Fertility Programs to Achieve High 21-day Pregnancy Rates in High Producing Dairy Herds

P.M. Fricke

M.C. Wiltbank, P.D. Carvalho, and J.O. Giordano

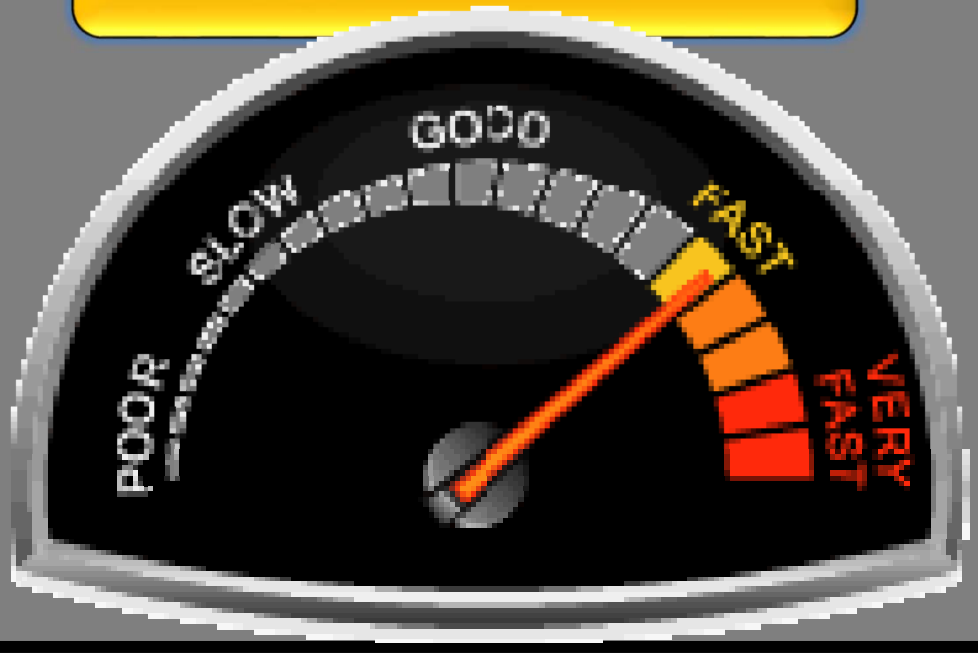
DEPARTMENT OF
DAIRY SCIENCE
University of Wisconsin-Madison

21-Day Pregnancy Rate

Service Rate

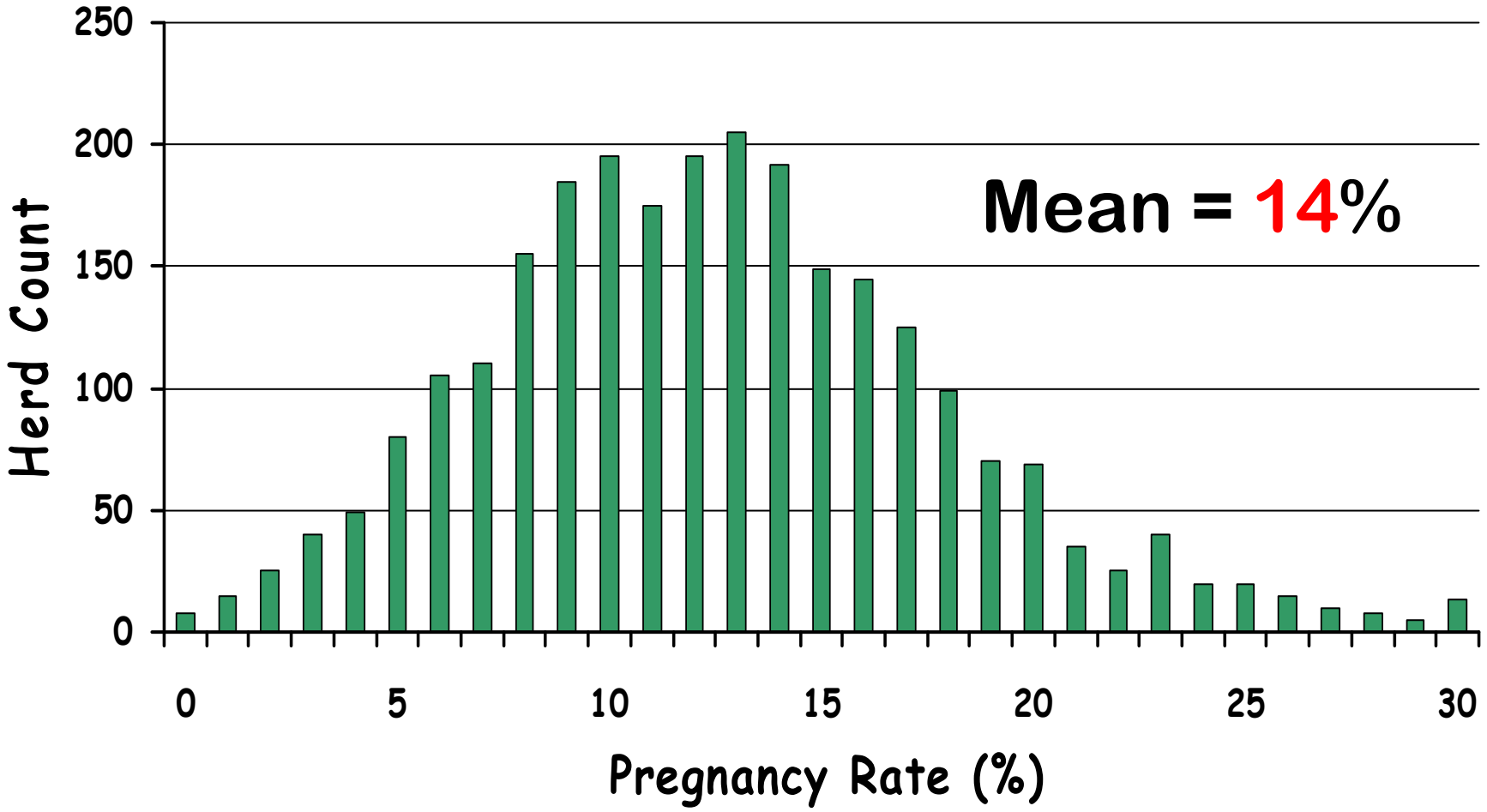
Conception Rate (P/AI)

21d-Preg Rate



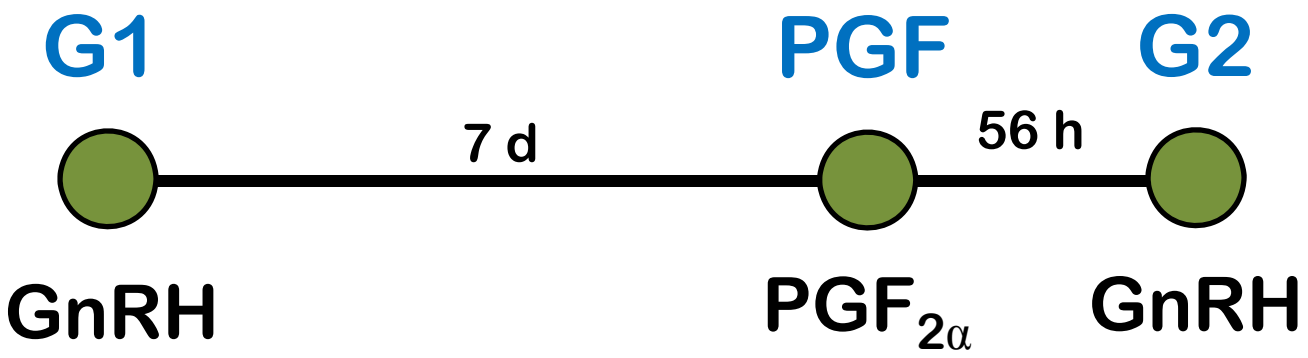
Pregnancy Rate, 1998 Minnesota DHI Data

Rapnicki P, Stewart S, Eicker S. 2001. Proc 4-State Appl Nutr Mgt Conf, La Crosse, WI



Ovsynch

Pursley, Mee, & Wiltbank, 1995; Theriogenology 44:915



Take-Home Message:

The key factor affecting fertility to an Ovsynch protocol is the response to each of the three sequential hormonal treatments which can be defined using progesterone profiles.

Outline

- Effect of Ovulatory Response to G1 on P/AI
- Effect of Progesterone at G1 and PGF on P/AI
- Effect of Progesterone at G2 on P/AI
- Addition of a Second $PGF_{2\alpha}$ Treatment Increases P/AI
- 5-d vs. 7-d Ovsynch Protocols
- Achieving a 30% 21-d Pregnancy Rate in a 30,000 lb. Dairy Herd

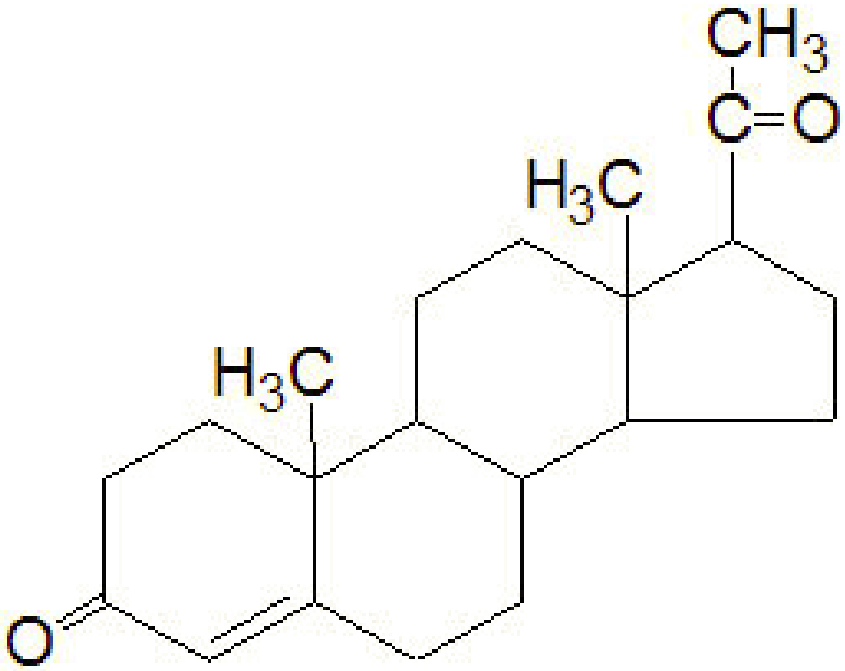
Outline

- **Effect of Ovulatory Response to G1 on P/AI**

J. Dairy Sci. 98:8800–8813
http://dx.doi.org/10.3168/jds.2015-9968

Manipulation of progesterone to increase ovulatory response to the first GnRH treatment of an Ovsynch protocol in lactating dairy cows receiving first timed artificial insemination

P. D. Carvalho, M. C. Wiltbank, and P. M. Fricke[1]
Department of Dairy Science, University of Wisconsin, Madison 53706

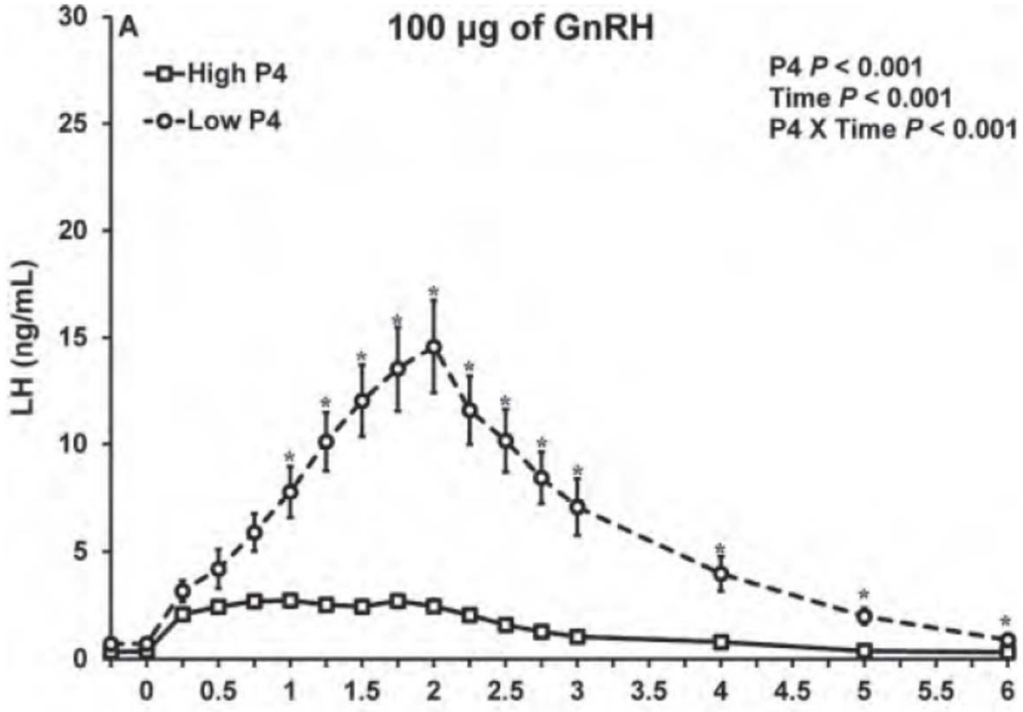


DEPARTMENT OF
DAIRY SCIENCE
University of Wisconsin-Madison

J. Dairy Sci. 95:3781–3793
http://dx.doi.org/10.3168/jds.2011-5155

Effect of progesterone on magnitude of the luteinizing hormone surge induced by two different doses of gonadotropin-releasing hormone in lactating dairy cows

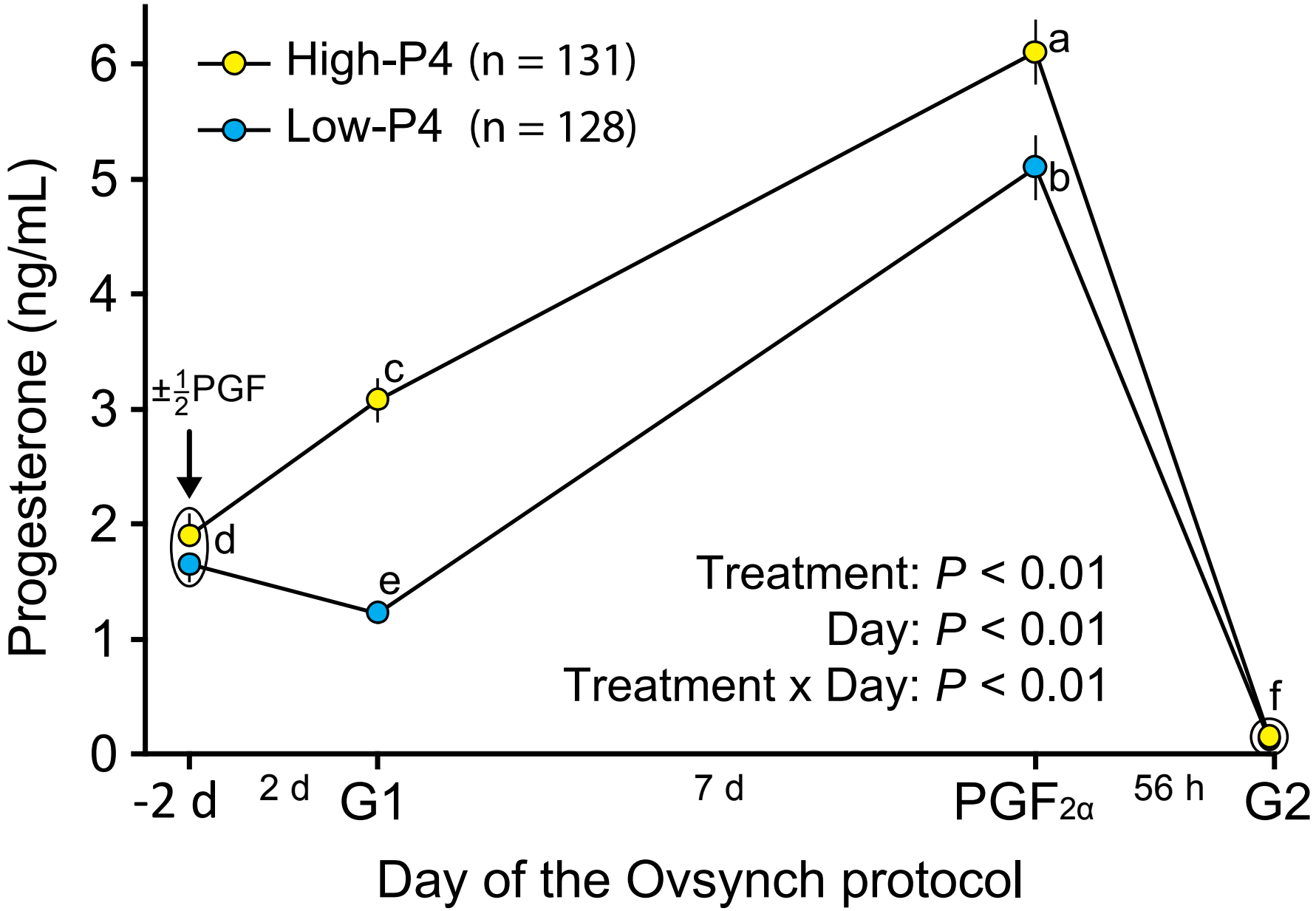
J. O. Giordano, P. M. Fricke, J. N. Guenther, G. Lopes Jr., M. M. Herlihy,[1] A. B. Nascimento, and M. C. Wiltbank[2]
Department of Dairy Science, University of Wisconsin–Madison, Madison 53706



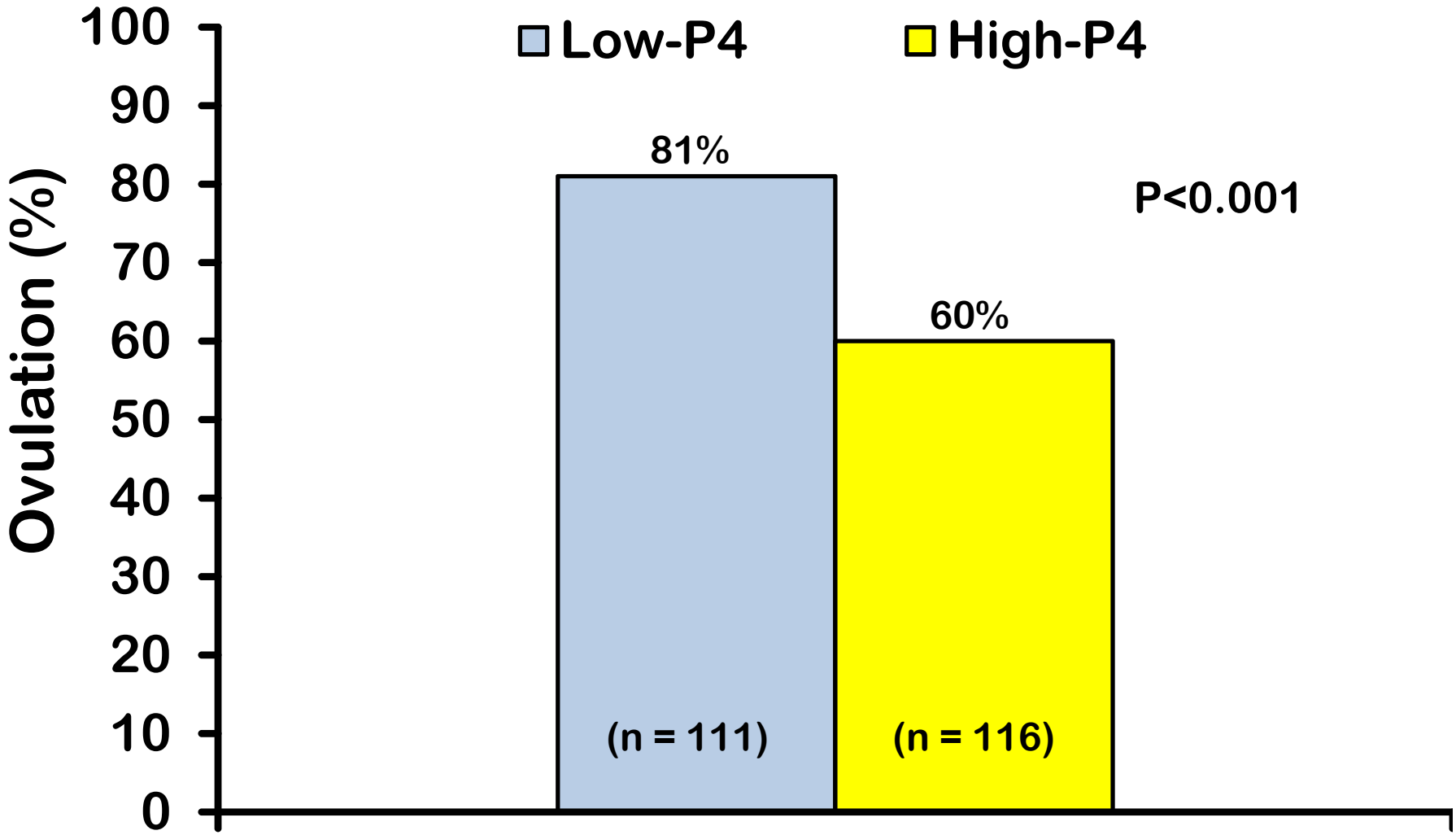
Experimental Design

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					GnRH	
					PGF	
	GnRH					$\pm\frac{1}{2}$PGF
	GnRH					
	PGF	PGF	GnRH	TAI		

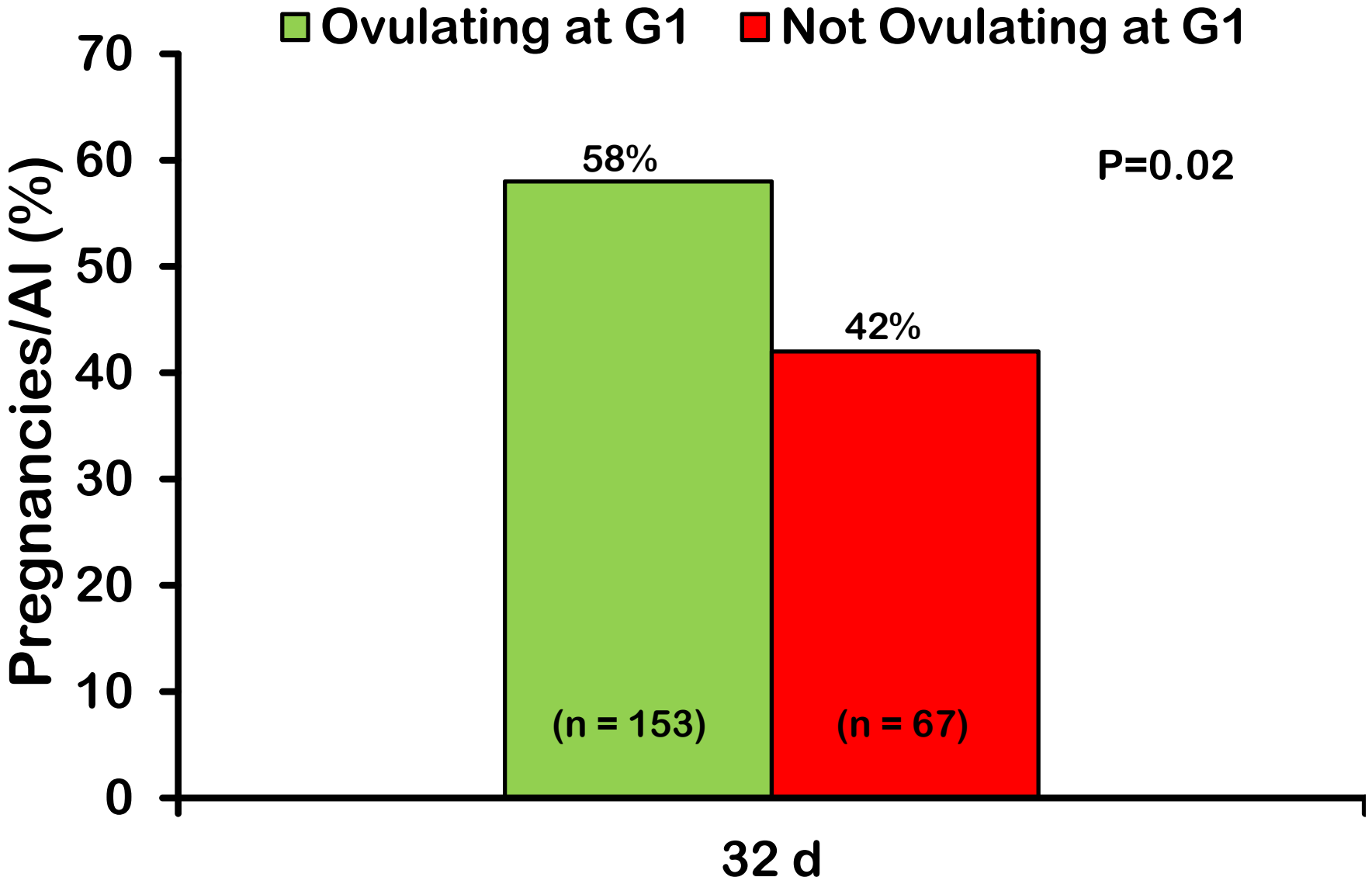
Effect of treatment on P4



Effect of treatment on ovulatory response to G1



Effect of ovulatory response to G1 on P/AI

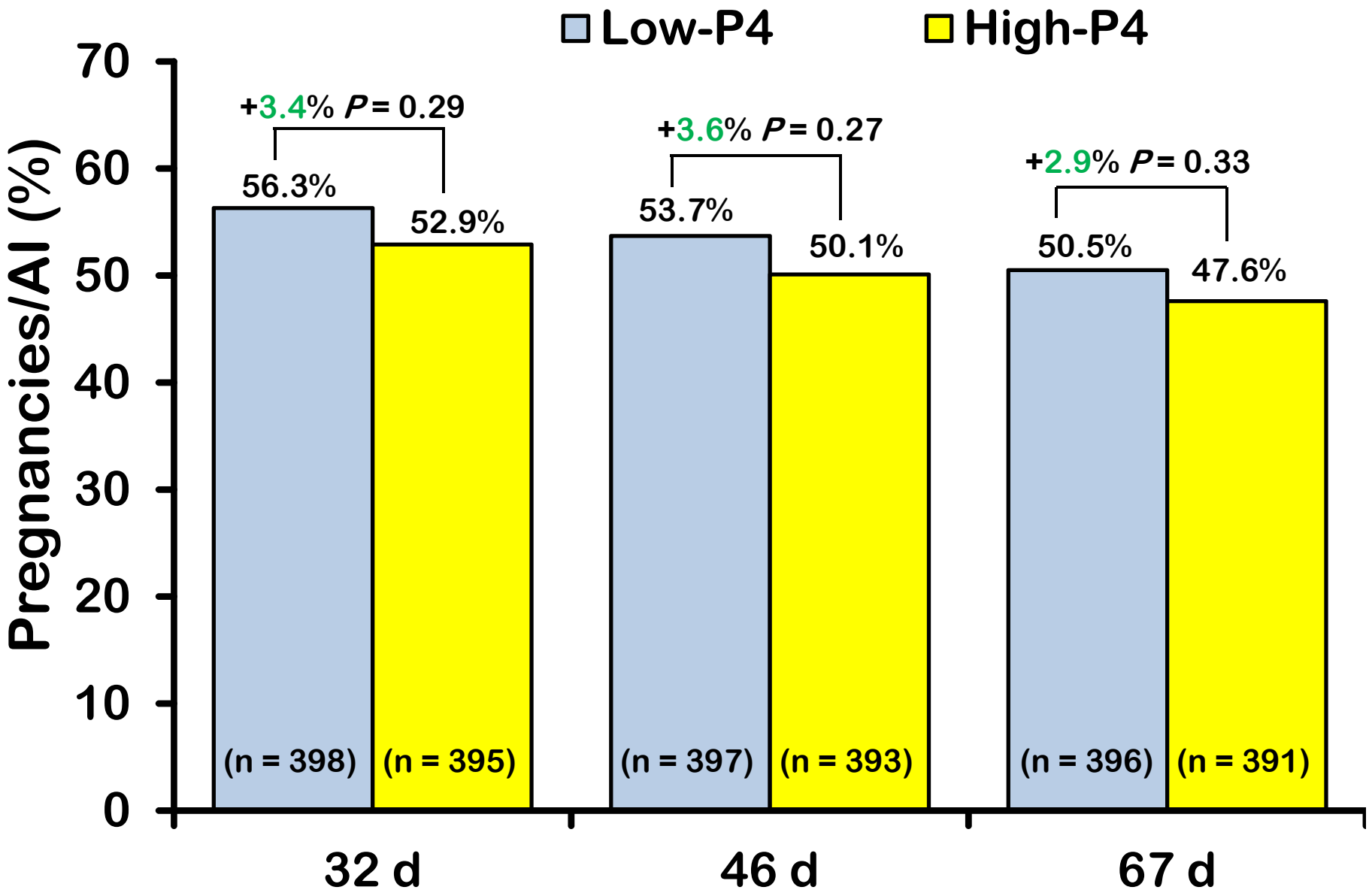


Expected Pregnancies/AI

Item	Treatment	
	Low P4	High P4
Ovulation to G1		
YES	81.0%	60.0%
P/AI for cows ovulating to G1	58.2%	58.2%
Overall P/AI	47.1%	34.9%
NO	19.0%	40.0%
P/AI for cows not ovulating to G1	41.8%	41.8%
Overall P/AI	7.9%	16.7%
Expected P/AI	55.0%	51.6%

Expected treatment difference = +3.4%

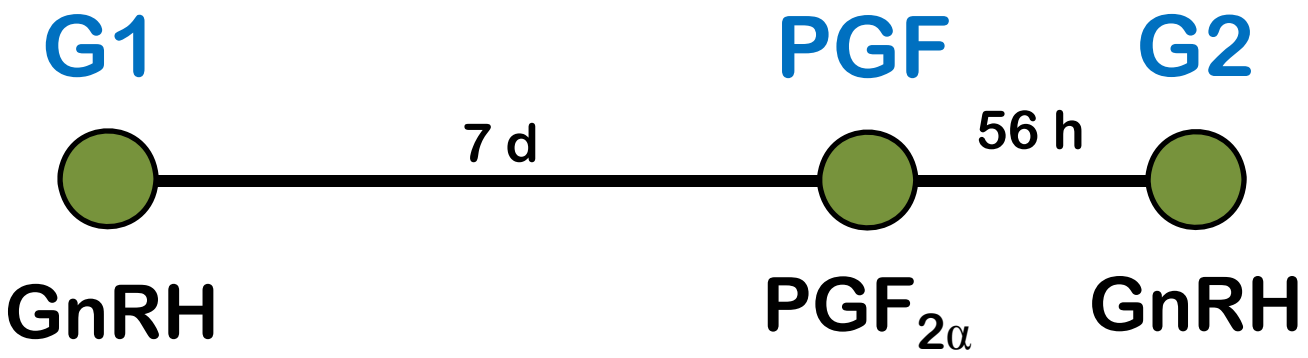
Effect of treatment on P/AI



Outline

- Effect of Ovulatory Response to G1 on P/AI
- Effect of Progesterone at G1 and PGF on P/AI

Key points during the Ovsynch Protocol

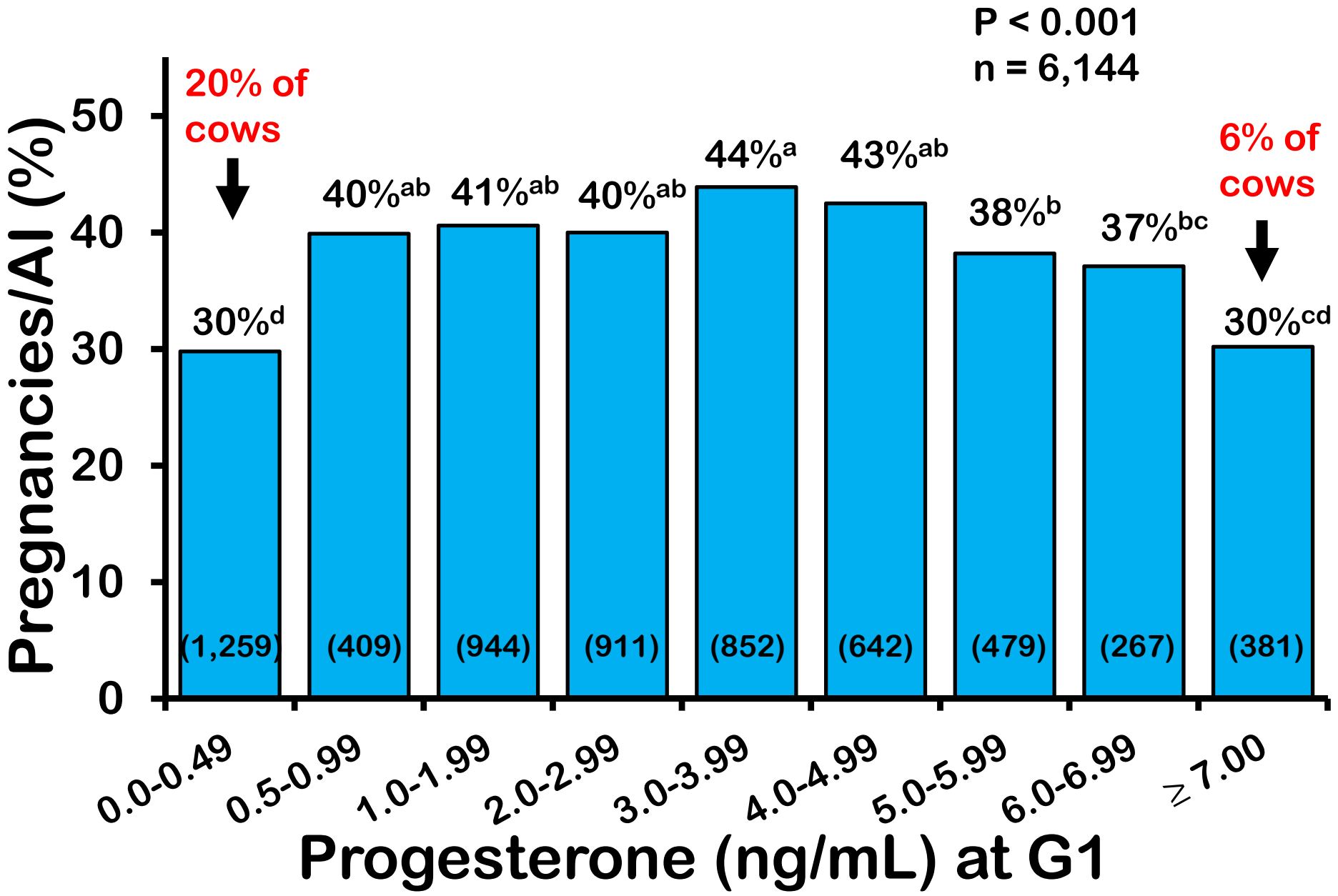


Question:

How does progesterone concentration during the Ovsynch protocol affect fertility?

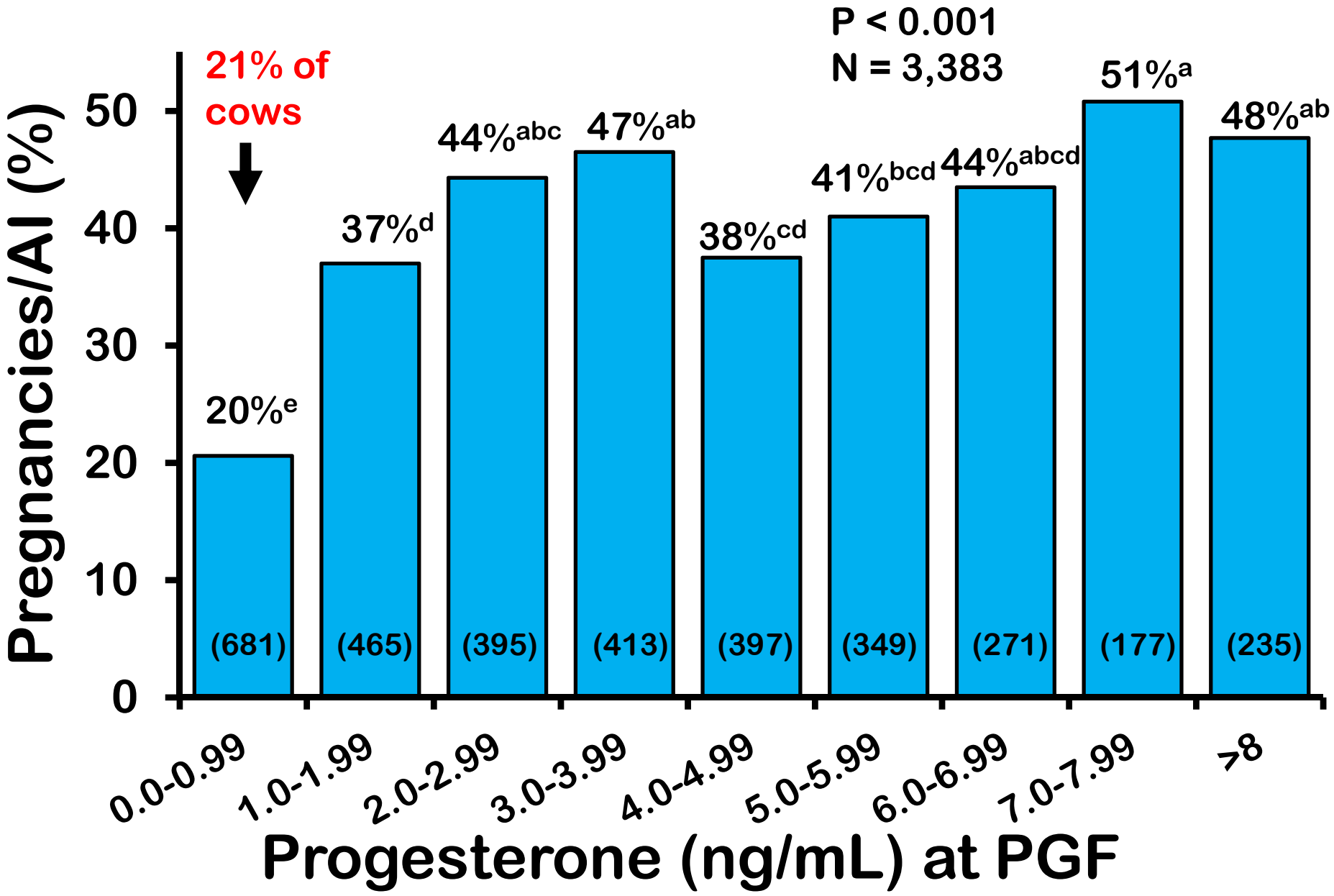
Effect of P4 at G1 on fertility

Carvalho et al., 2015; J. Dairy Sci. (Abstr.)



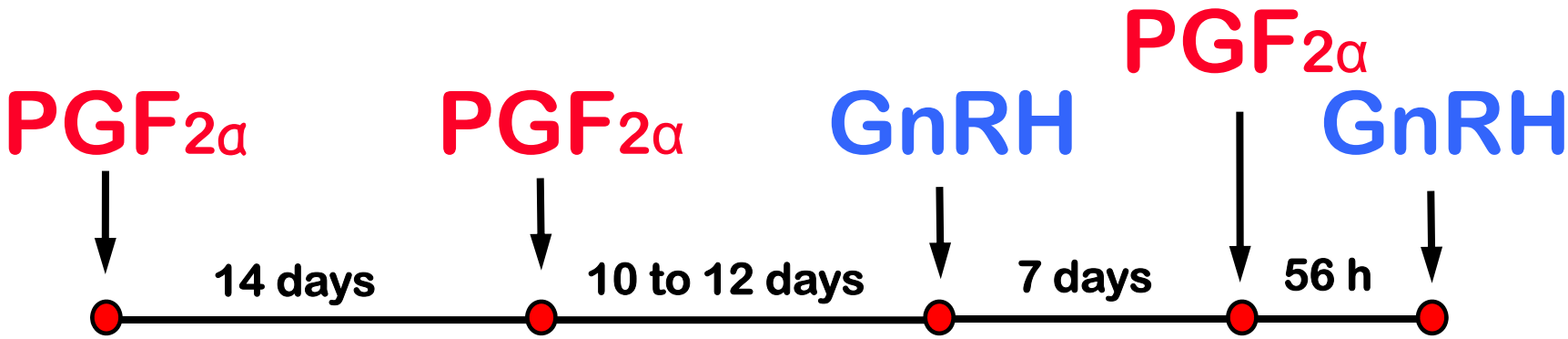
Effect of P4 at PGF on fertility

Carvalho et al., 2015; J. Dairy Sci. (Abstr.)



Presynch Ovsynch

1) Anovular cows are not affected
2) Cows are not tightly presynchronized



J. Dairy Sci. 92:5739–5753
doi:10.3168/jds.2009-2226

Genetic parameters for anovulation and pregnancy loss in dairy cattle

R. L. Bamber,*[1] G. E. Shook,*[2] M. C. Wiltbank,* J. E. P. Santos,† and P. M. Fricke*
*Dairy Science Department, University of Wisconsin, Madison 53706
†Department of Animal Sciences, University of Florida, Gainesville 32611-0910

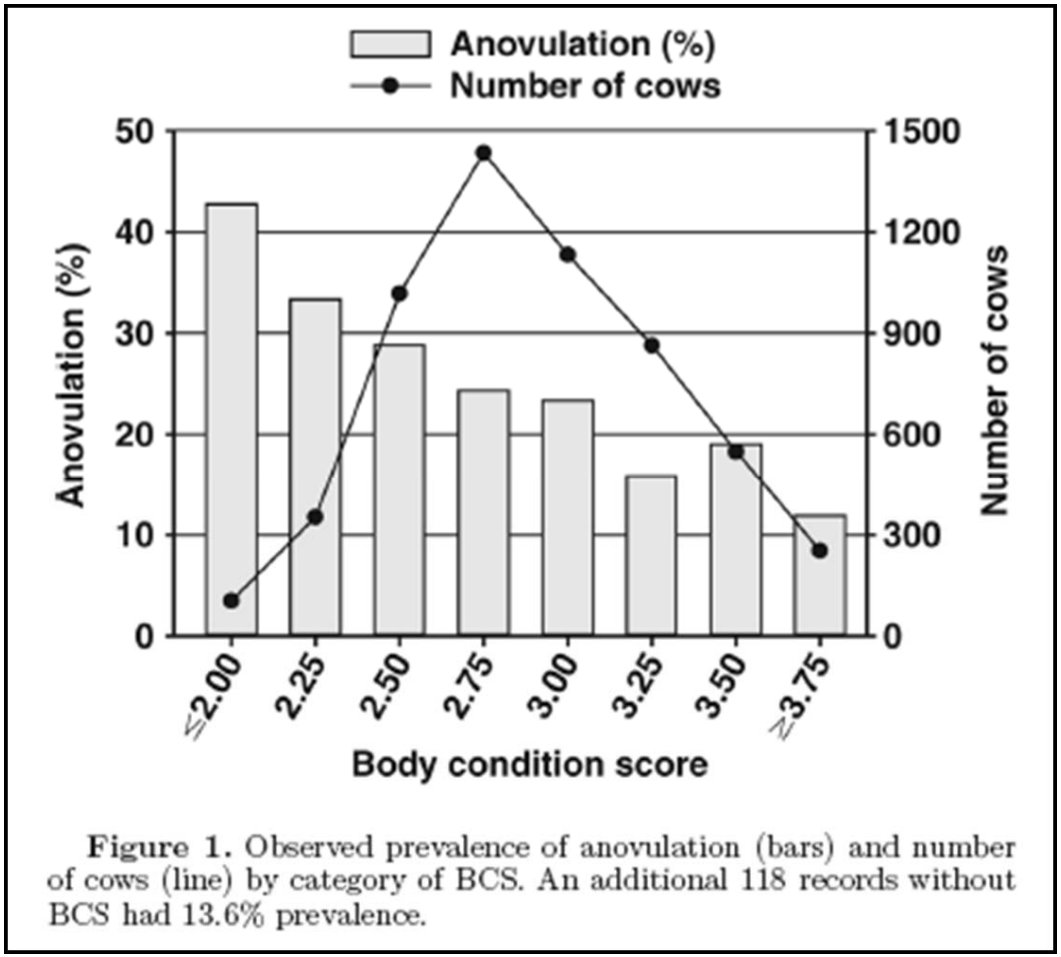


Figure 1. Observed prevalence of anovulation (bars) and number of cows (line) by category of BCS. An additional 118 records without BCS had 13.6% prevalence.

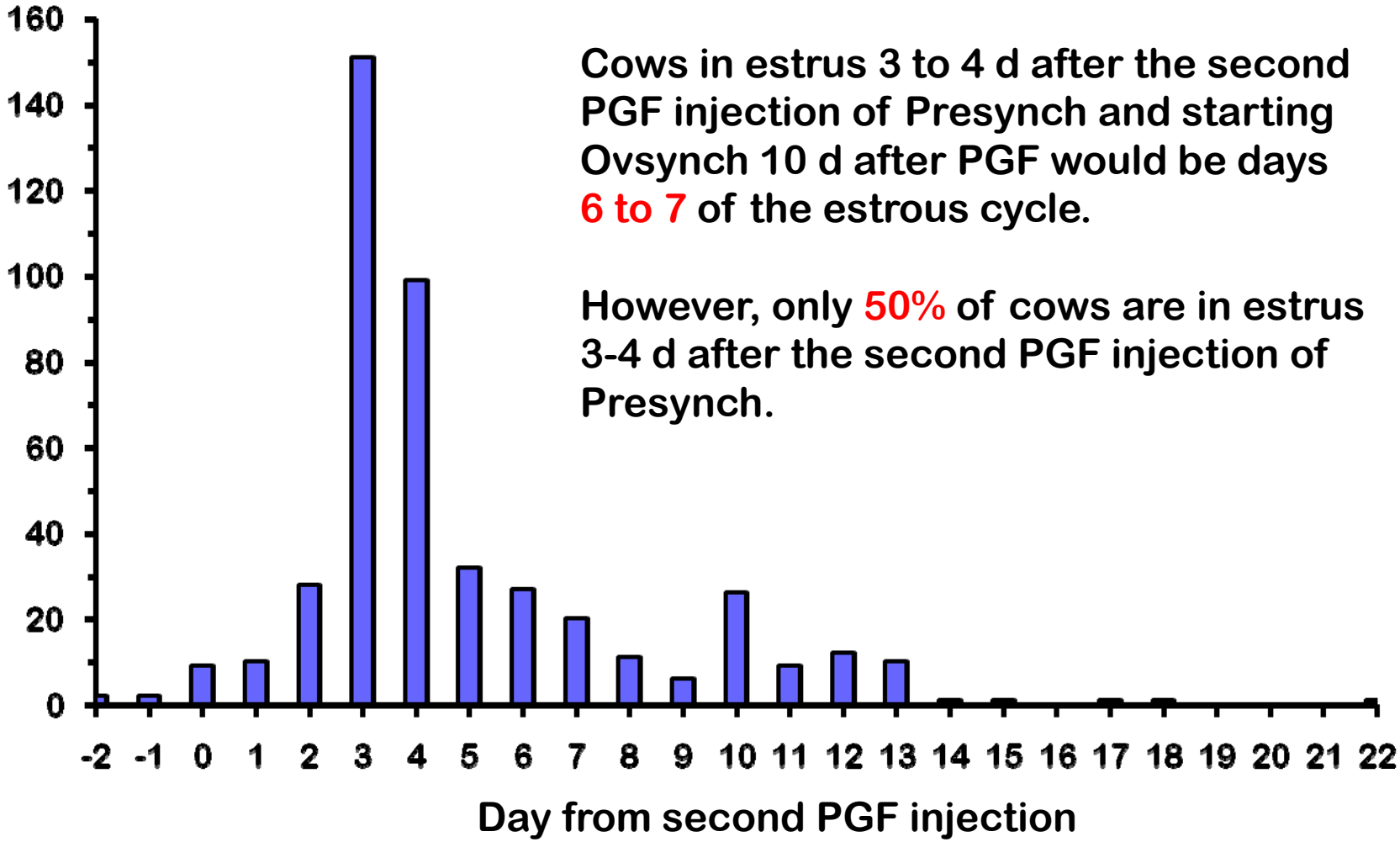
5,818 records from
13 studies in 8 herds

prevalence = 23.3%

Range: 7.3% to 41.7%

DEPARTMENT OF
DAIRY SCIENCE
University of Wisconsin-Madison

Frequency of AI Relative to the Second PGF Injection of Presynch



Cows in estrus 3 to 4 d after the second PGF injection of Presynch and starting Ovsynch 10 d after PGF would be days 6 to 7 of the estrous cycle.

However, only 50% of cows are in estrus 3-4 d after the second PGF injection of Presynch.

Double Ovsynch

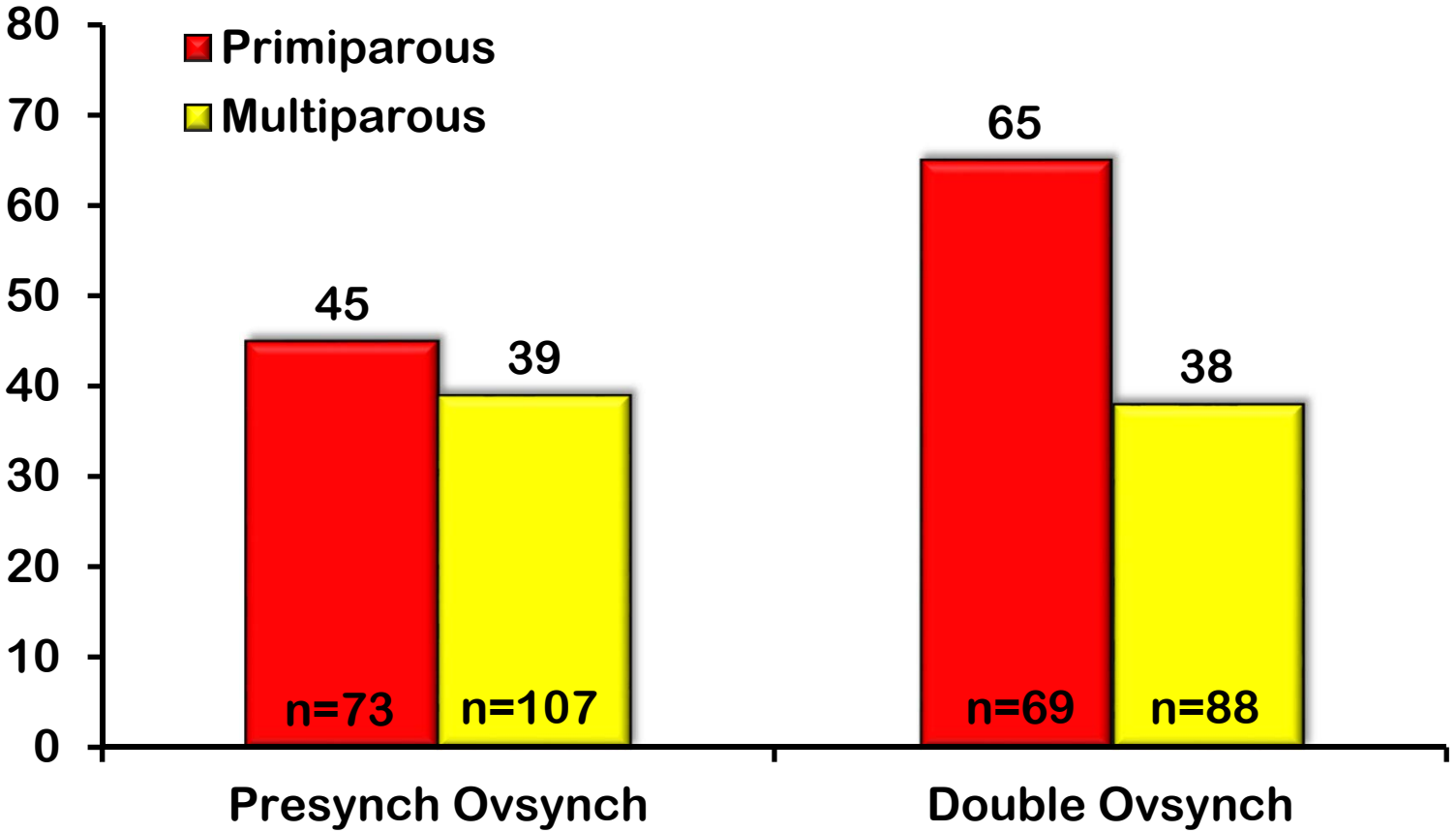
Souza et al., 2008; Theriogenology 70:208-215

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					GnRH	
					PGF	
	GnRH					
	GnRH					
	PGF		GnRH	TAI		

Effect of treatment on fertility 39 to 45 d after TAI

Souza et al., 2009; Theriogenology 70:208-215

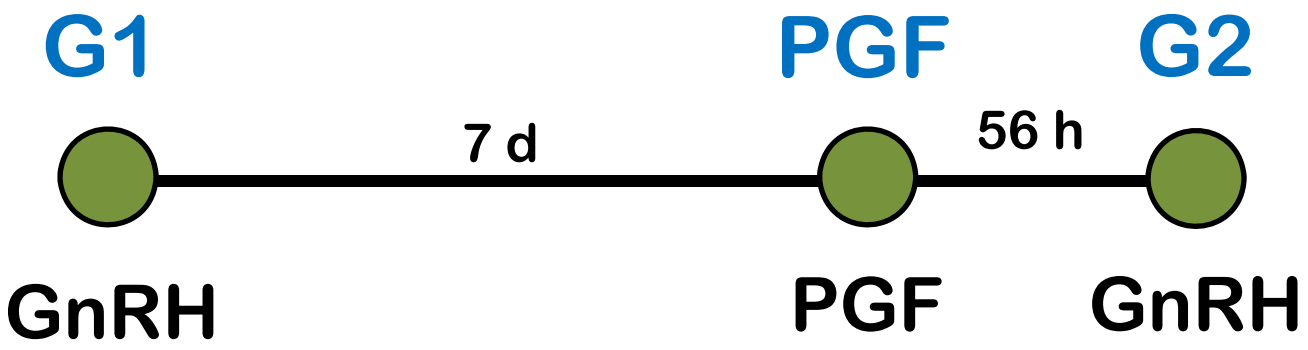
Effect	P-value
Treatment	0.03
Parity	0.02



Outline

- Effect of Ovulatory Response to G1 on P/AI
- Effect of Progesterone at G1 and PGF on P/AI
- Effect of Progesterone at G2 on P/AI

Key points during the Ovsynch Protocol

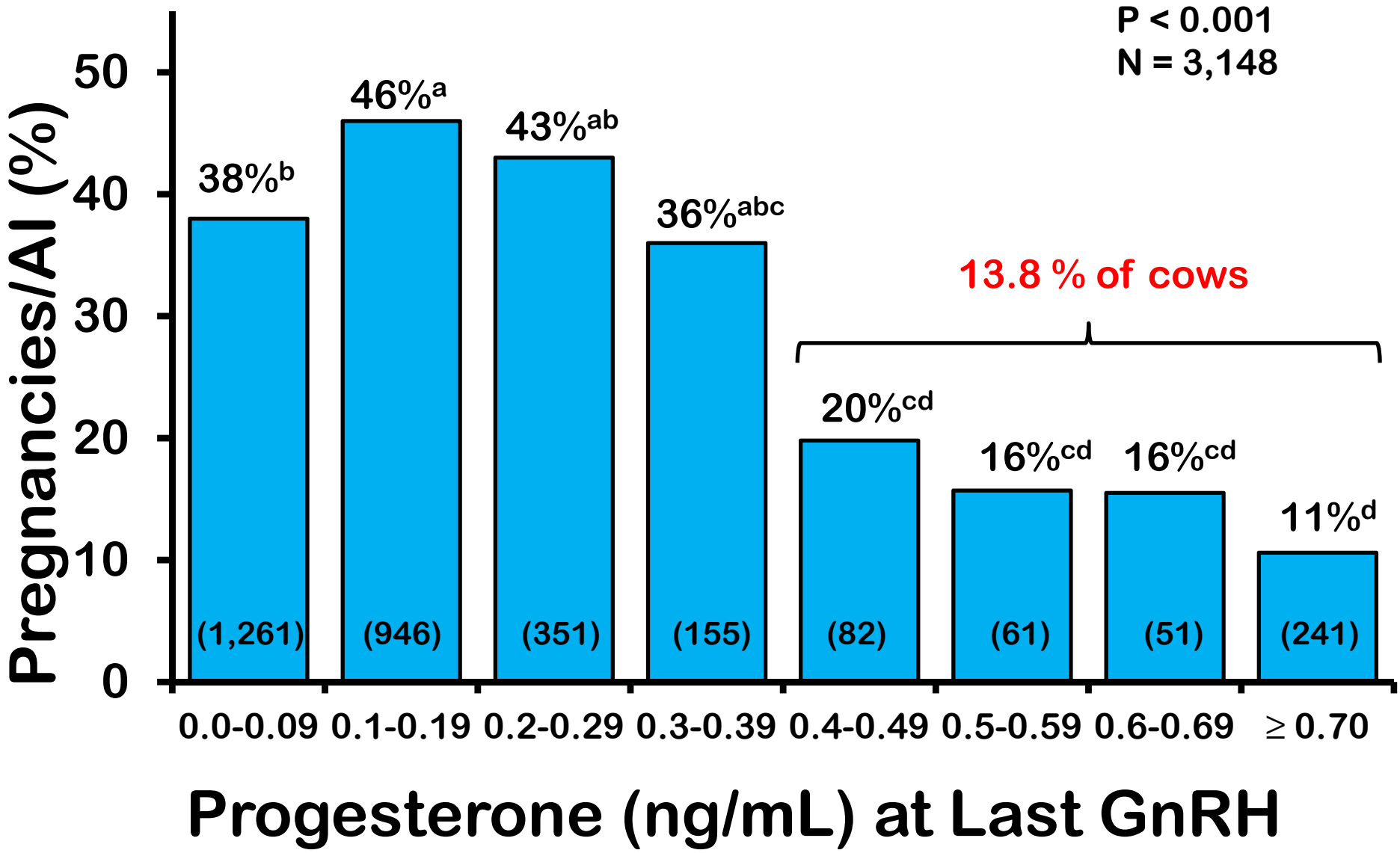


Question:

How does progesterone concentration during the Ovsynch protocol affect fertility?

Effect of P4 at G2 on fertility

Carvalho et al., 2015; J. Dairy Sci. (Abstr.)



Outline

- Effect of Ovulatory Response to G1 on P/AI
- Effect of Progesterone at G1 and PGF on P/AI
- Effect of Progesterone at G2 on P/AI
- Addition of a Second $PGF_{2\alpha}$ Treatment Increases P/AI

A second PGF treatment during Double Ovsynch

Brusveen et al., 2009; J. Dairy Sci. 92:1412-1422

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					GnRH	
					PGF	
	GnRH					
	GnRH					
	PGF	±PGF	GnRH	TAI		

Effect of second PGF treatment

Brusveen et al., 2009; J. Dairy Sci. 92:1412-1422

Treatment	First P/AI (%)	Low P4 (%)
1 x PGF	47 (109/232)	86 (179/208)
2 x PGF	53 (116/221)	98 (195/200)
P-value	0.24	<0.001
	+6	+12

J. Dairy Sci. 98:1–11
http://dx.doi.org/10.3168/jds.2015-9353

Effect of a second treatment with prostaglandin $F_{2\alpha}$ during the Ovsynch protocol on luteolysis and pregnancy in dairy cows

Milo C. Wiltbank,*[1] Giovanni M. Baez,*† Fenella Cochrane,‡ Rafael V. Barletta,* Cheryl R. Trayford,‡ and Robert T. Joseph‡
*Department of Dairy Science, University of Wisconsin, Madison 53706
†Universidad Francisco de Paula Santander, Cucuta 540003, Colombia
‡Parnell Corporate Services US Inc., Overland Park, KS 66211

Table 2. Effect of 1 versus 2 treatments with prostaglandin $F_{2\alpha}$ (PGF) on percentage pregnant/AI (P/AI) in primiparous and multiparous cows synchronized with Double-Ovsynch (experiment 1)[1]

Item	1 PGF	2 PGF	Effect of PGF difference, % (*P*-value)
Primiparous, % (no./no.)	46.1 (41/89)	48.2 (40/83)	4.6 (0.45)
Multiparous, % (no./no.)	36.6 (37/101)	45.0 (45/100)	23.0 (0.14)
P-value	0.24	0.77	
Overall, % (no./no.)	41.1 (78/190)	46.4 (85/183)	12.9 (0.17)

[1]The relative difference between treatments is calculated as the difference in P/AI between 2 PGF minus 1 PGF P/AI and then divided by the 1 PGF P/AI. All cows that were enrolled in Double-Ovsynch are included in this analysis.

Double Ovsynch for Resynch

Giordano et al., 2012; J. Dairy Sci. 95:639-653

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					GnRH	
					PGF	
	GnRH					
	GnRH					
	PGF		GnRH	TAI		

J. Dairy Sci. 95:639–653
doi:10.3168/jds.2011-4418

Increased fertility in lactating dairy cows resynchronized with Double-Ovsynch compared with Ovsynch initiated 32 d after timed artificial insemination

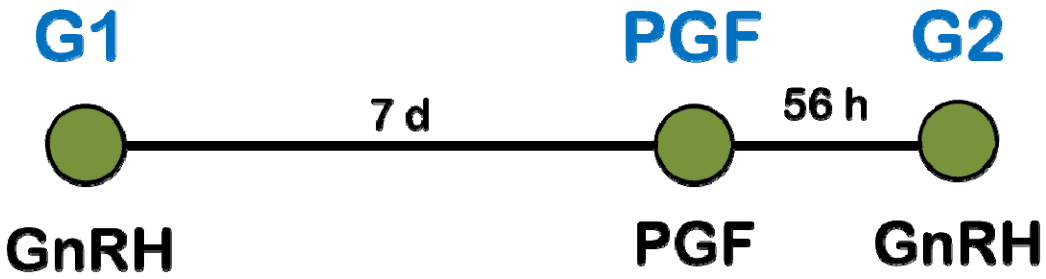
J. O. Giordano,* M. C. Wiltbank,* J. N. Guenther,* R. Pawlisch,† S. Bas,* A. P. Cunha,* and P. M. Fricke*[1]
*Department of Dairy Science, University of Wisconsin, Madison 53706
†Brodhead Veterinary Clinic, Brodhead, WI 53520

Age and number of CL at PGF	Percentage with incomplete luteolysis
Day ~7 CL	36% (21/59)
Day ~7 & Day ~14 CL	8% (6/74)
Day ~14 CL	3% (5/166)

J. Dairy Sci. 98:8741–8752
http://dx.doi.org/10.3168/jds.2015-9719

Modifications to Ovsynch improve fertility during resynchronization: Evaluation of presynchronization with gonadotropin-releasing hormone 6 d before initiation of Ovsynch and addition of a second prostaglandin $F_{2\alpha}$ treatment

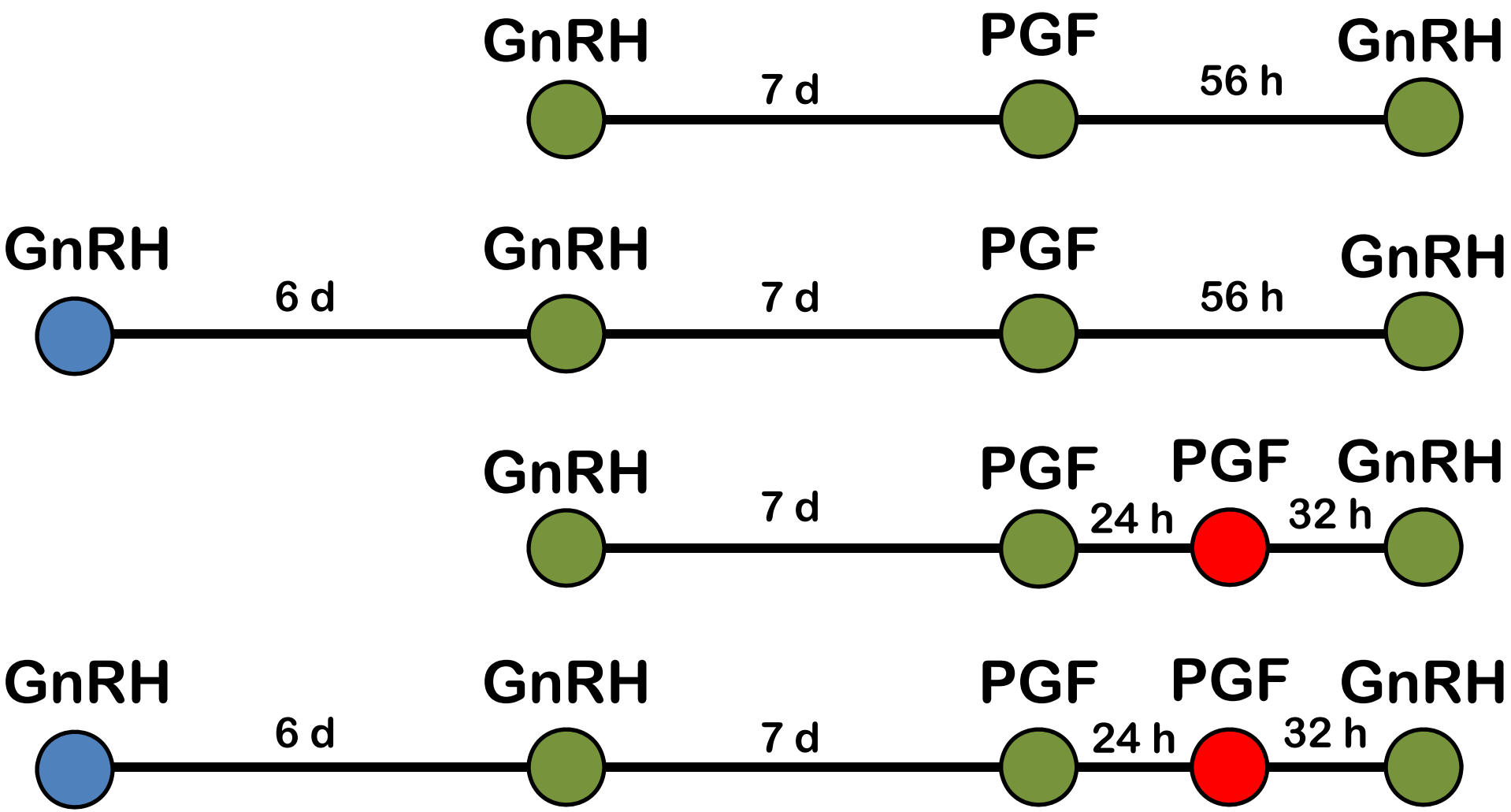
P. D. Carvalho,* M. J. Fuenzalida,* A. Ricci,* A. H. Souza,† R. V. Barletta,* M. C. Wiltbank,* and P. M. Fricke*[1]
*Department of Dairy Science, University of Wisconsin, Madison 53706
†University of California, Cooperative Extension, Tulare 93274



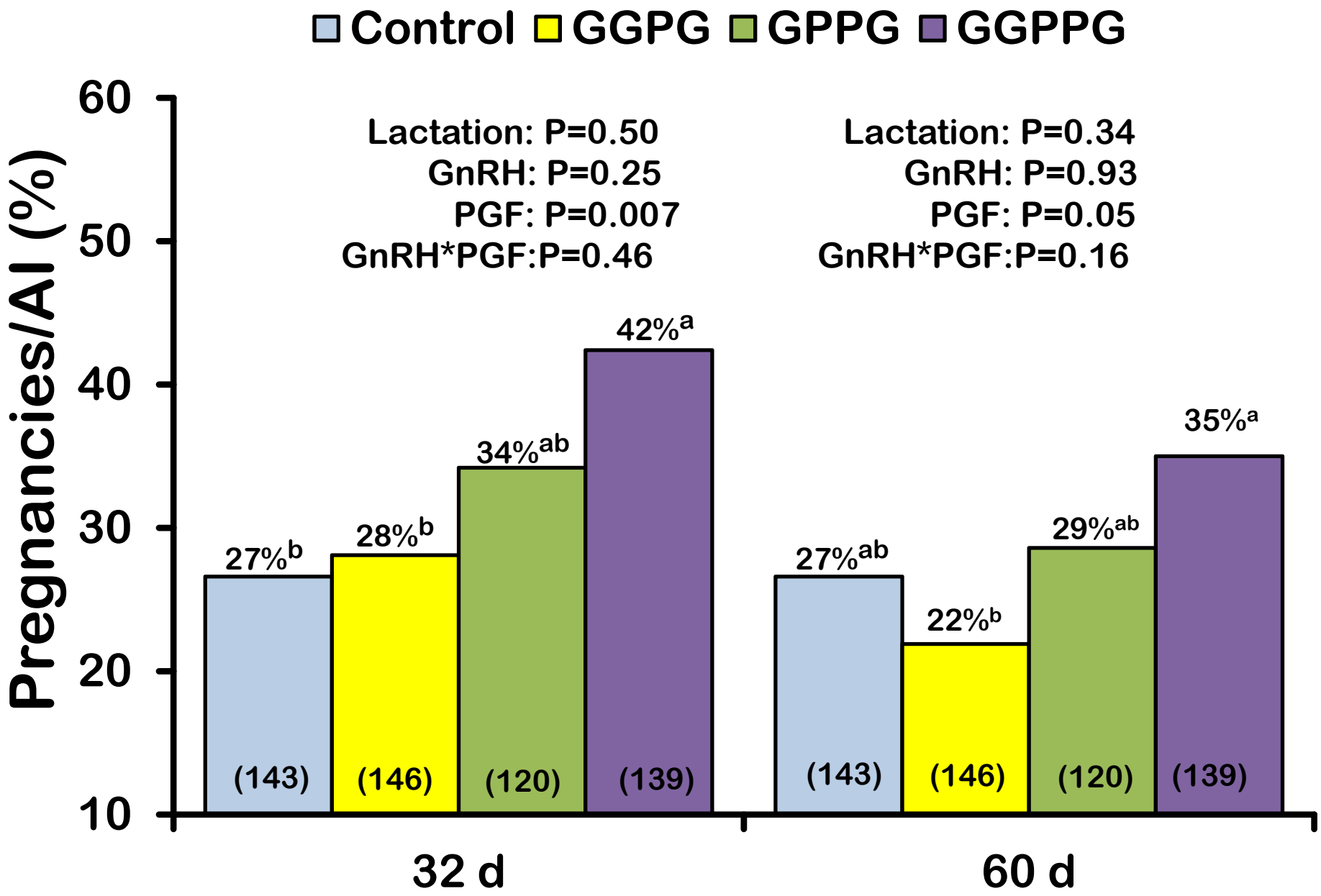
DEPARTMENT OF
DAIRY SCIENCE
University of Wisconsin-Madison

Treatments

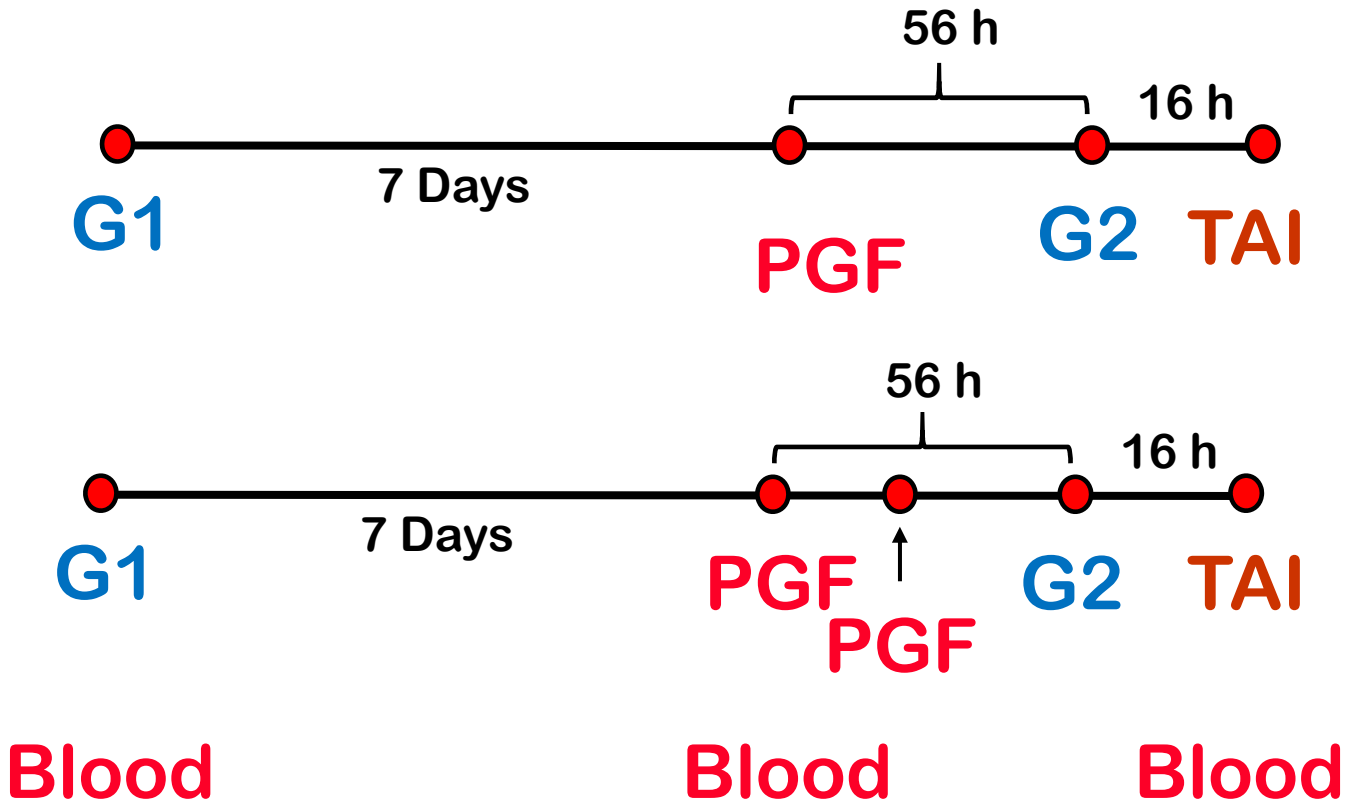
Carvalho et al., 2015; J. Dairy Sci. 98:8741-8752



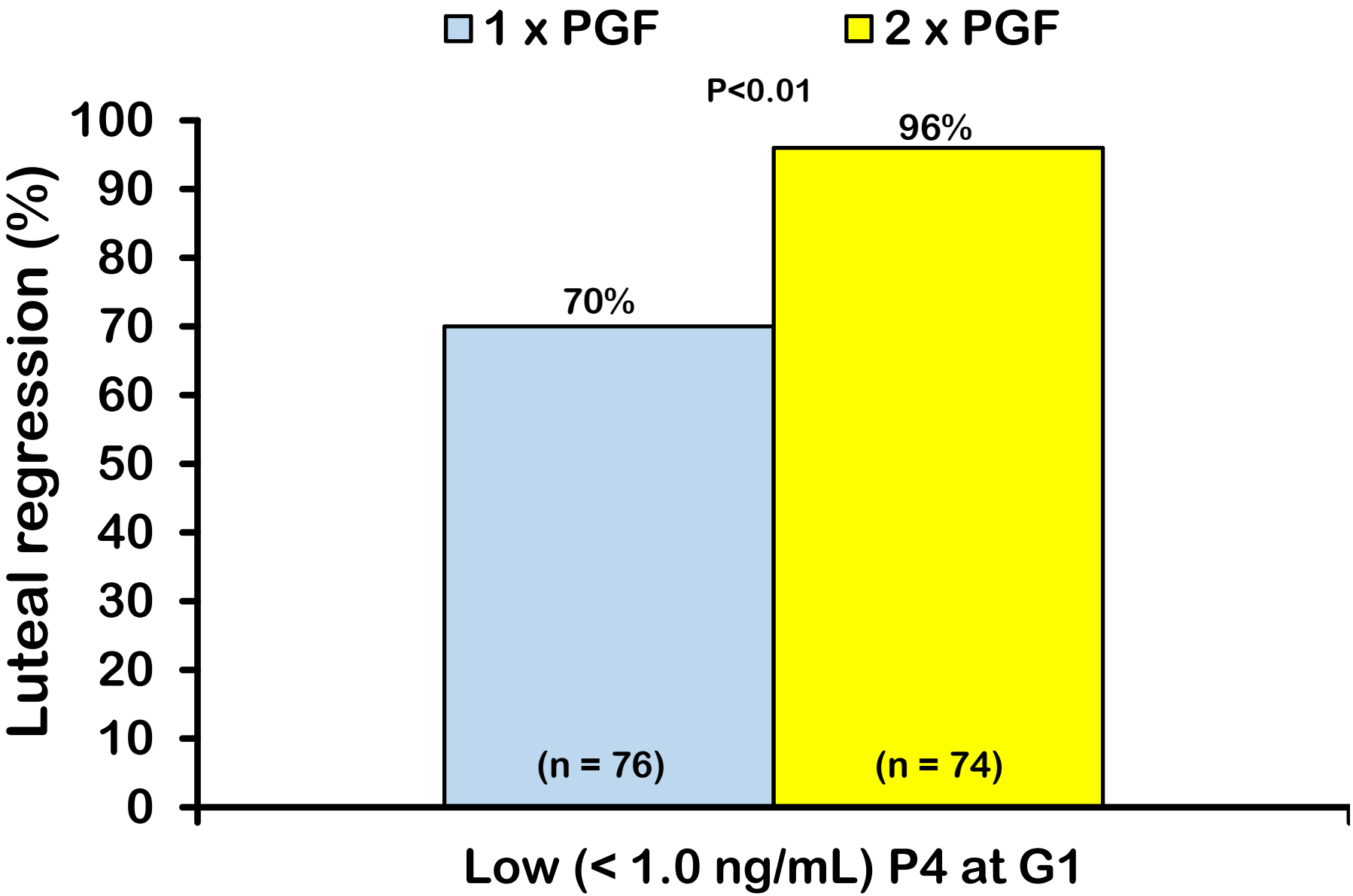
P/AI for Resynch TAI



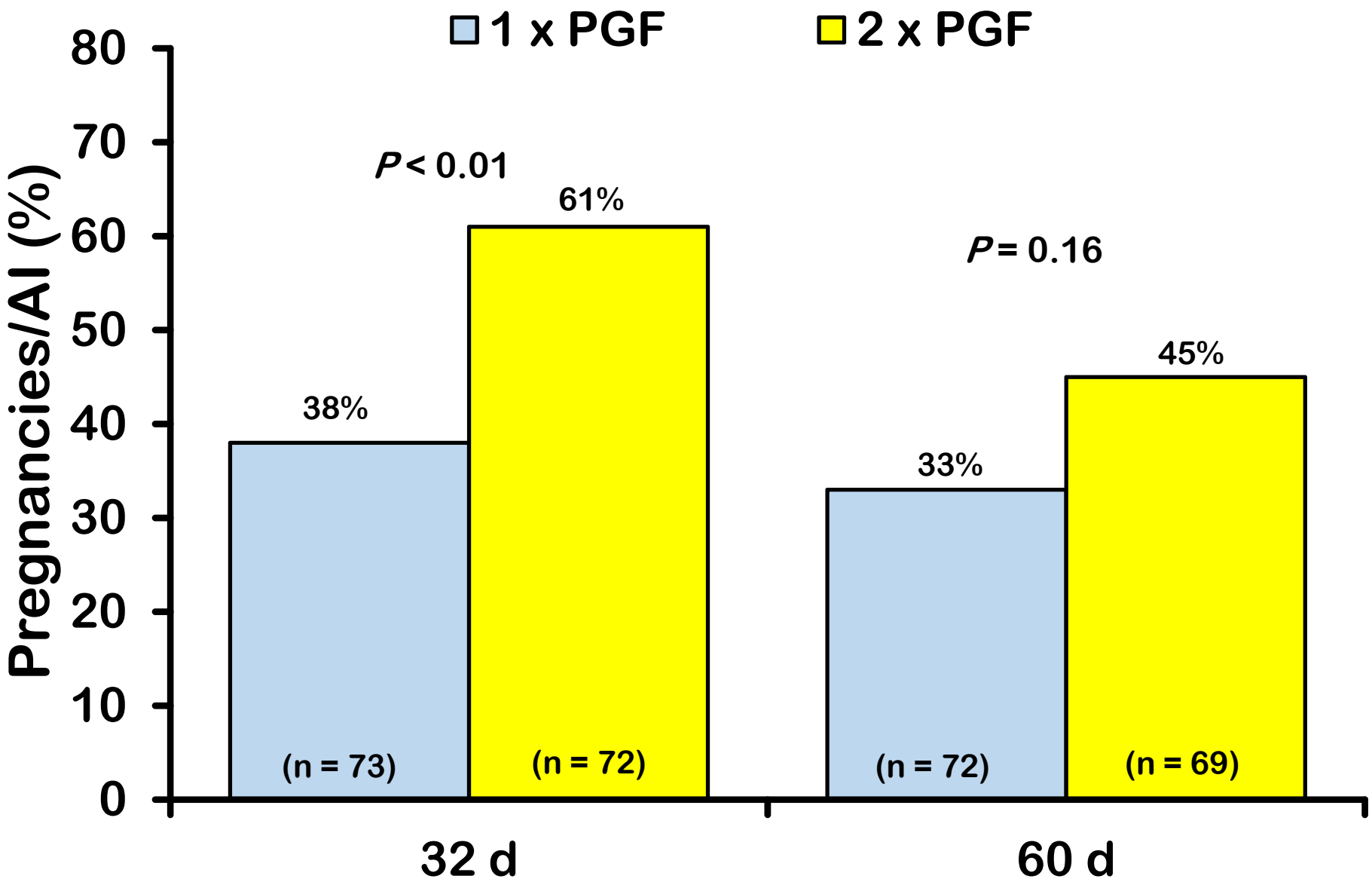
Effect of second PGF treatment on Ovsynch



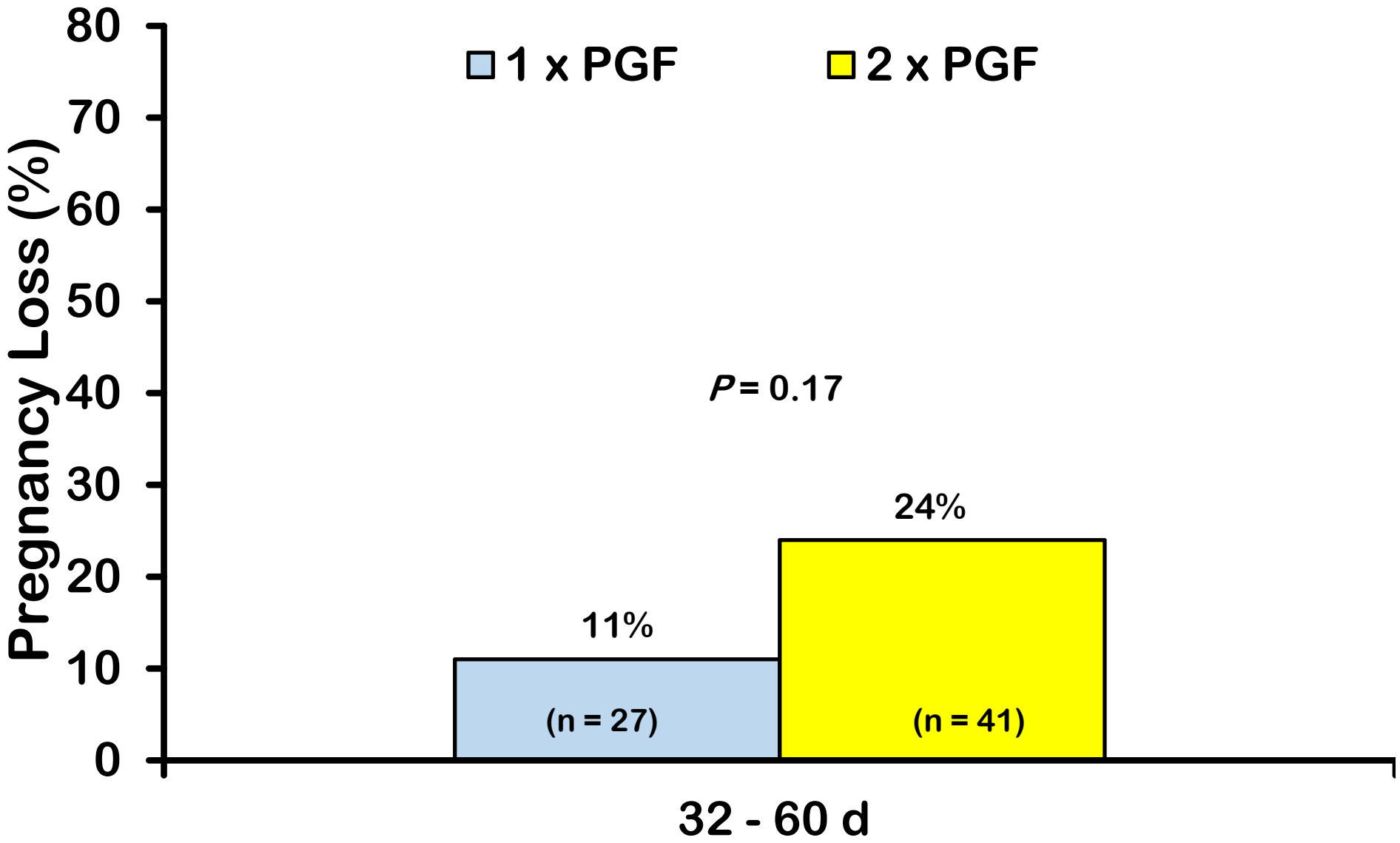
Luteal regression for cows with Low P4 at G1



Pregnancies/AI for cows with Low P4 at G1



Pregnacny Loss for cows with Low P4 at G1



Double Vision

Management of Twinning in Dairy Cows

Paul M. Fricke, Ph.D.

Professor of Dairy Science
University of Wisconsin-Madison

DEPARTMENT OF
DAIRY SCIENCE
University of Wisconsin-Madison

Outline

- Effect of Ovulatory Response to G1 on P/AI
- Effect of Progesterone at G1 and PGF on P/AI
- Effect of Progesterone at G2 on P/AI
- Addition of a Second $PGF_{2\alpha}$ Treatment Increases P/AI
- 5-d vs. 7-d Ovsynch Protocols

Available online at www.sciencedirect.com
ScienceDirect
Theriogenology
ELSEVIER
Theriogenology 69 (2008) 843–851
www.theriojournal.com

Decreasing the interval between GnRH and $PGF_{2\alpha}$ from 7 to 5 days and lengthening proestrus increases timed-AI pregnancy rates in beef cows

G.A. Bridges [a], L.A. Helser [b], D.E. Grum [c], M.L. Mussard [c], C.L. Gasser [d], M.L. Day [c,*]

[a] *Department of Animal Sciences, Purdue University, West Lafayette, IN 47907, United States*
[b] *Select Sires Inc., Plain City, OH 43064, United States*
[c] *Department of Animal Sciences, The Ohio State University, Columbus, OH 43210, United States*
[d] *Department of Agriculture and Nutrition Science, Southern Utah University, Cedar City, UT 84720, United States*

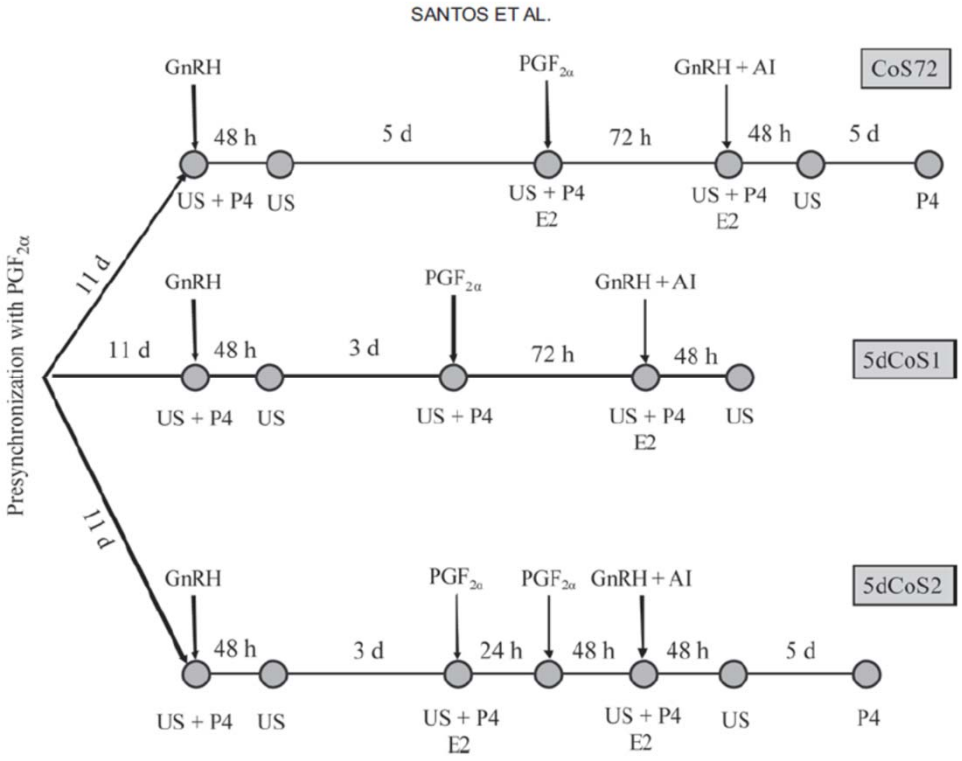
Received 1 October 2007; received in revised form 7 December 2007; accepted 7 December 2007

A second $PGF_{2\alpha}$ injection was given 12 h after the initial $PGF_{2\alpha}$ treatment for all cows in both treatments. CR to TAI did not differ when timing of AI was similar (7CO-60 vs. 5CO-60; Expt. 2), however, CR was 13.3% (Expt. 3) and 9.1% (Expt. 4) greater for the 5 than the 7 day protocol when timing of AI differed between treatments (7CO-60 vs. 5CO-72).

J. Dairy Sci. 93:2976–2988
doi:10.3168/jds.2009-2870

Effect of reducing the period of follicle dominance in a timed artificial insemination protocol on reproduction of dairy cows

J. E. P. Santos,*[1,2] C. D. Narciso,* F. Rivera,* W. W. Thatcher,* and R. C. Chebel†[2]
*Department of Animal Sciences, University of Florida, Gainesville 32611
†Department of Veterinary Population Medicine, University of Minnesota, St. Paul 55108



	Luteal Regression	P/AI Day 38
CoS72	79.0% (45/57)	30.9% (144/466)
5dCoS1	59.1% (26/44)	
5dCoS2	95.7% (45/47)	37.9% (174/462)

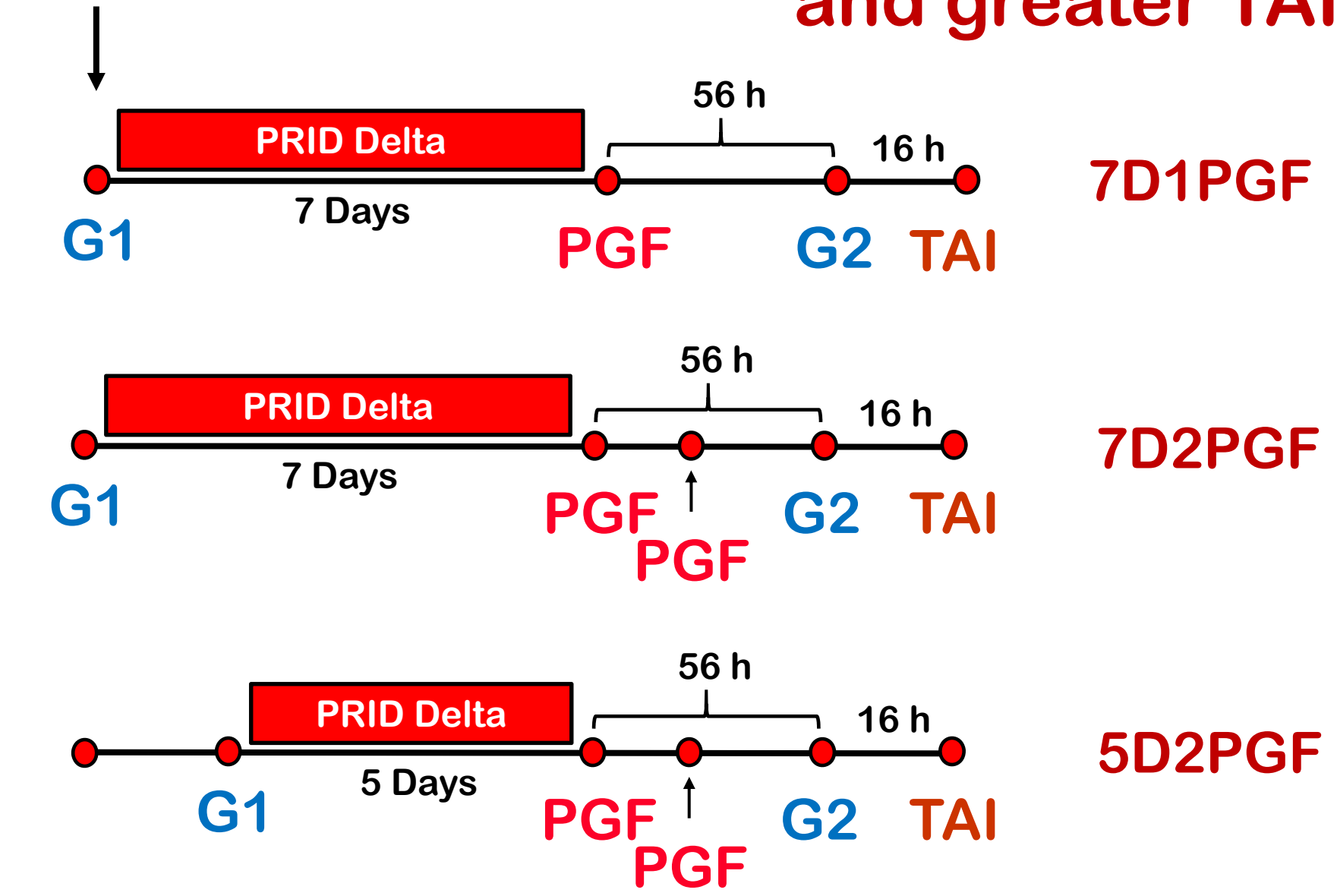
J. Dairy Sci. TBC:1–11
http://dx.doi.org/10.3168/jds.2015-10557

Adding a second prostaglandin $F_{2\alpha}$ treatment to but not reducing the duration of a PRID-Synch protocol increases fertility after resynchronization of ovulation in lactating Holstein cows

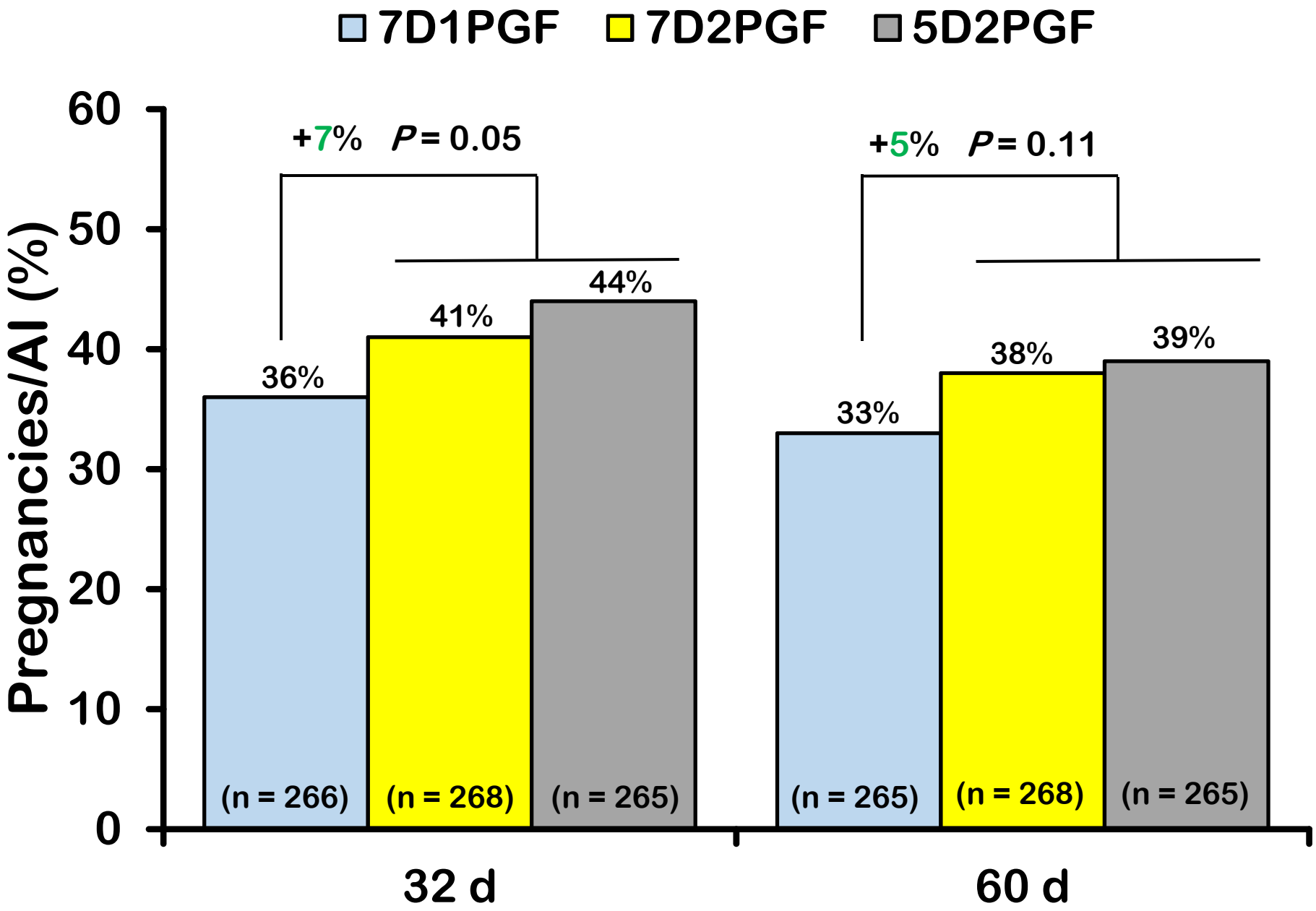
V. G. Santos,*[1] P. D. Carvalho,*[1] C. Maia,† B. Carneiro,† A. Valenza,‡ P. M. Crump,* and P. M. Fricke*
*Department of Dairy Science, University of Wisconsin, Madison 53706
†Diessen Serviços Veterinários Lda, 7001 Évora, Portugal
‡CEVA Santé Animale, 10 Avenue de la Ballastiere, 33500 Libourne, France

DEPARTMENT OF
DAIRY SCIENCE
University of Wisconsin-Madison

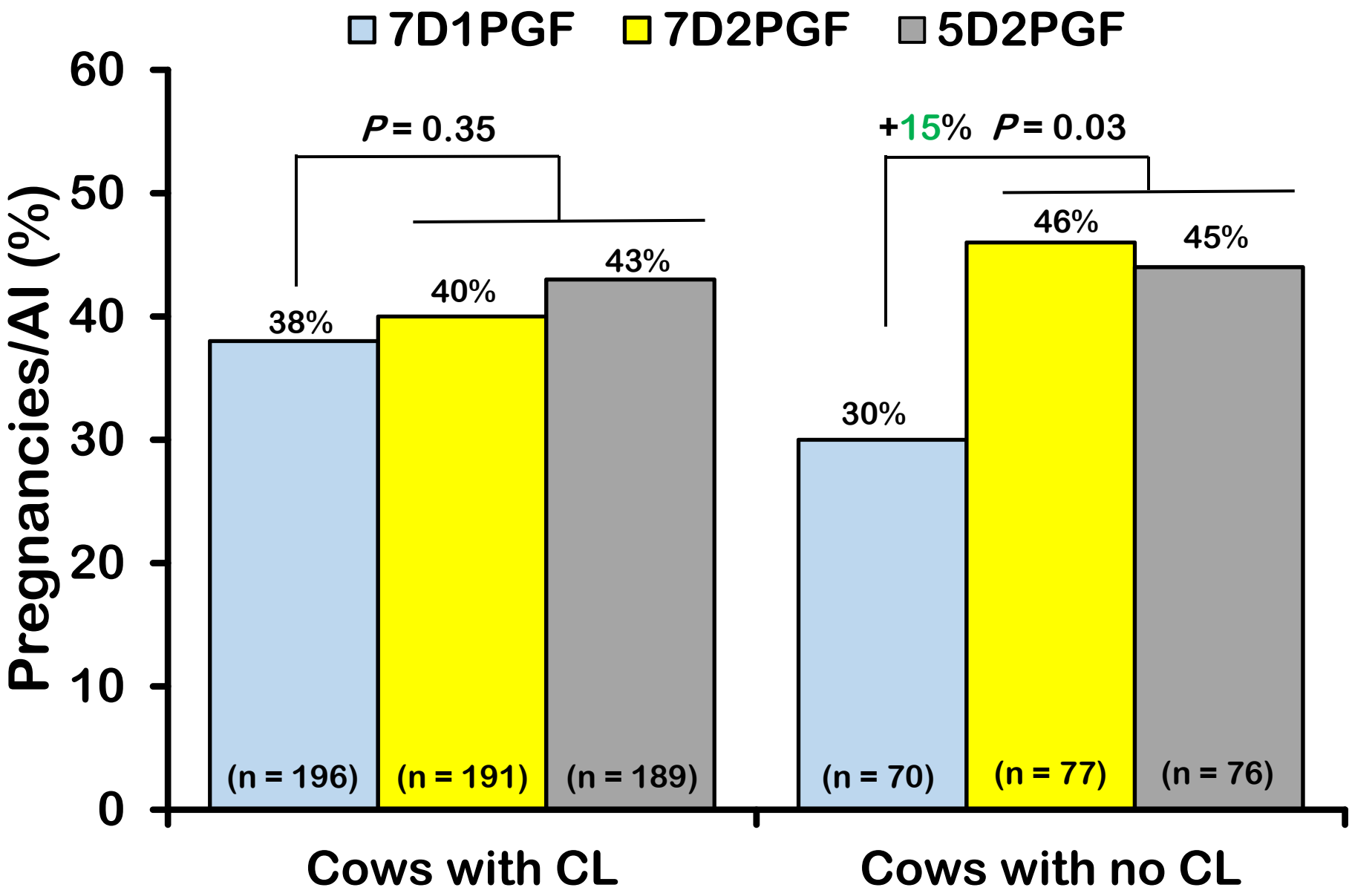
Resynch for 2nd and greater TAI



Effect of treatment on P/AI



Effect of CL at G1 on P/AI at 32 d



Outline

- Effect of Ovulatory Response to G1 on P/AI
- Effect of Progesterone at G1 and PGF on P/AI
- Effect of Progesterone at G2 on P/AI
- Addition of a Second $PGF_{2\alpha}$ Treatment Increases P/AI
- 5-d vs. 7-d Ovsynch Protocols
- Achieving a 30% 21-d Pregnancy Rate in a 30,000 lb. Dairy Herd

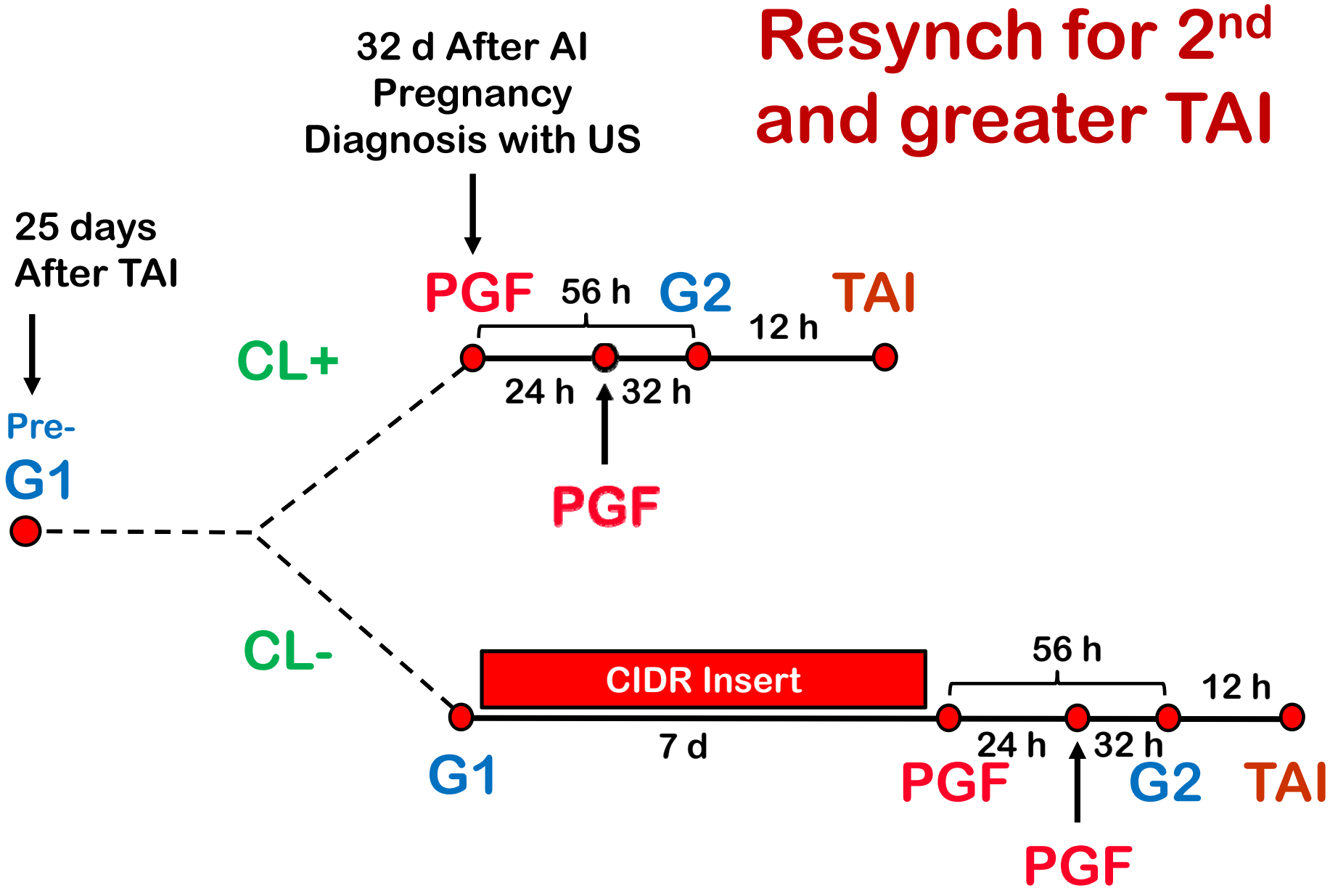
University of Wisconsin-Madison

Emmons Blaine Dairy Cattle Research Center

Double Ovsynch for First TAI

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					GnRH	
					PGF	
	GnRH					
	GnRH					
	PGF	PGF	GnRH	TAI		

Resynch for 2nd and greater TAI

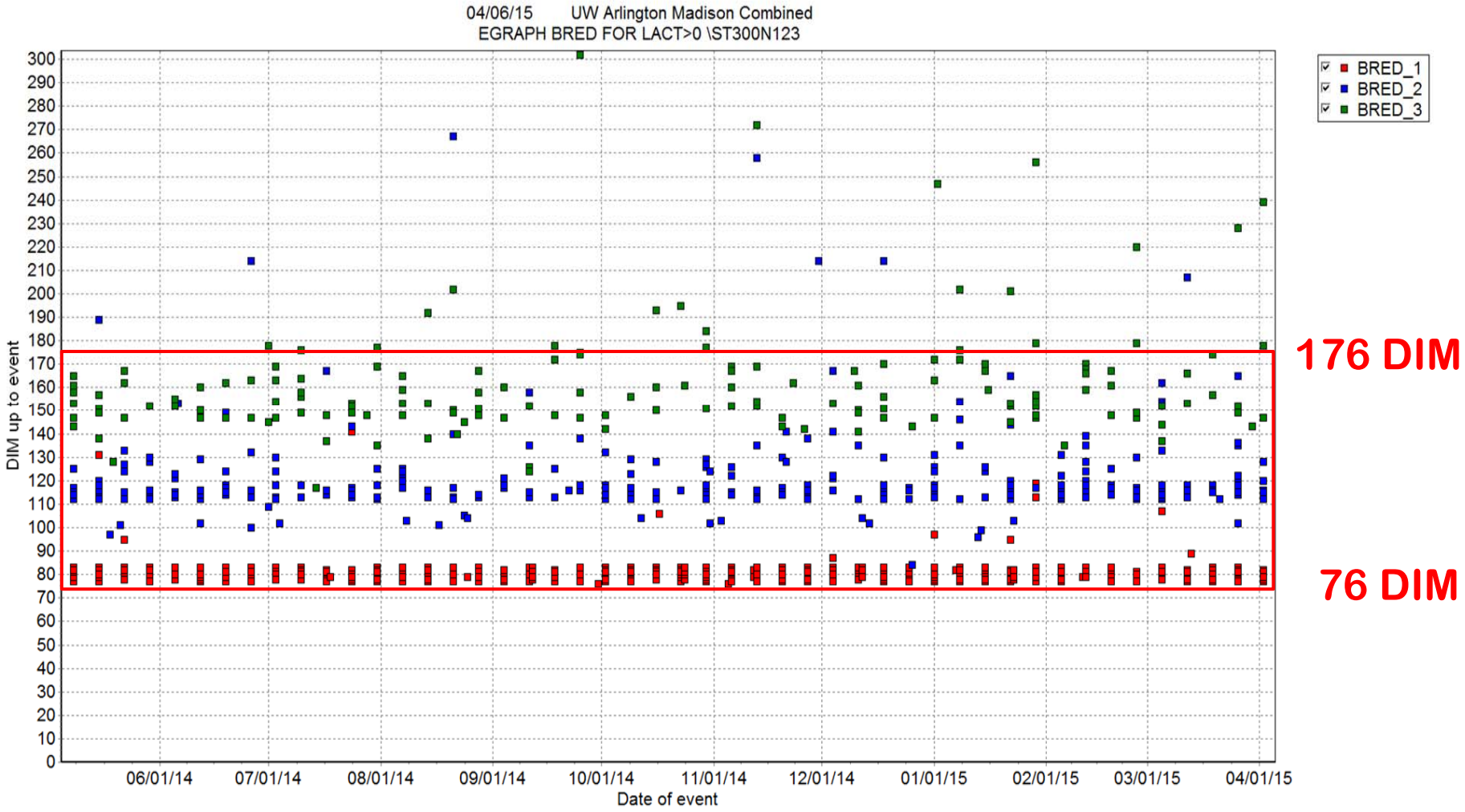


SUM ME305 MILK BY LACT

By LACT	Pct	Count	AvME305	Av MILK
1	21	115	29505	80
2	35	187	32160	96
3	22	120	32728	110
4	12	67	31967	110
5	5	27	30786	106
6	2	13	28732	115
7	1	6	30215	89
8	0	2	36705	138
9	0	1	33240	70
Total	100	538	31534	99

2X milking

DIM at first three inseminations



BREDSUM 21-Day Pregnancy Risk

January, 2015 to January, 2016

Date	Br Elig	Bred	Pct	Pg Elig	Preg	Pct	Aborts	
1/07/15	119	61	51	117	34	29	3	
1/28/15	120	58	48	118	30	25	3	
2/18/15	111	62	56	111	30	27	4	
3/11/15	105	49	47	105	22	21	2	
4/01/15	126	58	46	126	21	17	4	
4/22/15	138	63	46	138	23	17	5	
5/13/15	150	71	47	149	40	27	5	
6/03/15	129	70	54	127	32	25	0	
6/24/15	114	54	47	113	27	24	3	
7/15/15	108	58	54	107	23	21	2	
8/05/15	114	55	48	114	22	19	3	
8/26/15	117	55	47	117	20	17	3	
9/16/15	137	58	42	137	30	22	2	
10/07/15	128	77	60	128	39	30	6	
10/28/15	116	55	47	116	34	29	1	
11/18/15	112	56	50	112	30	27	2	
12/09/15	116	54	47	0	0	0	3	???? Preg Stat
12/30/15	116	59	51	0	0	0	0	???? Preg Stat
Total	1944	960	49	1935	457	24	48	

Wait Period 50

BREDSUM 21-Day Pregnancy Risk

January, 2015 to January, 2016

Date	Br Elig	Bred	Pct	Pg Elig	Preg	Pct	Aborts	
1/07/15	86	57	66	85	32	38	2	
1/28/15	76	53	70	74	28	38	3	
2/18/15	79	58	73	79	26	33	4	
3/11/15	71	43	61	71	19	27	2	
4/01/15	75	53	71	75	20	27	3	
4/22/15	88	51	58	88	19	22	3	
5/13/15	96	62	65	95	34	36	5	
6/03/15	92	63	68	90	29	32	0	
6/24/15	80	46	58	79	21	27	1	
7/15/15	79	54	68	78	21	27	2	
8/05/15	80	52	65	80	22	28	3	
8/26/15	82	49	60	82	19	23	3	
9/16/15	85	55	65	85	28	33	2	
10/07/15	92	68	74	92	33	36	4	
10/28/15	81	53	65	81	33	41	1	
11/18/15	66	46	70	66	25	38	1	
12/09/15	71	46	65	0	0	0	3	???? Preg Stat
12/30/15	66	49	74	0	0	0	0	???? Preg Stat
Total	1308	863	66	1300	409	31	39	

Wait Period 76

BREDSUM By Times Bred

February 3, 2014 to May 6, 2014 – before 2nd PGF for resynch

	95% CI	%Conc	#Preg	#Open	Other	Abort	Total	%Tot	SPC
1	49-64	56	97	75	1	6	173	51	1.8
2	26-49	37	25	43	1	3	69	20	2.7
3	12-37	22	9	32	1	2	42	12	4.6
4	22-53	36	12	21	1	2	34	10	2.8
5	-	55	6	5	0	0	11	3	1.8
6	-	67	2	1	1	1	4	1	1.5
7	-	50	2	2	0	0	4	1	2.0
TOTALS	41-51	46	153	179	5	14	337	100	2.2

BREDSUM By Times Bred

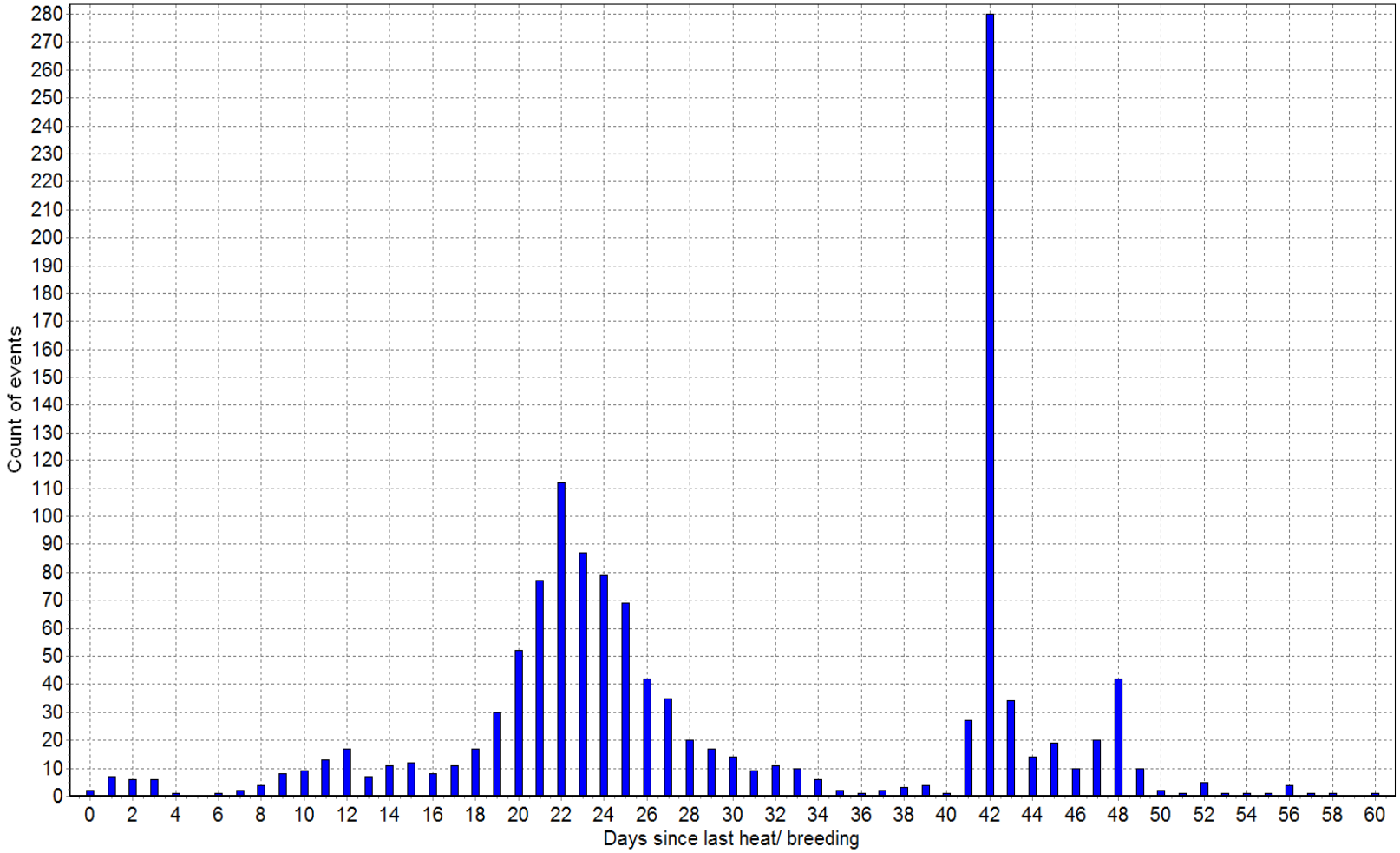
January, 2015 to January, 2016

	95% CI	%Conc	#Preg	#Open	Other	Abort	Total	%Tot	SPC
1	46-55	50	269	266	5	35	540	49	2.0
2	47-58	53	153	137	4	13	294	27	1.9
3	42-58	50	75	75	1	6	151	14	2.0
4	34-57	46	31	37	1	2	69	6	2.2
5	21-54	36	10	18	0	1	28	3	2.8
6	-	62	10	6	0	0	16	1	1.6
7	-	50	1	1	0	0	2	0	2.0
8	-	100	1	0	0	0	1	0	1.0
TOTALS	47-53	50	550	540	11	57	1101	100	2.0

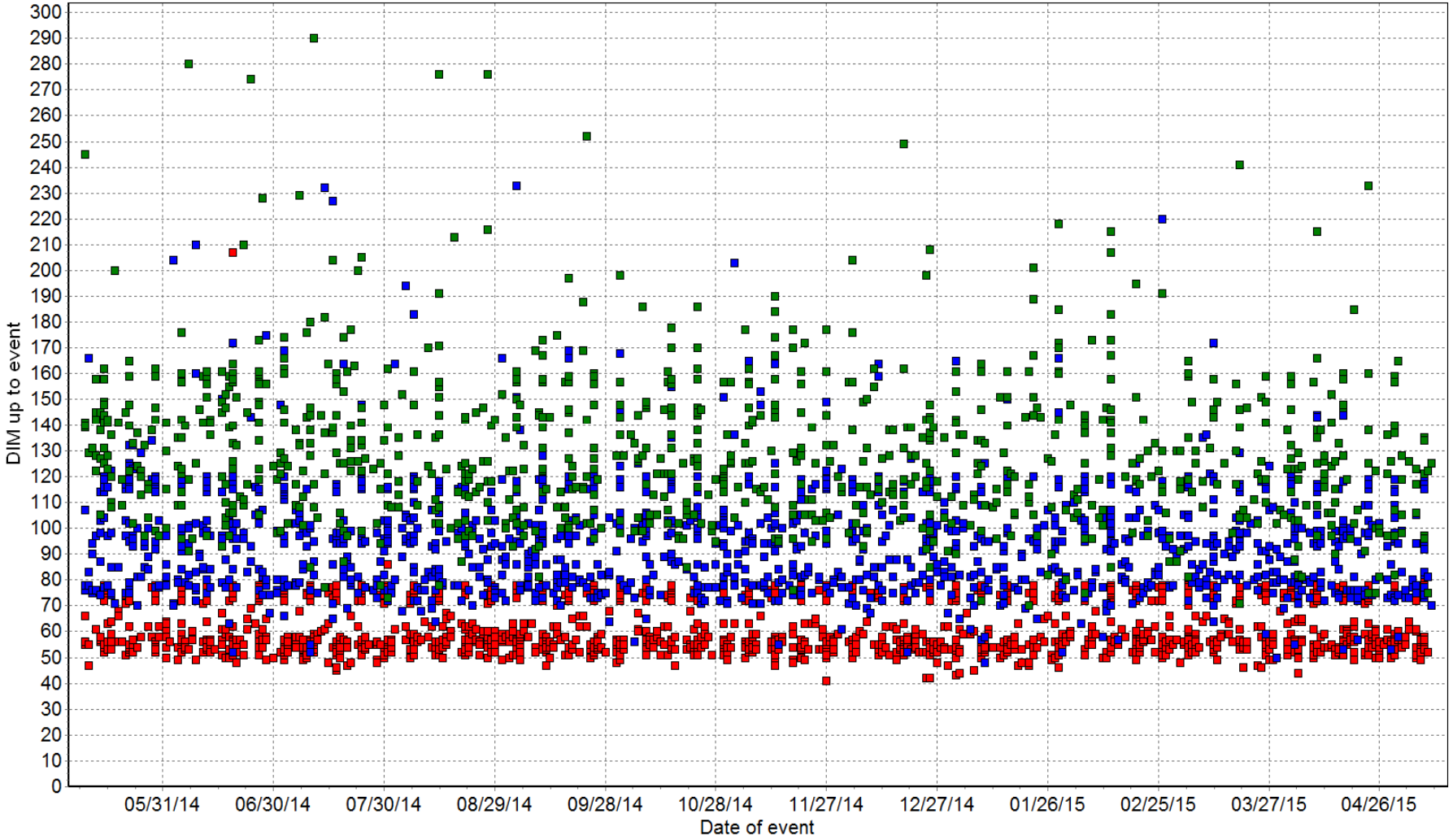
90% pregnant after 3 AI

96% pregnant after 4 AI

Submission of cows for 2nd and greater TAI



Detection of estrus after first TAI



http://paulfricke.dysci.wisc.edu/