**
  - Cows in **C** consuming the prepartum diet received 1.17 kg of MP per d, resulting in 6.86% MP as Lys, 2.98 % MP as Met, and 2.71 % MP as His with a Lys:Met of 2.30 and His:Met of 0.92.
  - Cows in **L** received 1.19 kg of MP per d, resulting in 8.24 % MP as Lys, 2.94 % MP as Met, and 2.67 % MP as His with a Lys:Met of 2.80 and His:Met of 0.92.
- **Postpartum:**
  - Cows in **C** consuming the postpartum diet received 2.28 kg of MP per d, resulting in 6.27% MP as Lys, 2.54 % MP as Met, and 2.42 % MP as His with a Lys:Met of 2.46 and His:Met of 0.94.
  - Cows in **L** received 2.22 kg of MP per d, resulting in 7.15 % MP as Lys, 2.55 % MP as Met, and 2.40 % MP as His with a Lys:Met of 2.80 and His:Met of 0.93.

Fehlberg et al., *unpublished*

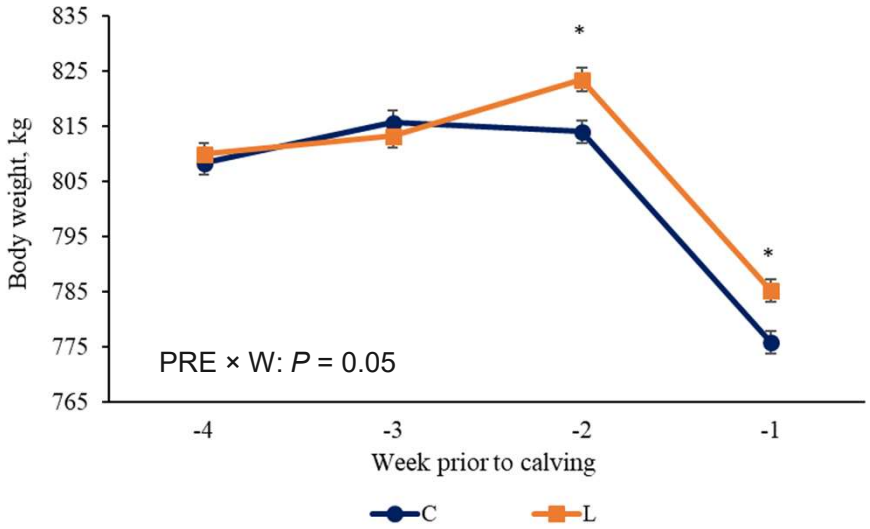
TMR

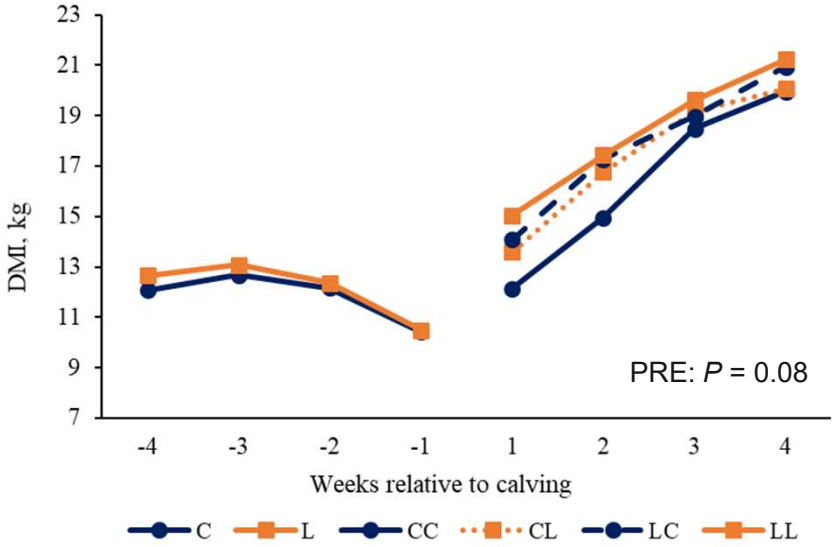
Ingredient (% of DM)	Prepartum	Postpartum
Corn silage (34.7% DM)	31.06	39.38
Canola meal	1.45	5.36
Alfalfa hay	-	20.95
Wheat midds	4.10	-
Corn gluten feed	6.69	-
Soybean meal, 48% CP	2.19	-
Wheat straw	40.25	-
Dry ground corn grain	0.16	15.26
Smartamine M	0.12	0.09
Energy booster100	-	1.93
SoyPlus	5.74	6.66
Animate	3.85	-
Urea 46%	0.23	0.30
Magnesium oxide	-	0.09
Magnesium sulfate	0.25	-
Dicalcium phosphate	-	0.33
Molasses beet	-	4.43
Calcium carbonate	2.08	-
Vit. and mineral mix	1.31	-
Vit. and mineral mix	-	4.73

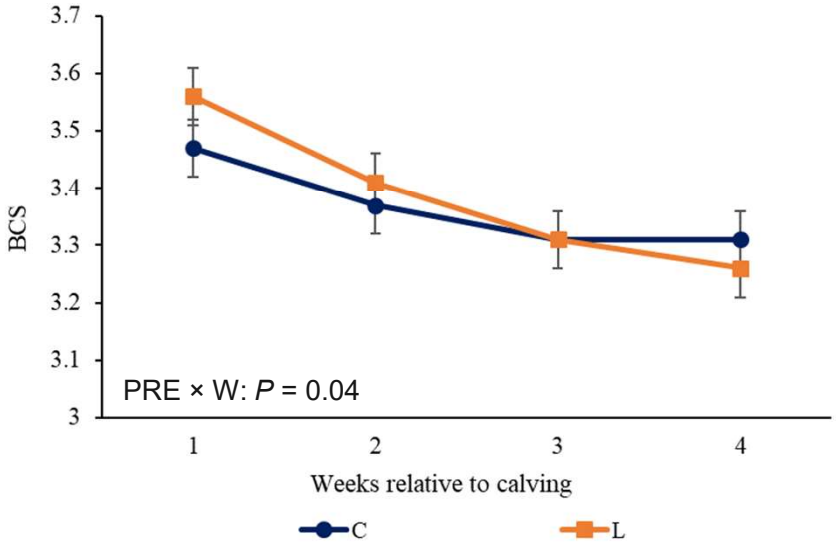
Chemical composition

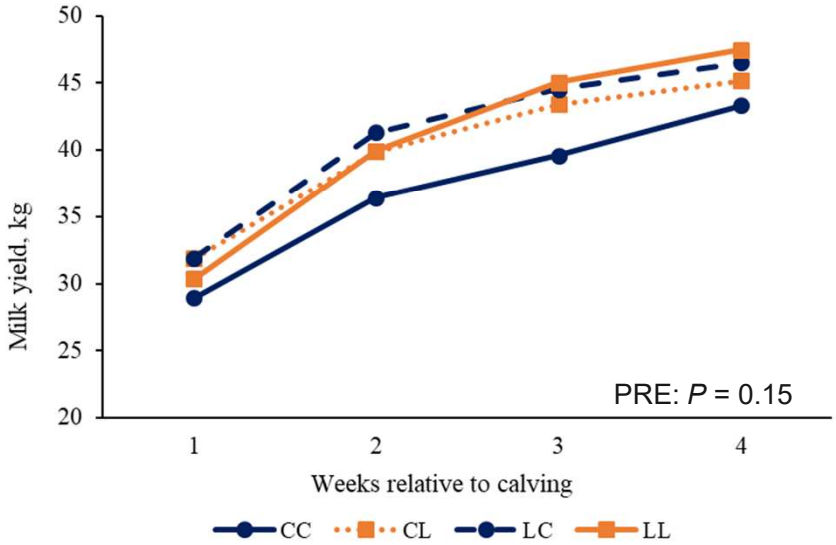
Item	Prepartum	Postpartum
DM, %	43.43 ± 1.42	45.71 ± 1.64
CP, % of DM	14.22 ± 0.68	16.75 ± 1.06
ADF, % of DM	28.41 ± 2.80	20.94 ± 1.77
NDF, % of DM	44.82 ± 2.75	31.25 ± 3.29
Lignin, % of DM	4.44 ± 0.74	3.80 ± 0.49
Starch, % of DM	13.99 ± 1.69	24.39 ± 2.62
Crude fat, % of DM	3.03 ± 0.21	4.95 ± 0.51
Ash, % of DM	10.34 ± 1.34	9.16 ± 0.74
NE_L, Mcal/kg of DM[3]	1.44 ± 0.03	1.67 ± 0.05
Ca, % of DM	1.46 ± 0.35	1.12 ± 0.21
P, % of DM	0.37 ± 0.04	0.41 ± 0.04
Mg, % of DM	0.50 ± 0.07	0.38 ± 0.03
K, % of DM	1.12 ± 0.11	1.75 ± 0.17
Mn, ppm	91.9 ± 17.5	99.3 ± 13.7
Mo, ppm	1.20 ± 0.30	1.32 ± 0.30

Fehlberg et al., *unpublished*



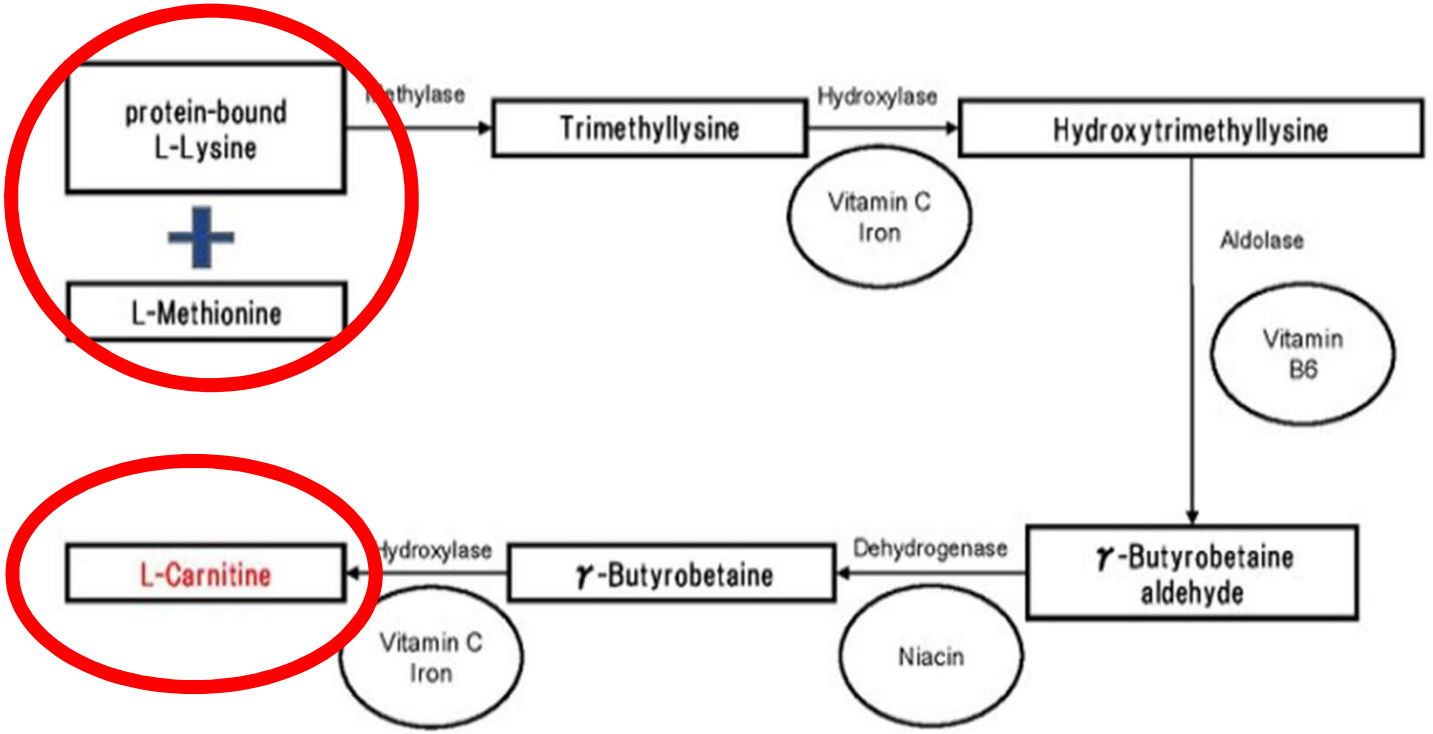


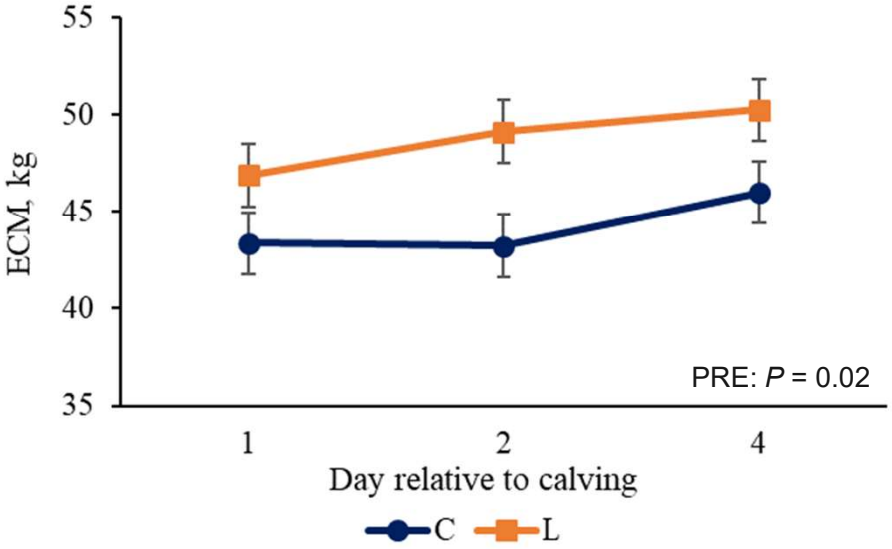


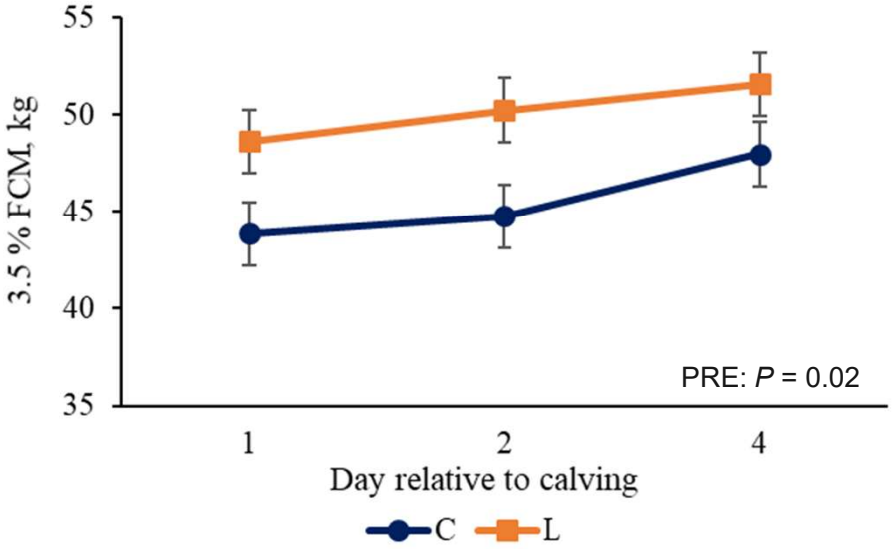


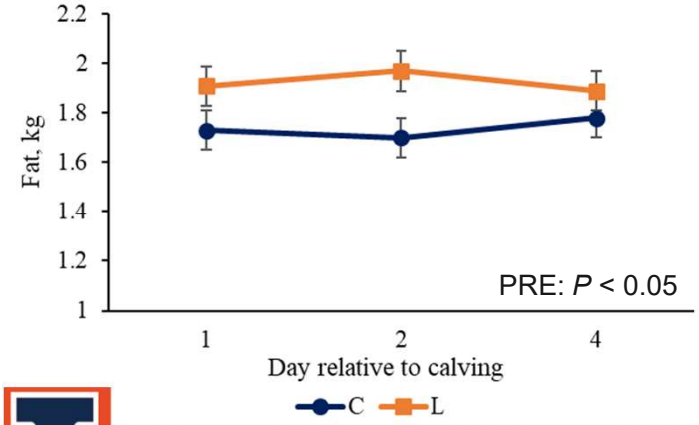
Fehlberg et al., *unpublished*

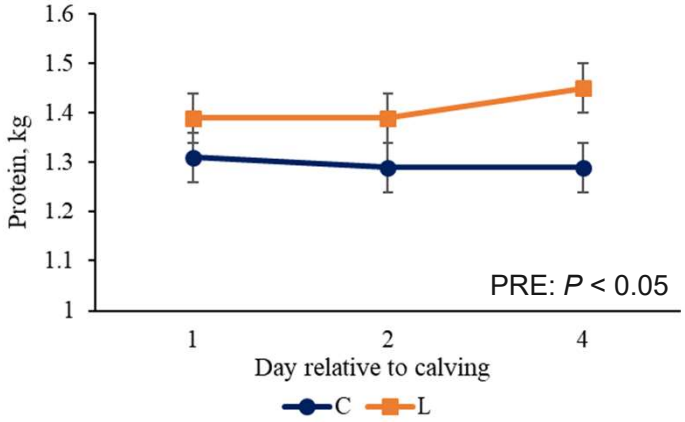
Carnitine is synthesized in mammals from Lysine residues

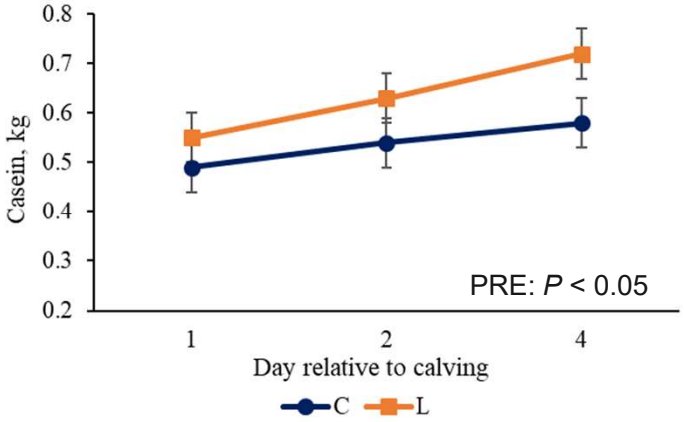












Fehlberg et al., *unpublished*

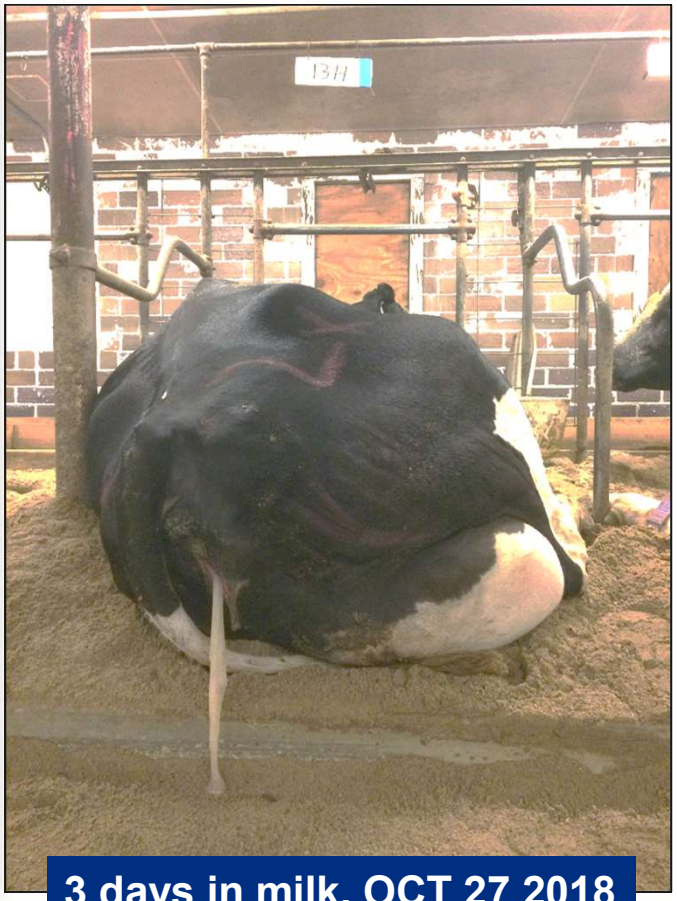

TAKE HOME MESSAGE
Remember!

Cow # 1311 on controlled energy diet, - DCAD and AA

Prepartum

Cow # 1311 on controlled energy diet, - DCAD and AA

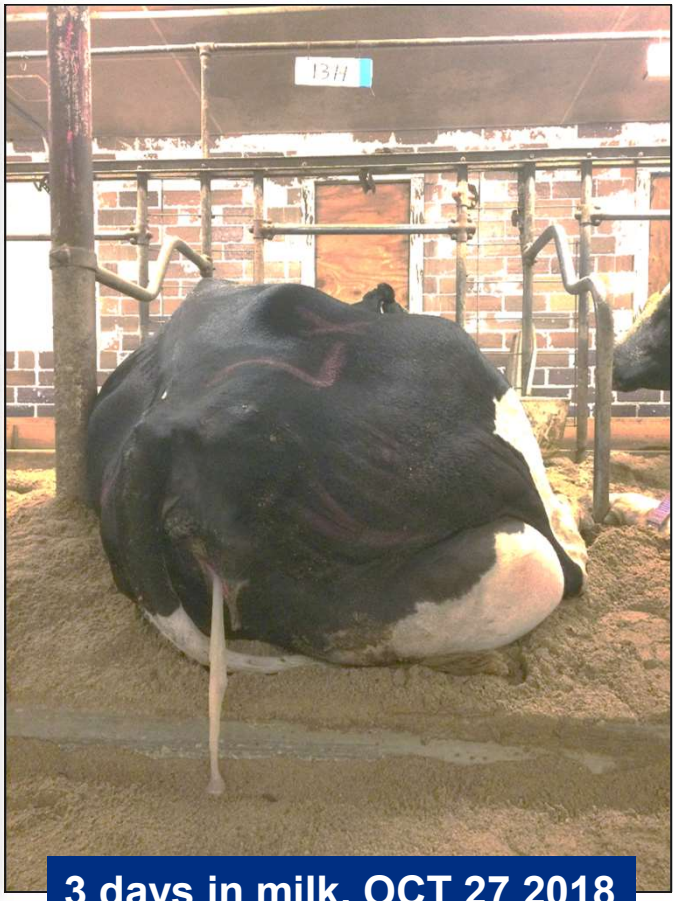
Prepartum



3 days in milk, OCT 27 2018

Cow # 1311 on controlled energy diet, - DCAD and AA

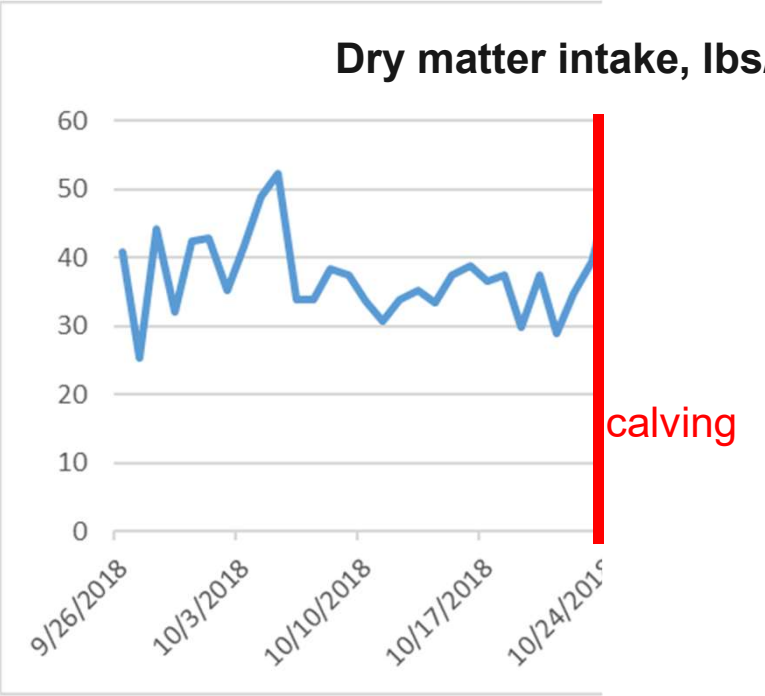
Prepartum



3 days in milk, OCT 27 2018

17 days in milk, NOV 10 2018

Cow # 1311 on controlled energy diet, - DCAD and AA



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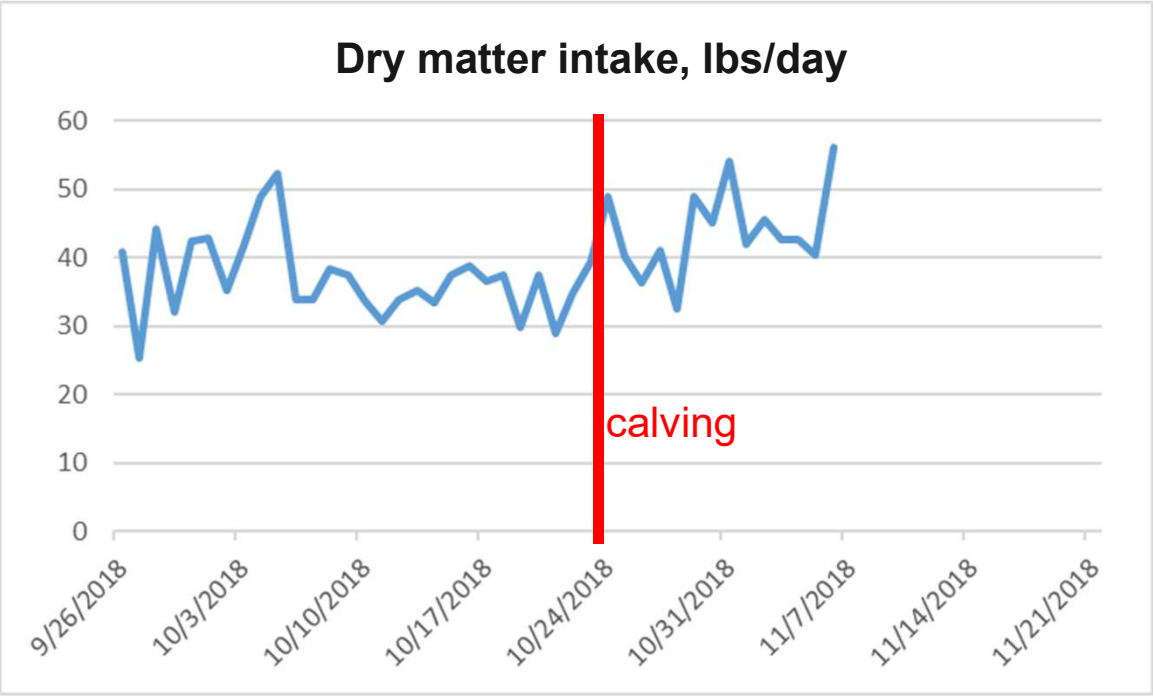

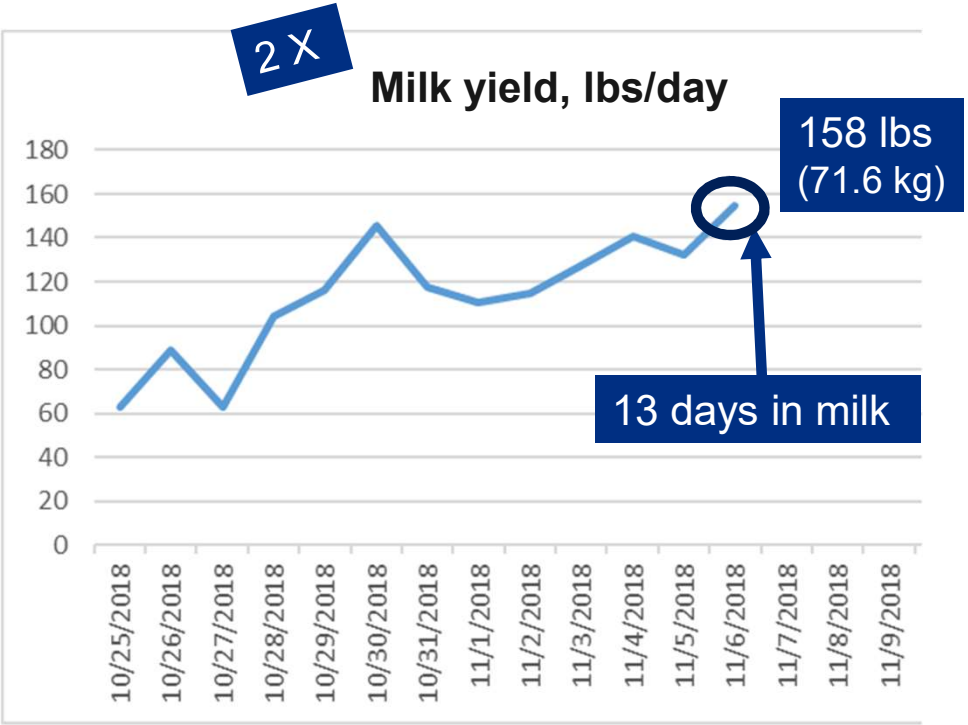

Cow	Colostrum Weight, lbs	Colostrum Brix, %	Fat, %	Total Protein, %	Total Solids, %
1311	13.15	25.6	3.43	17	24.26

Summary

- Manage dietary ingredients for
  - ~~Manage for adequate CP (~13% Dry & 16% Lactation)~~
  - Metabolizable methionine in TMR (30 g/d Dry & 46 g/d Lactation)
    ~ 15 g/d Dry & 20 g/d Lactation of rumen-protected methionine
  - Metabolizable lysine in TMR (84 g/d Dry & 129 g/d Lactation)
    ~ 26 g/d Dry & 36 g/d Lactation rumen-protected lysine
    - Balanced for the ratios: Met 2.6% MP; Lys, 7.0% MP (LYS:MET ratio of 2.7:1)
    - Methionine supply relative to energy is ~ 0.97-1.14 g/Mcal ME
    - Lysine supply relative to energy is ~ 2.72-3.03 g/Mcal ME
  - Pregnancy rate > 20% (go for > 25%; conception rate at first AI > 40%)
  - Embryonic death < 15% (go for < 10%)

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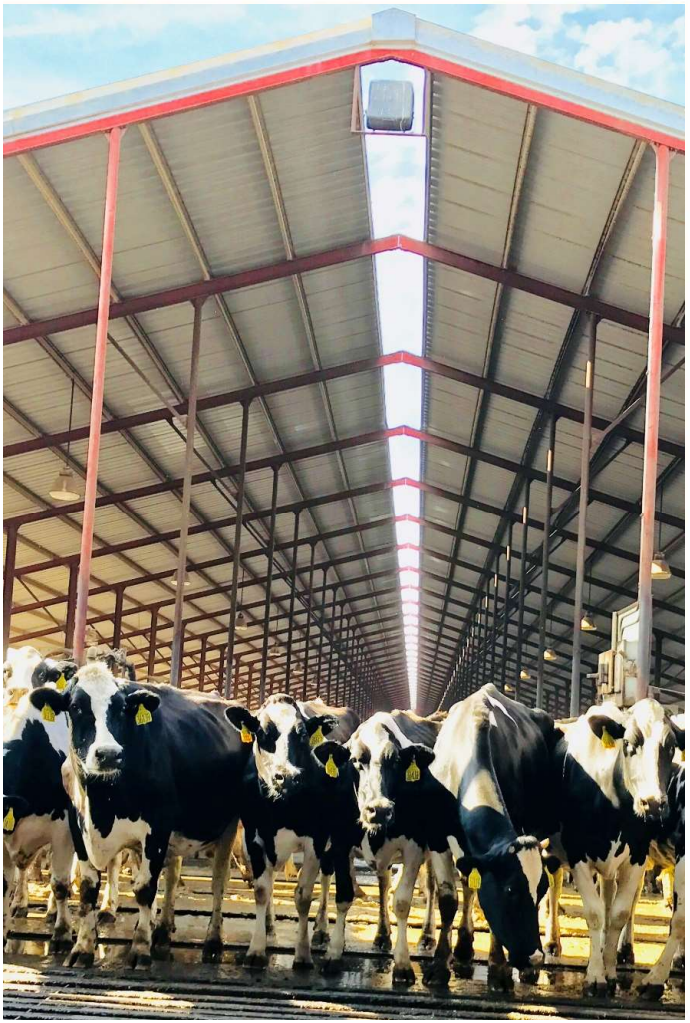

THANK YOU!

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www.dairyfocus.illinois

Dairy Focus Lab