Development of Fertility Programs for High Producing Dairy Cows

Paul M. Fricke

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SYNCHRONIZATION OF OVULATION IN DAIRY COWS USING $PGF_{2\alpha}$ AND GnRH

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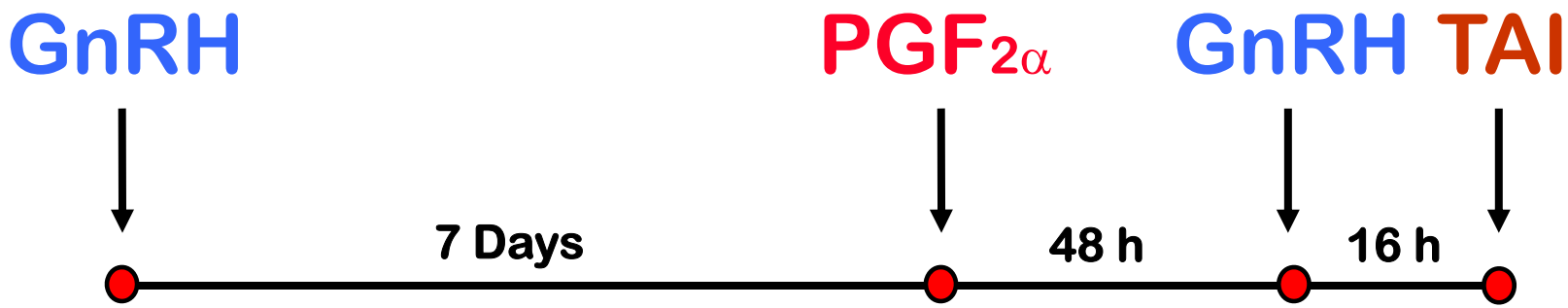
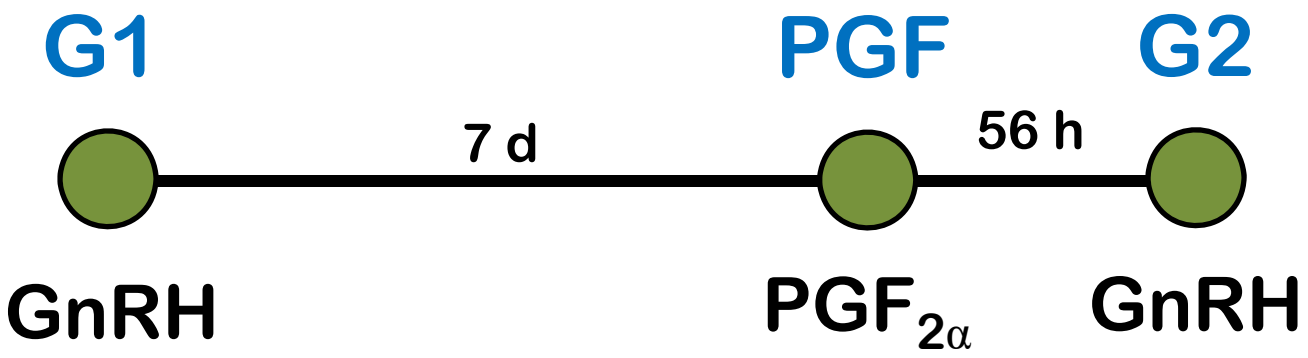
Theriogenology 44:915; 1995



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.

J. Dairy Sci. 84:1646–1659

Effects of Presynchronization and Bovine Somatotropin on Pregnancy Rates to a Timed Artificial Insemination Protocol in Lactating Dairy Cows

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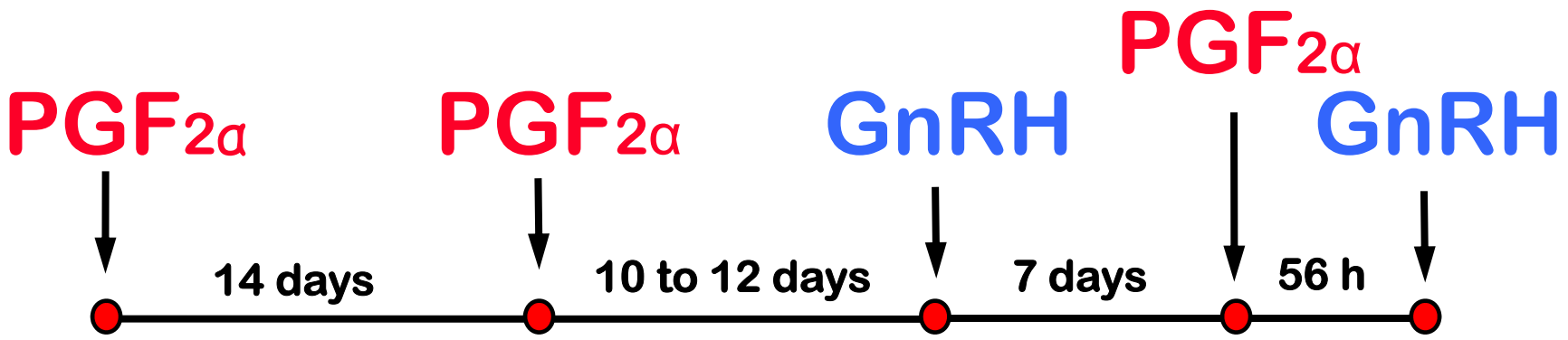


Fertility Programs for 1st AI

Presynch-Ovsynch

Moreira et al., 2001; J. Dairy Sci. 84:1646-1659

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			PGF			
			PGF	AI to Estrus		
	GnRH					
	PGF		GnRH	TAI		

When anovular cows (23%) were removed from the analysis, presynchronization increased P/AI

Fertility Programs for 1st AI

Presynch-Ovsynch

Moreira et al., 2001; J. Dairy Sci. 84:1646-1659

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			PGF			
			PGF	AI to Estrus		
	GnRH					
	PGF		GnRH	TAI		

J. Dairy Sci. 99:2248–2256
http://dx.doi.org/10.3168/jds.2015-10358

Effect of insemination after estrous detection on pregnancy per artificial insemination and pregnancy loss in a Presynch-Ovsynch protocol: A meta-analysis

S. Borchardt, P. Haimerl, and W. Heuwieser[1]
Clinic for Animal Reproduction, Faculty of Veterinary Medicine, Freie Universität Berlin, Koenigsweg 65, 14163 Berlin, Germany

- 3 randomized controlled studies including 1,689 cows were used in a meta-analysis.
- The incorporation of AI to estrus during a Presynch-Ovsynch protocol **decreased** the odds of pregnancy by **35%**.

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

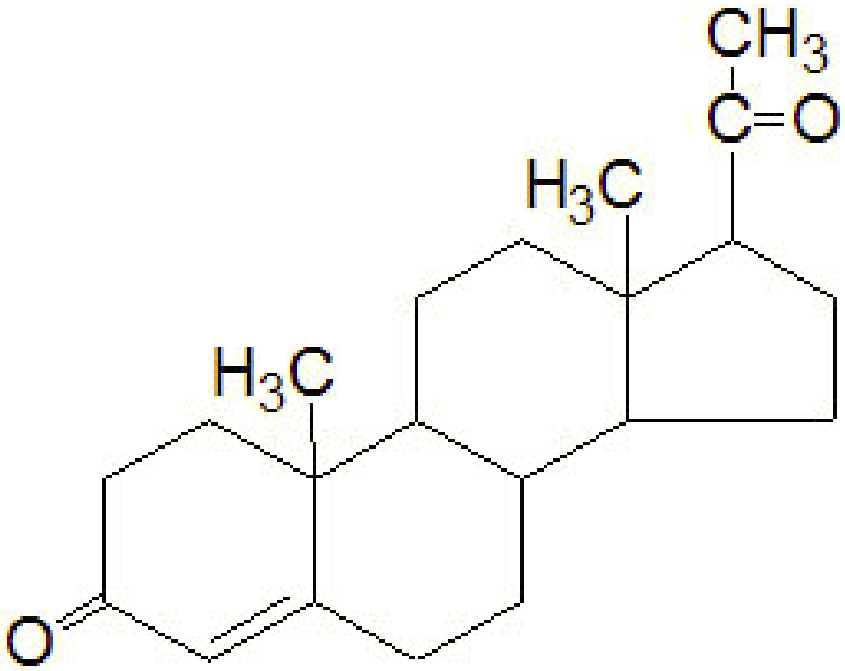
Outline

- **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



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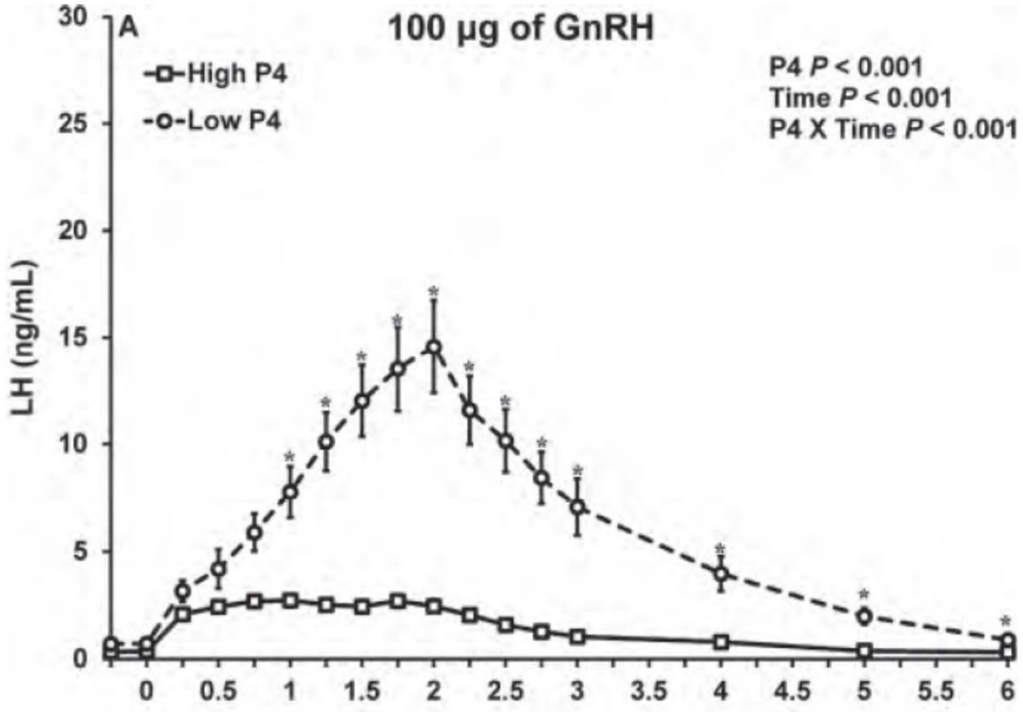
J. Dairy Sci. 95:3781–3793
http://dx.doi.org/10.3168/jds.2011-5155

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

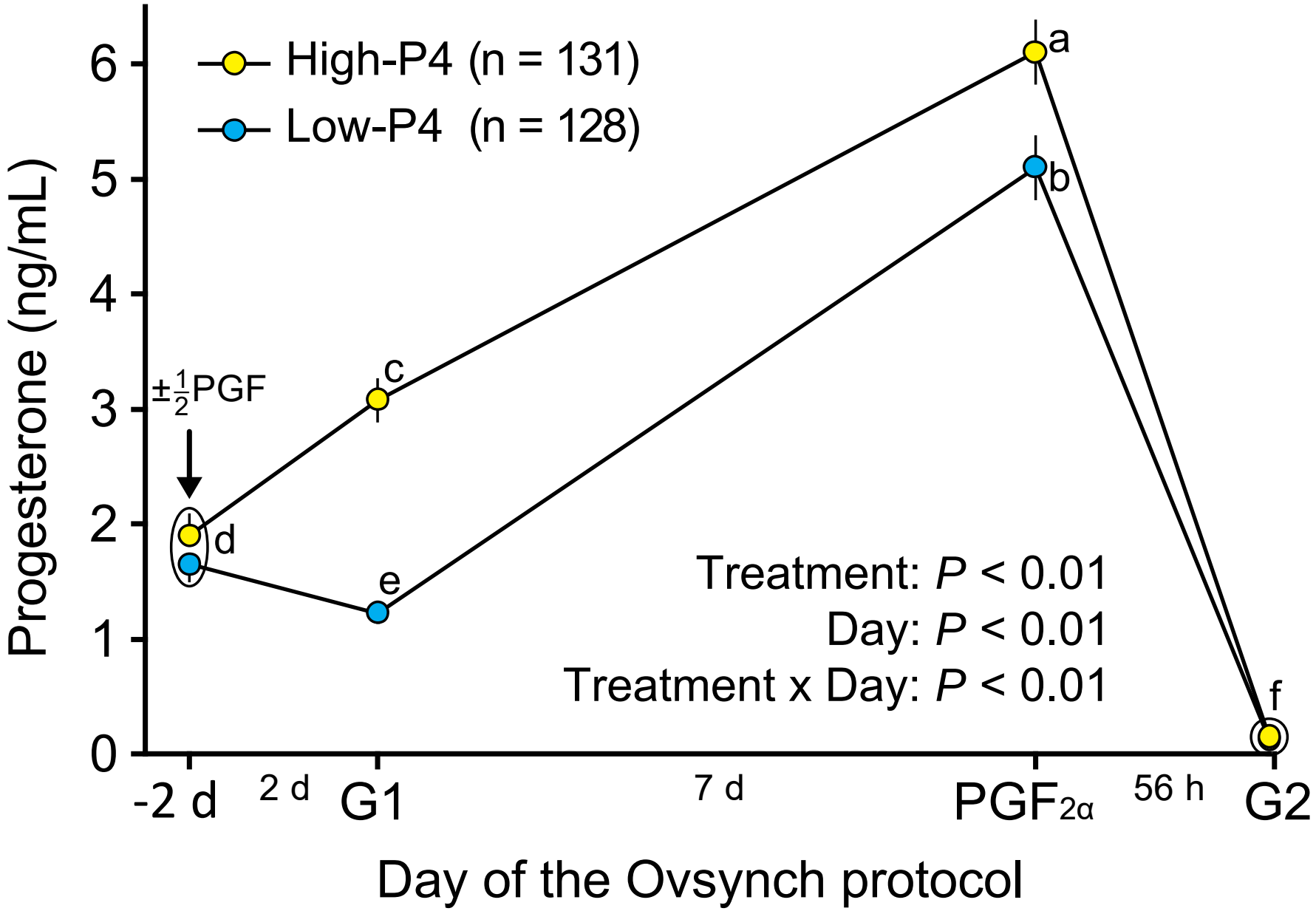
J. O. Giordano, P. M. Fricke, J. N. Guenther, G. Lopes Jr., M. M. Herlihy,[1] A. B. Nascimento, and M. C. Wiltbank[2]
Department of Dairy Science, University of Wisconsin–Madison, Madison 53706



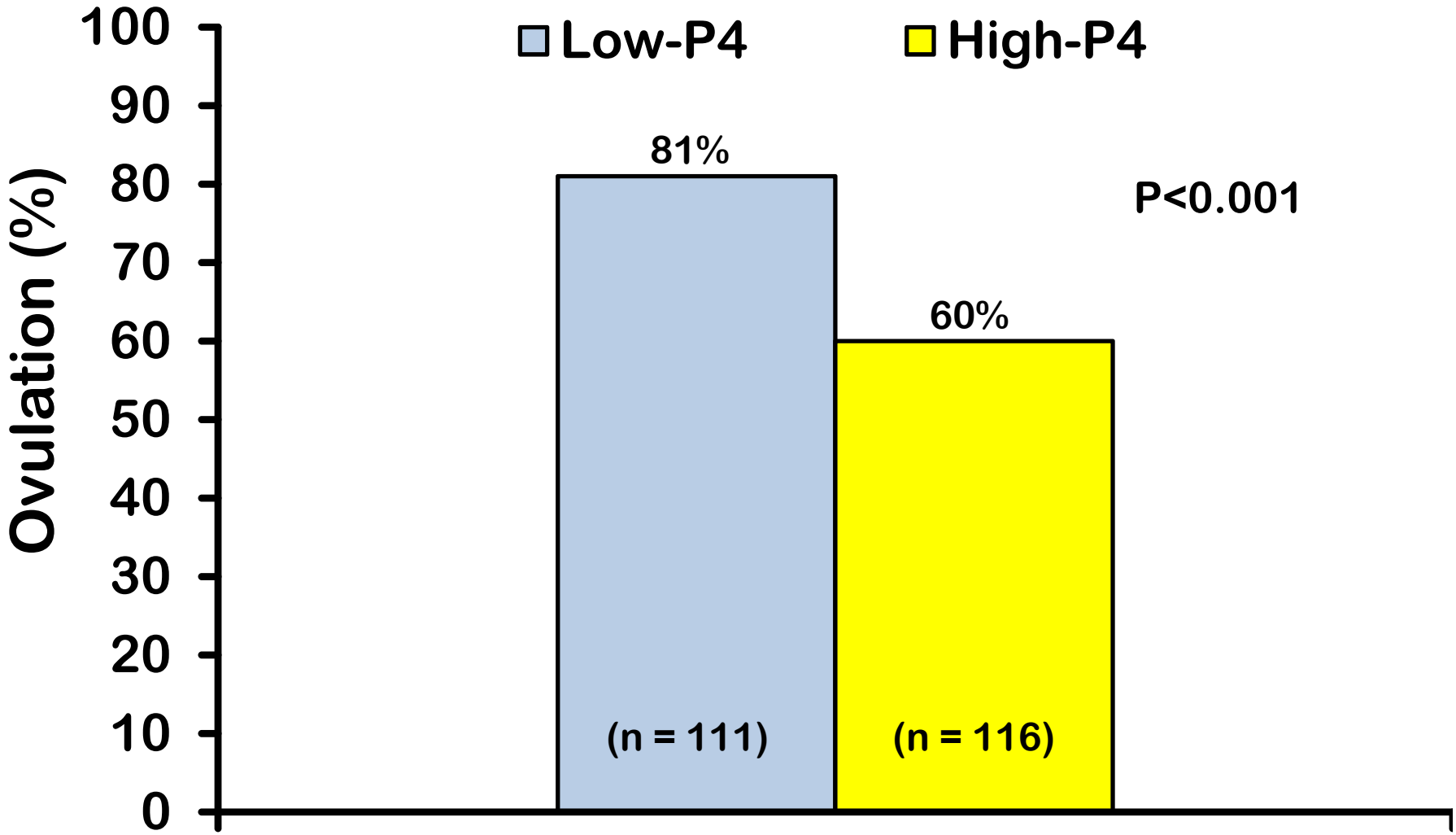
Experimental Design

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

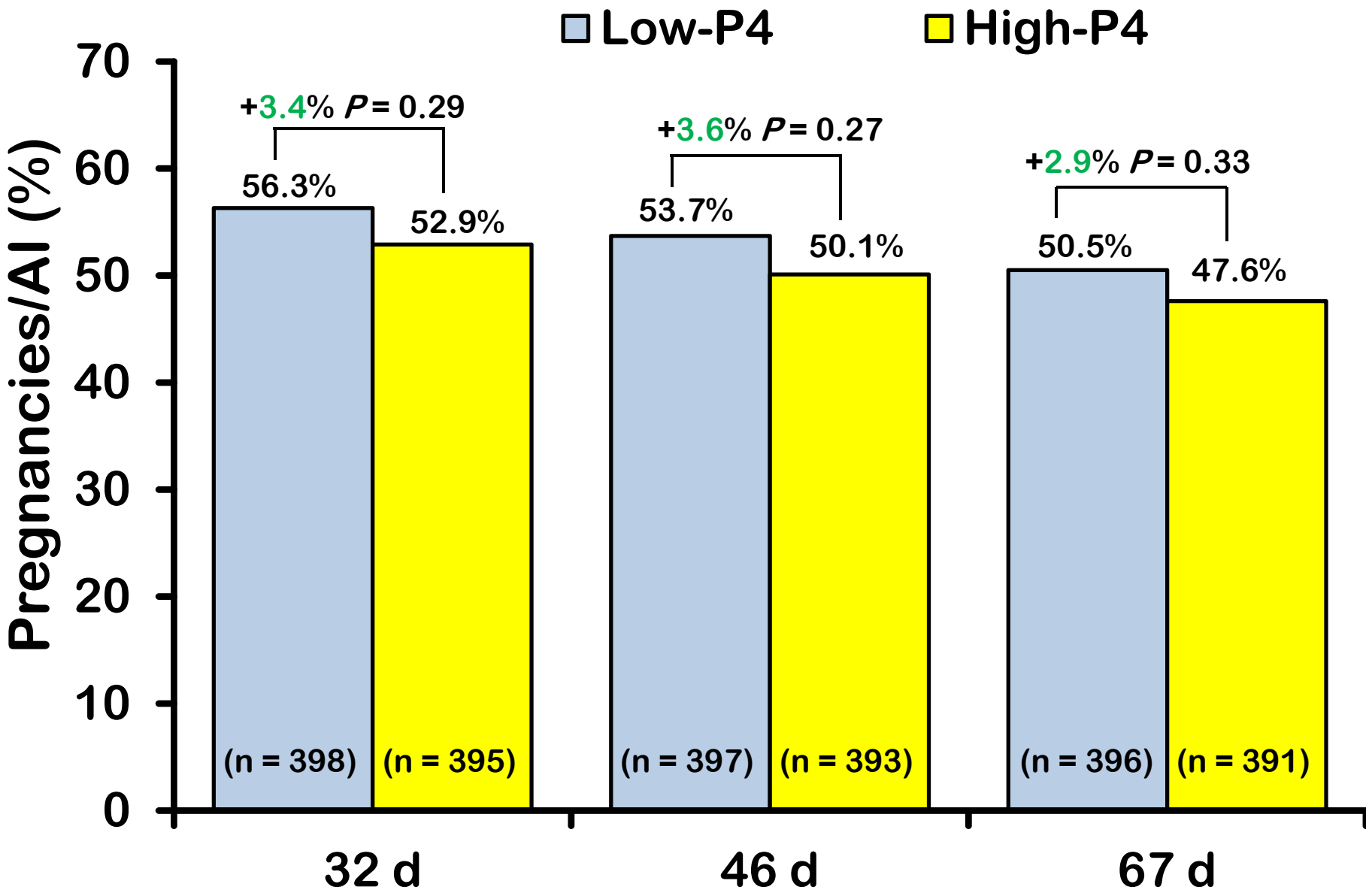
Effect of treatment on P4



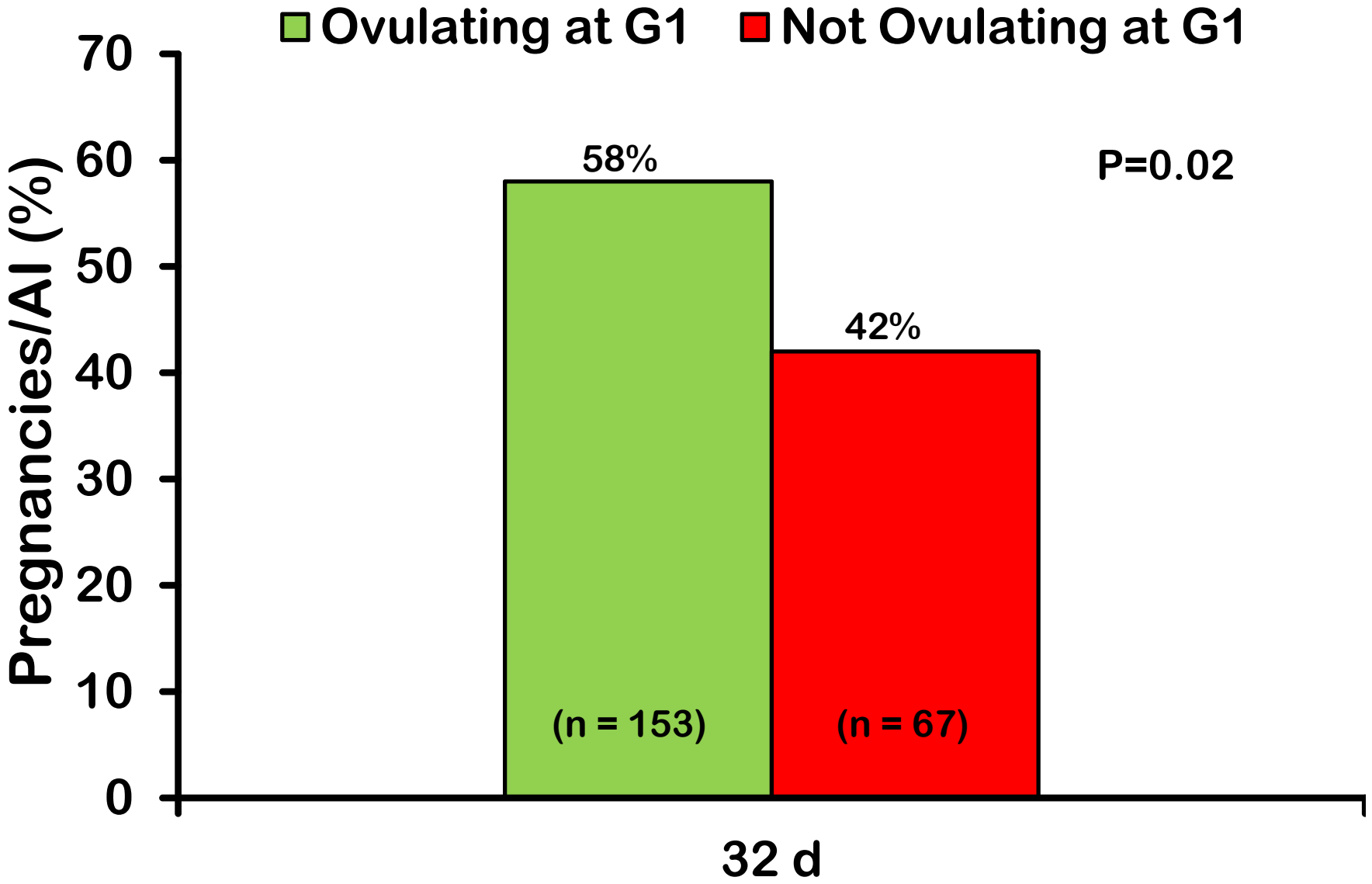
Effect of treatment on ovulatory response to G1



Effect of treatment on P/AI



Effect of ovulatory response to G1 on P/AI



Expected Pregnancies/AI

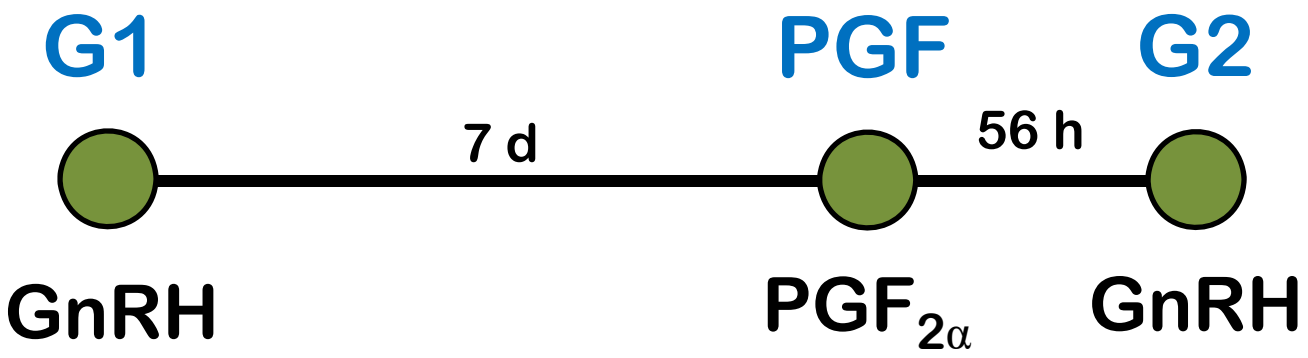
Item	Treatment	
	Low P4	High P4
Ovulation to G1		
YES	81.0%	60.0%
P/AI for cows ovulating to G1	58.2%	58.2%
Overall P/AI	47.1%	34.9%
NO	19.0%	40.0%
P/AI for cows not ovulating to G1	41.8%	41.8%
Overall P/AI	7.9%	16.7%
Expected P/AI	55.0%	51.6%

Expected treatment difference = +3.4%

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

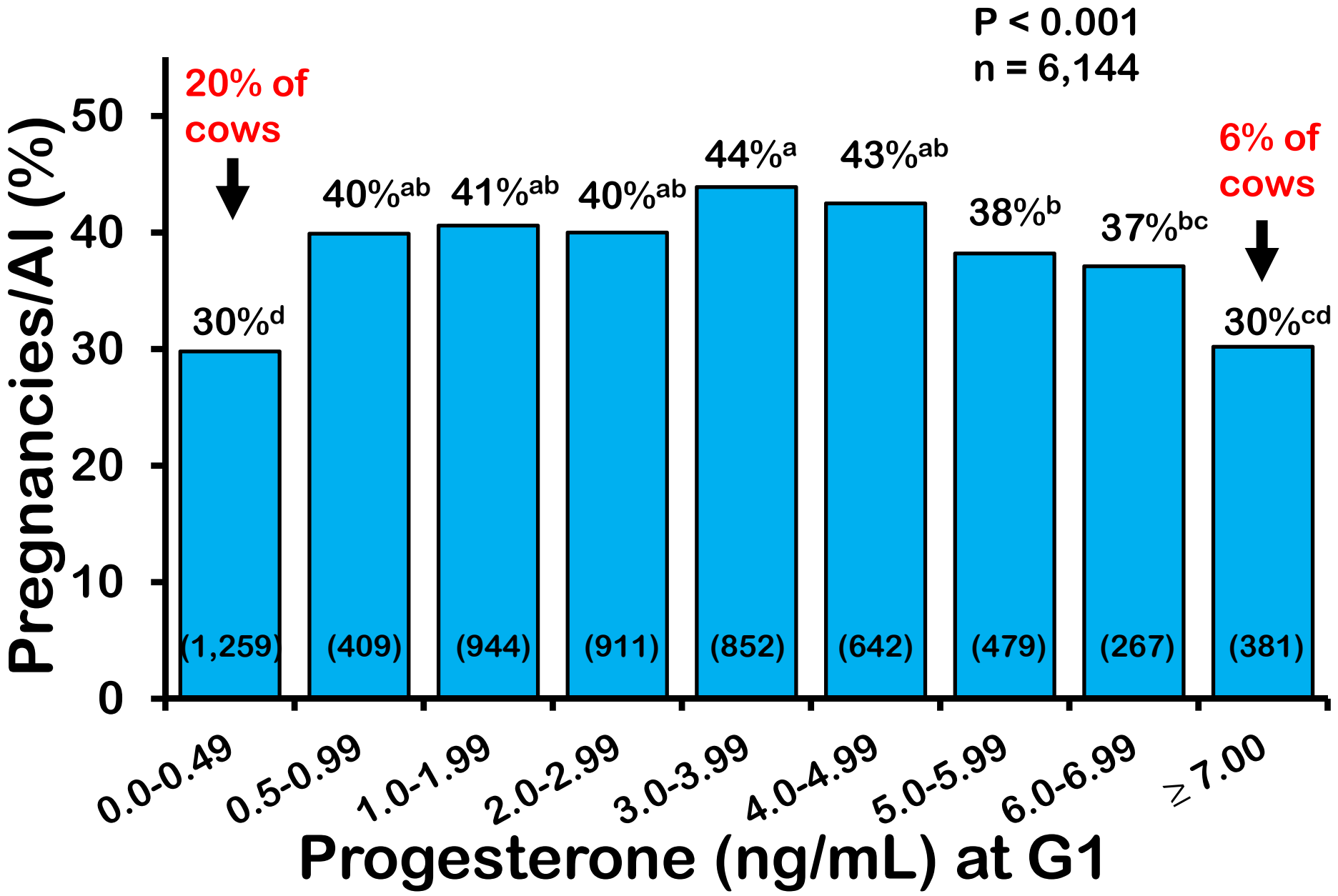


Question:

How does progesterone concentration during the Ovsynch protocol affect fertility?

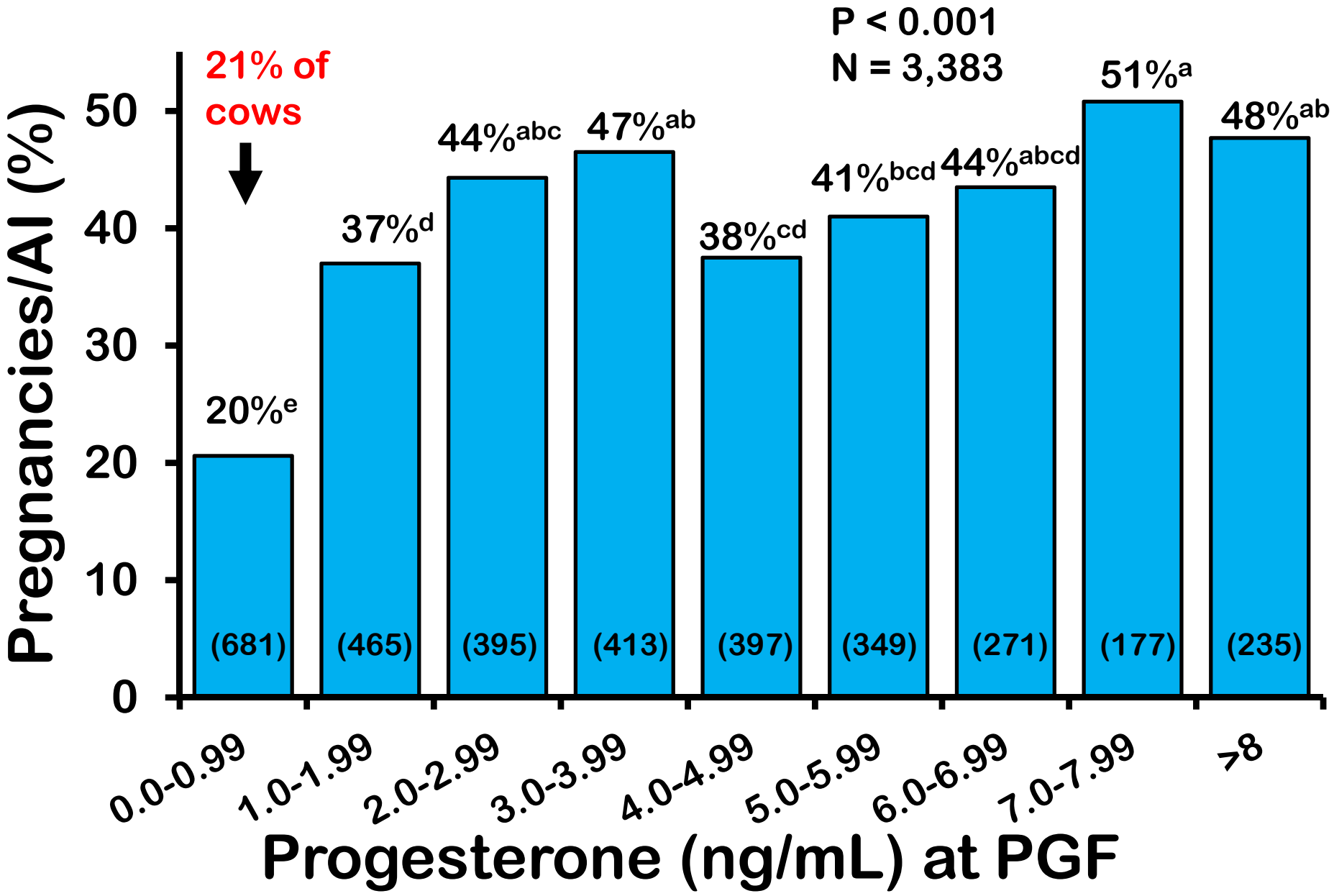
Effect of P4 at G1 on fertility

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



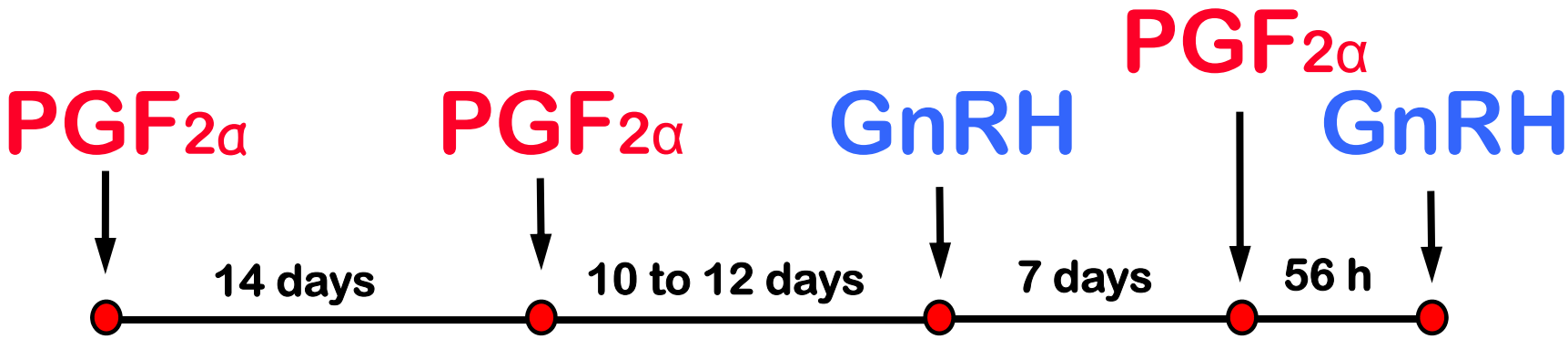
Effect of P4 at PGF on fertility

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

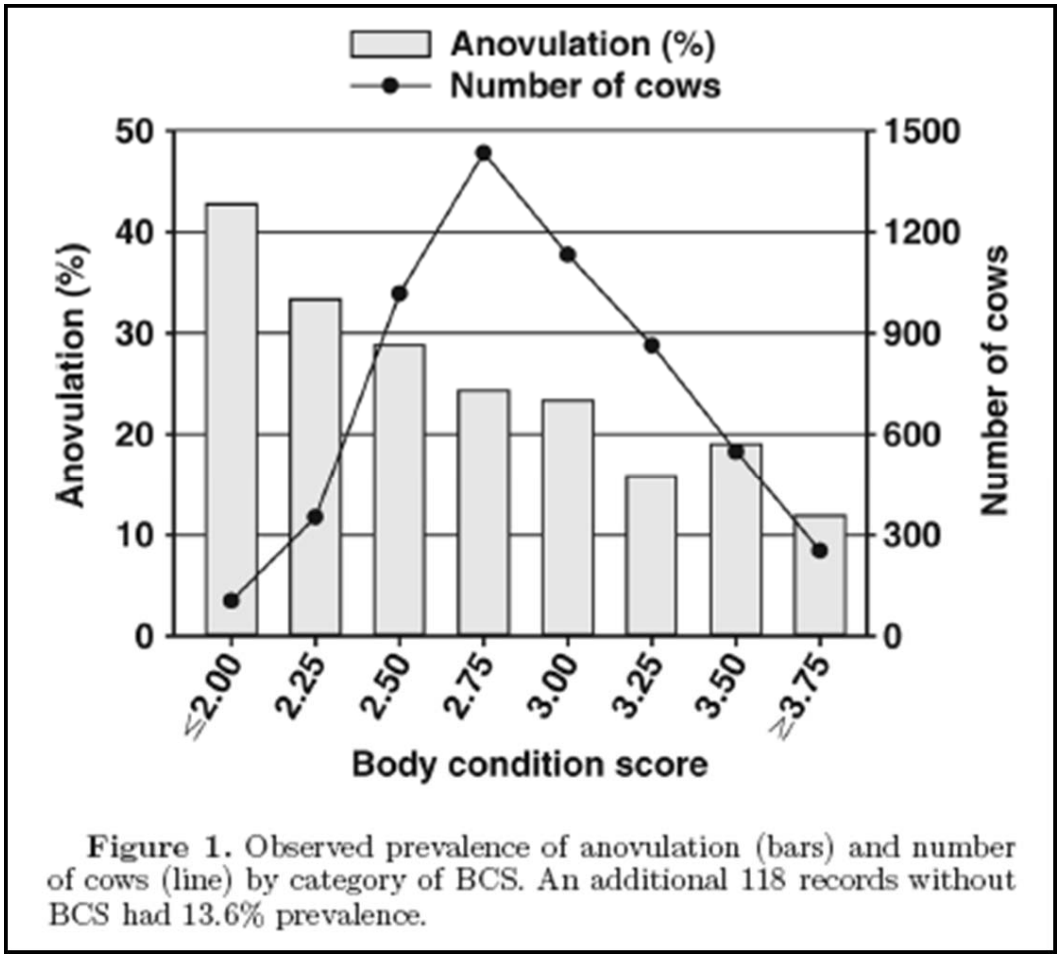


Figure 1. Observed prevalence of anovulation (bars) and number of cows (line) by category of BCS. An additional 118 records without BCS had 13.6% prevalence.

5,818 records from
13 studies in 8 herds

prevalence = 23.3%

Range: 7.3% to 41.7%

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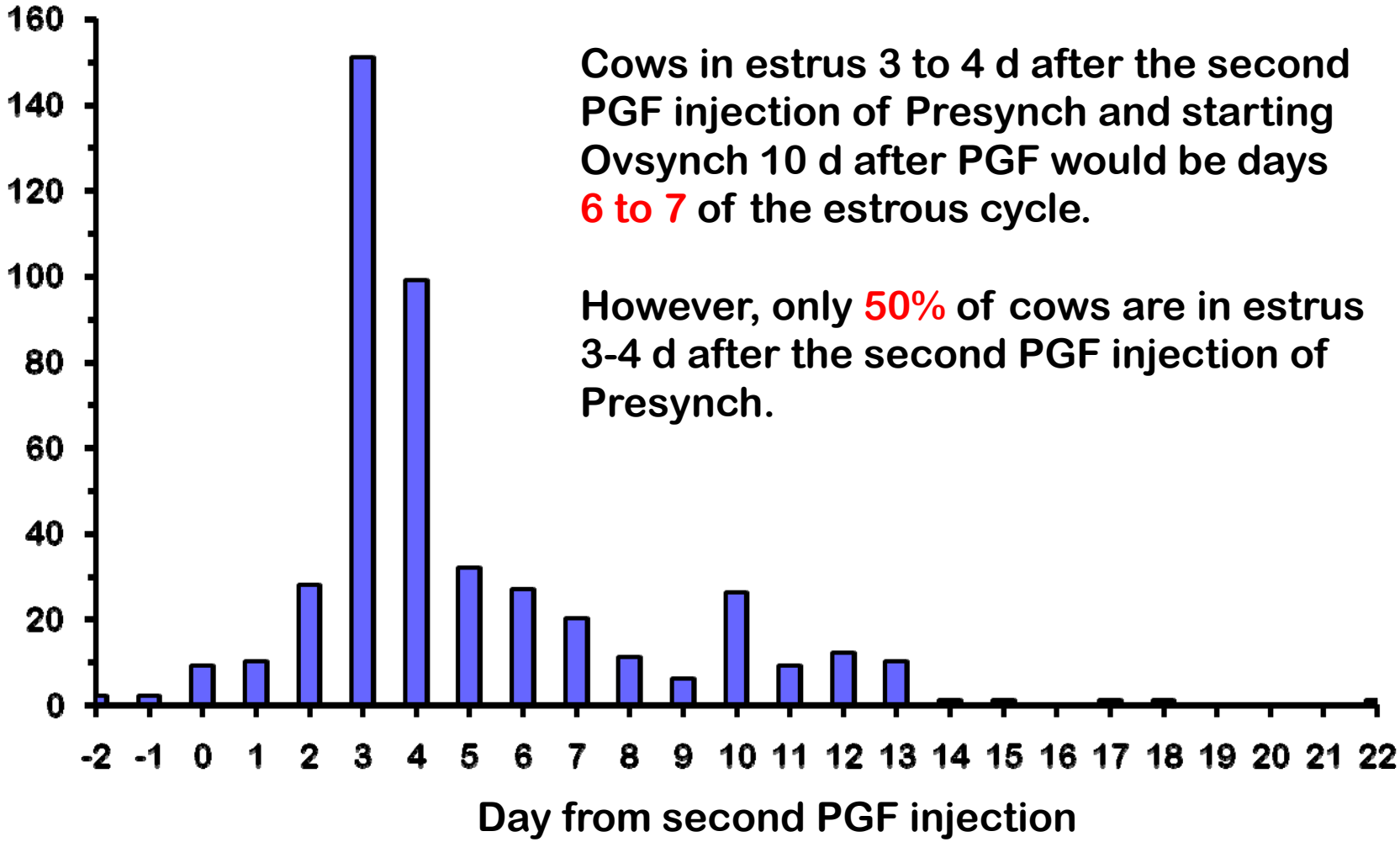
Frequency of AI Relative to the Second PGF Injection of Presynch



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.

Fertility Programs for 1st AI

Double-Ovsynch

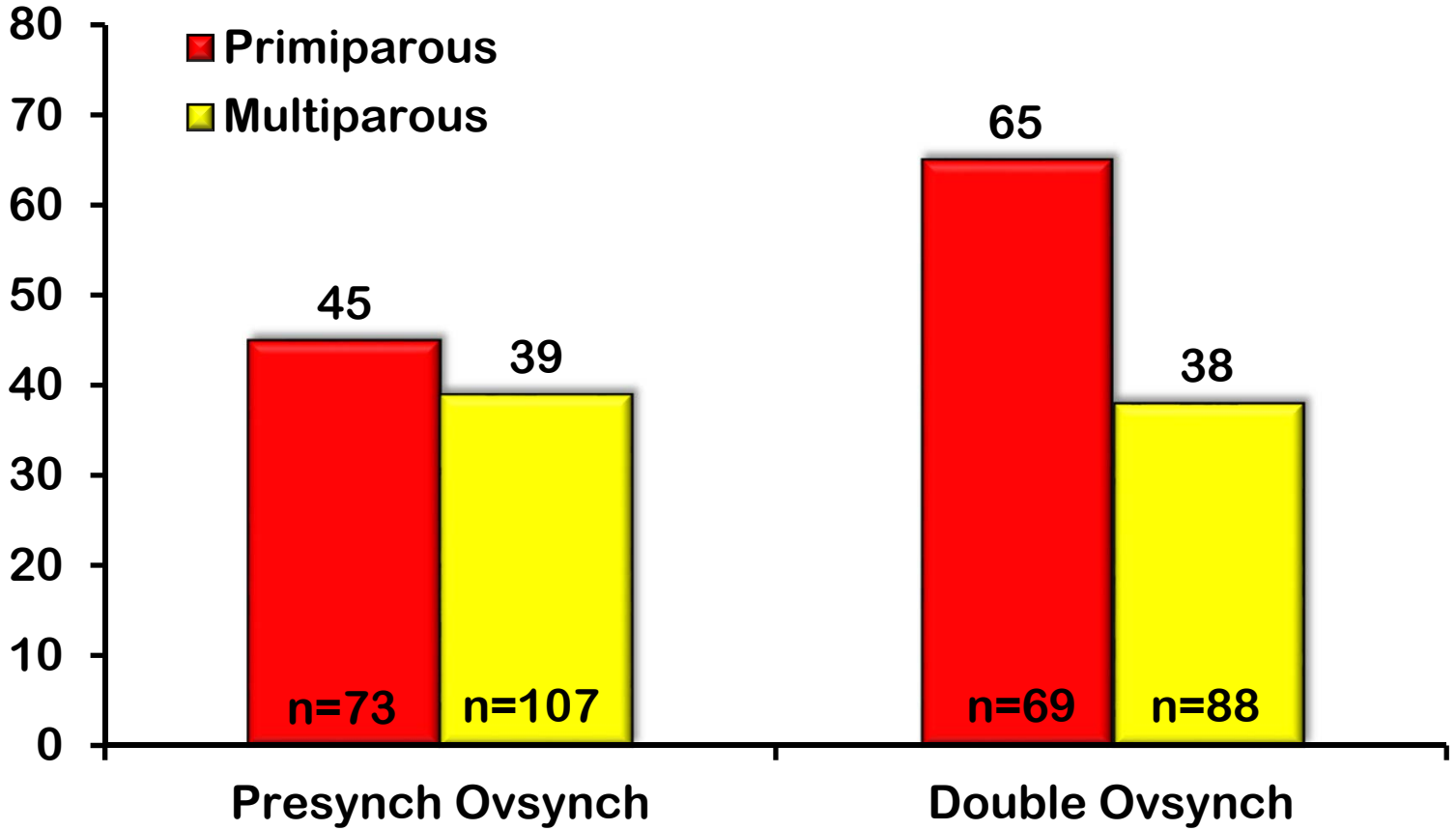
Souza et al., 2008; Theriogenology 70:208-215

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

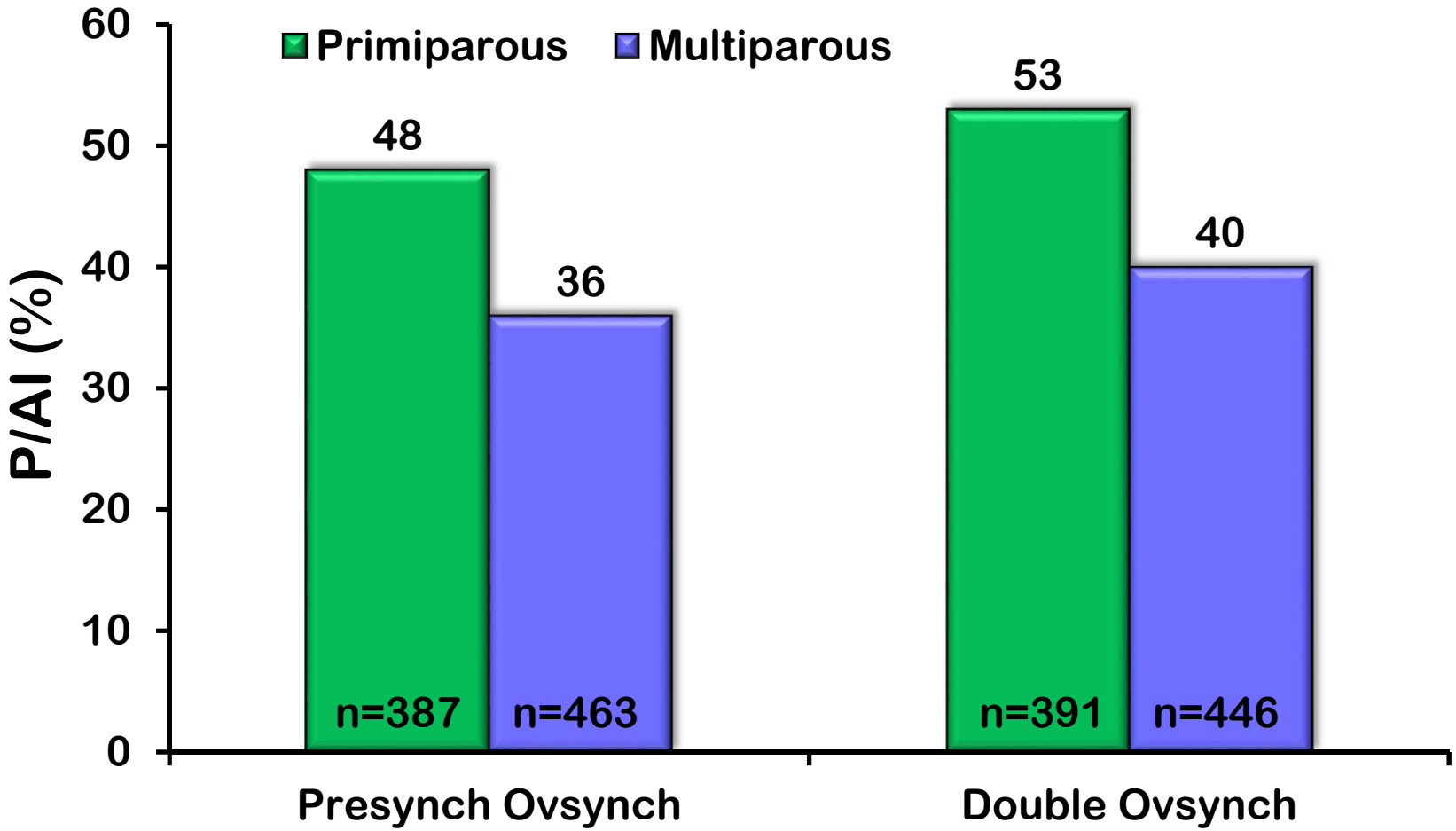
Effect	P-value
Treatment	0.03
Parity	0.02



Effect of treatment on P/AI 39 d after TAI

Herlihy et al., 2012; J. Dairy Sci. 70:208-215

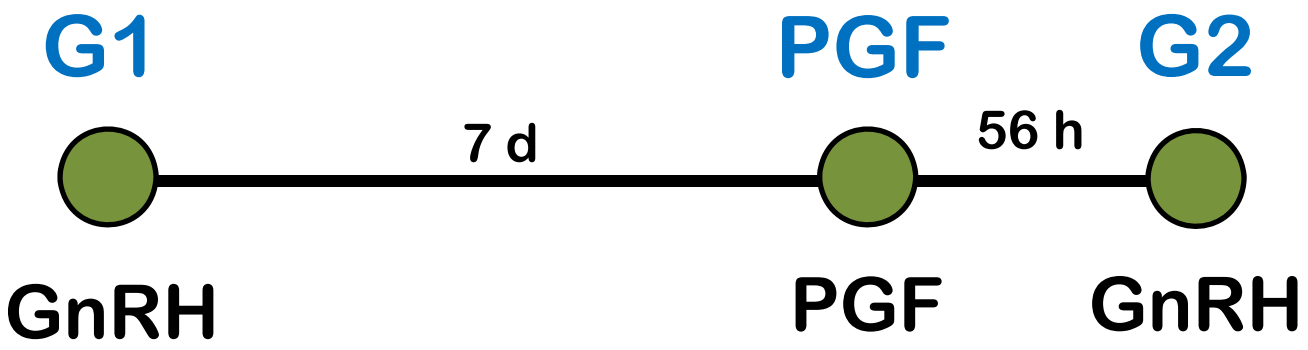
Effect	P-value
Treatment	0.03
Parity	0.02



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

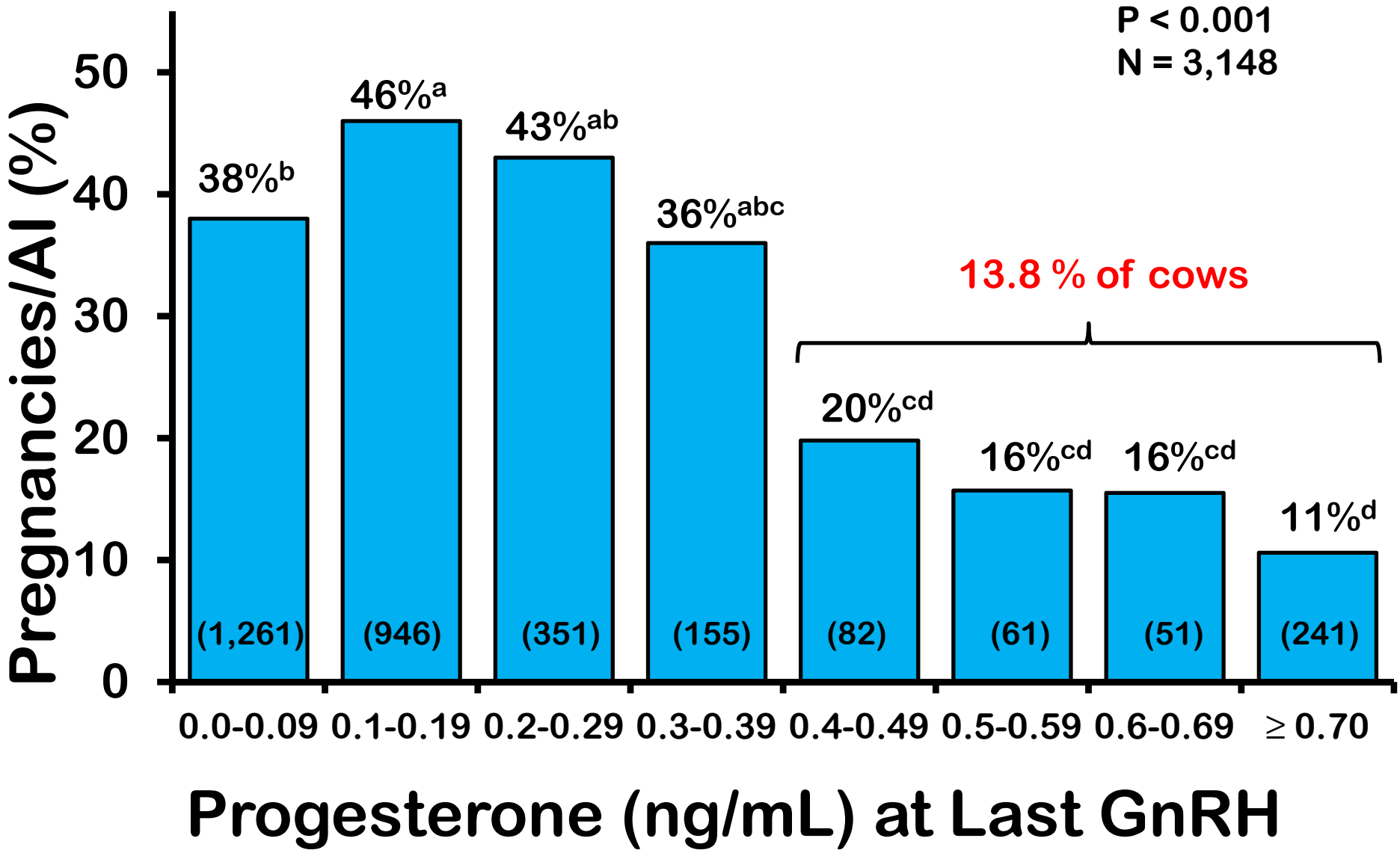


Question:

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		

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

Item	1 PGF	2 PGF	Difference (%)	P-value
Primiparous (%)	46 (41/89)	48 (40/83)	5	0.45
Multiparous (%)	37 (37/101)	45 (45/100)	23	0.14
P-value	0.24	0.77		
Overall (%)	41 (78/190)	46 (85/183)	13	0.17

Effect of dose and timing of prostaglandin $F_{2\alpha}$ treatments during a Resynch protocol

R. V. Barletta, P. D. Carvalho,
L. F. Mello, C. E. Consentini,
A. Jones, and P. M. Fricke

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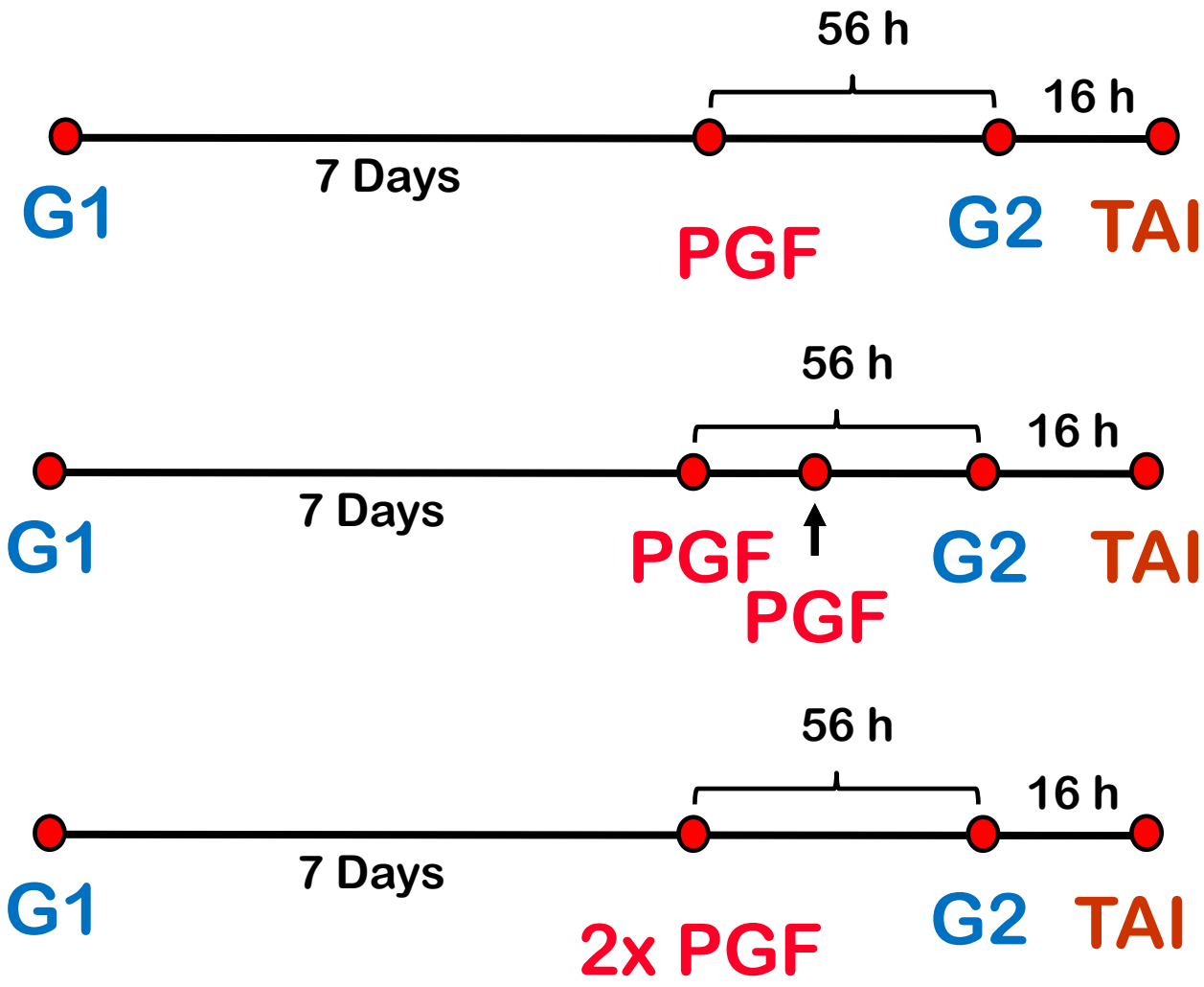
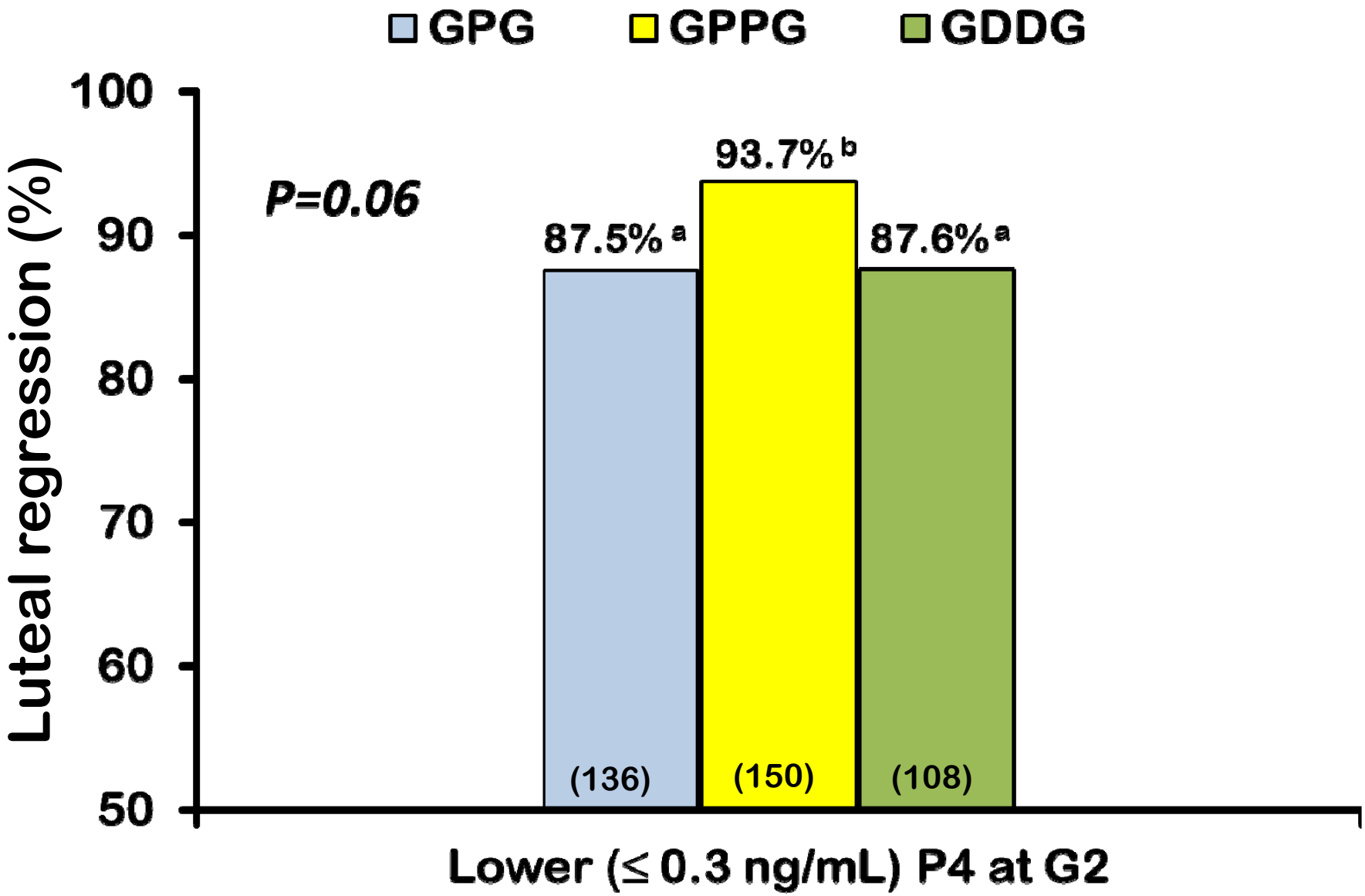
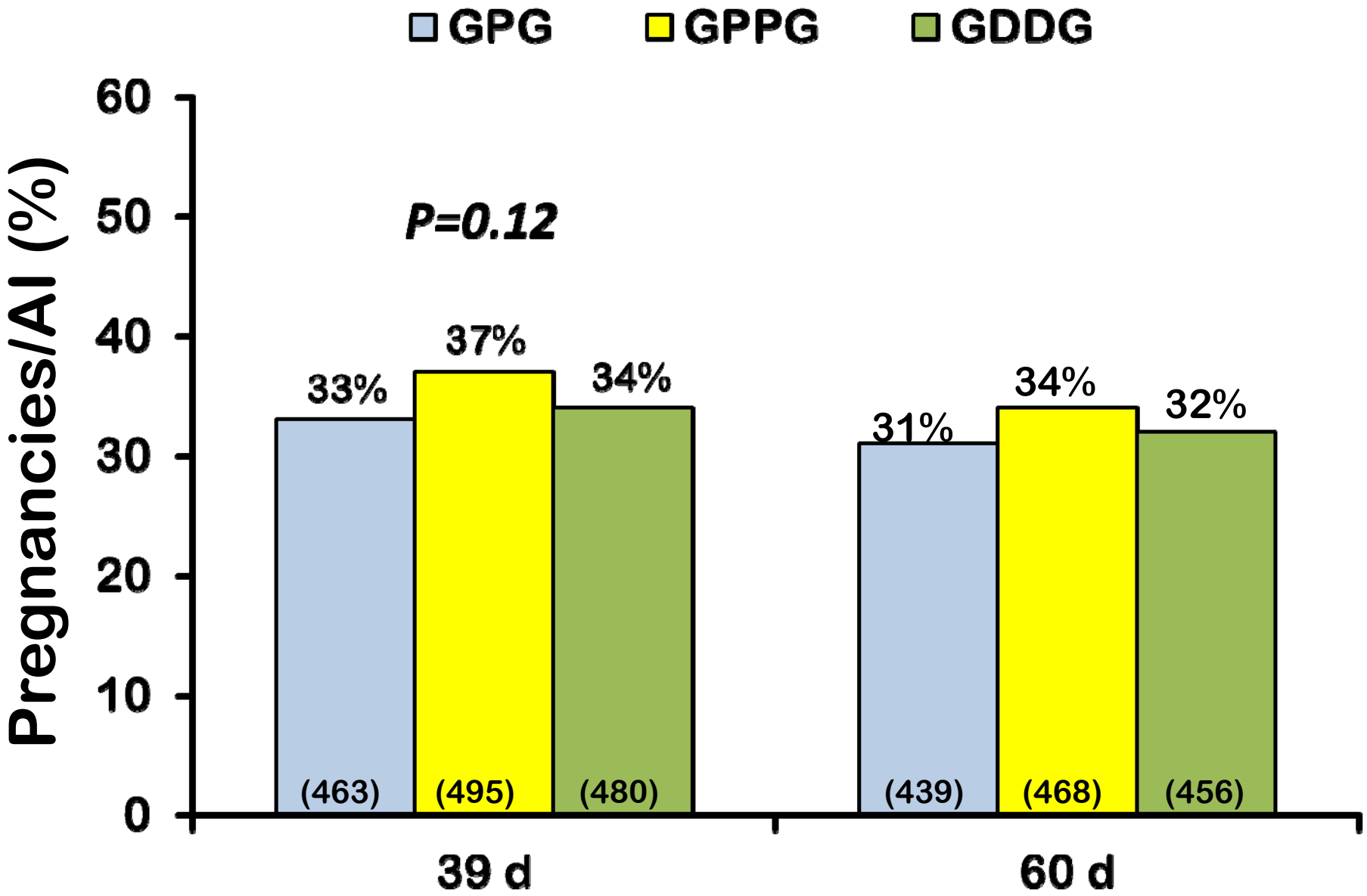
Resynch Treatments



Luteal regression



Pregnancies/AI



Comparison of Strategies for Induction of Luteal Regression during a Double-Ovsynch Protocol

A.M. Niles, A.E. Jones, P.D. Carvalho, and P.M. Fricke

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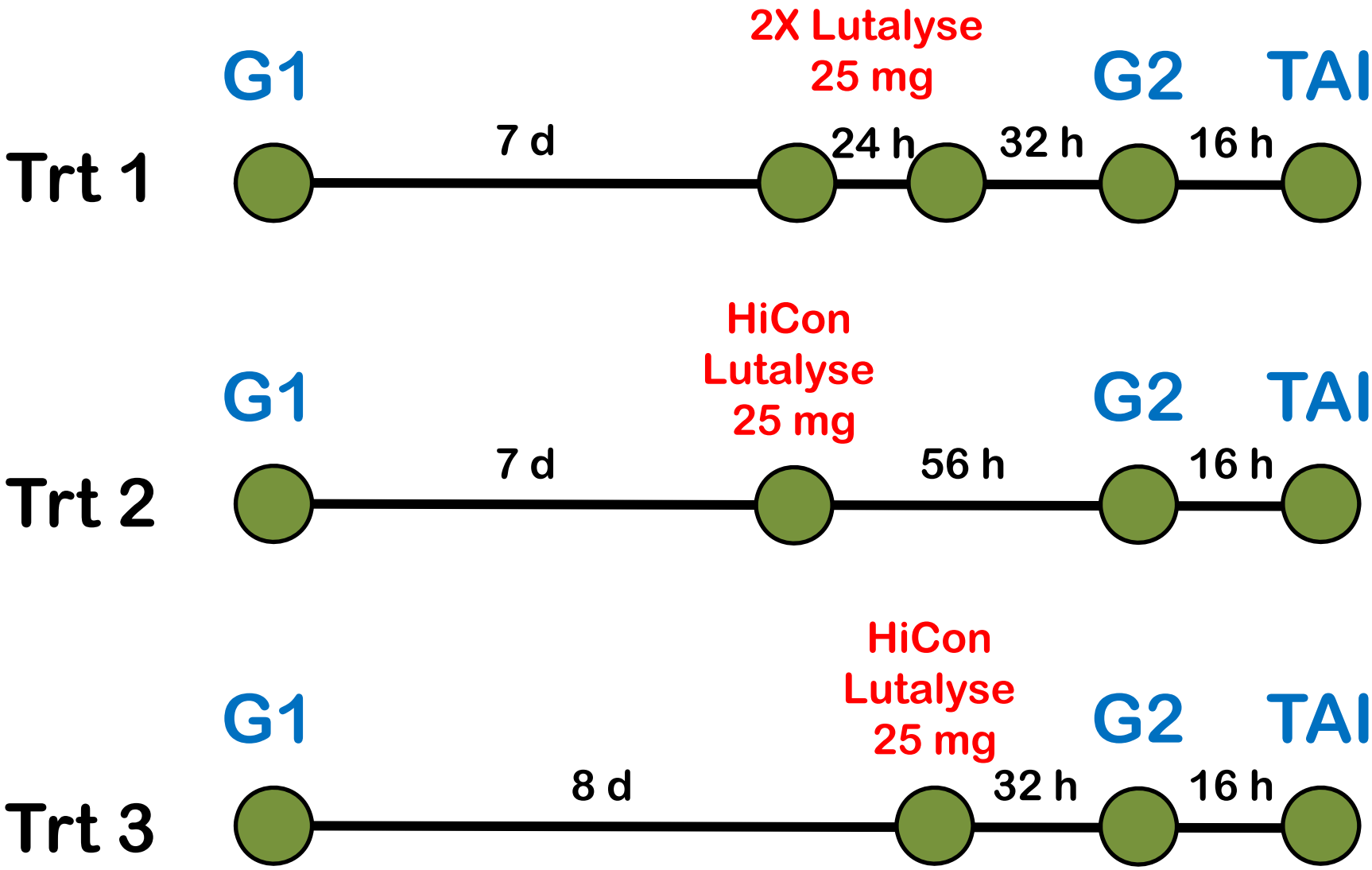
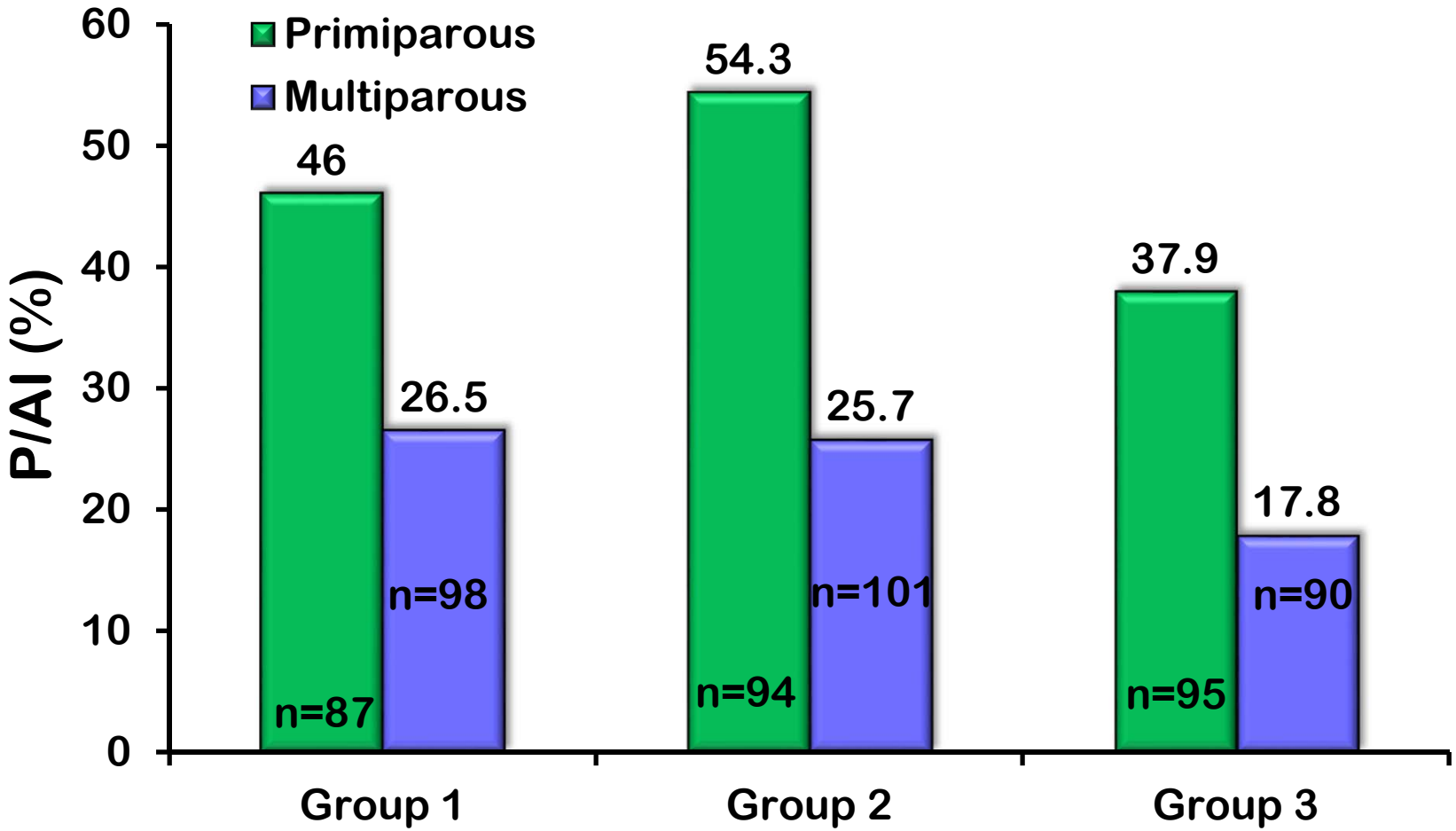

Trt 1
G1
7 d
2X Lutalyse
25 mg
24 h
32 h
G2
16 h
TAI
Trt 2
G1
7 d
HiCon
Lutalyse
25 mg
56 h
G2
16 h
TAI
Trt 3
G1
8 d
HiCon
Lutalyse
25 mg
32 h
G2
16 h
TAI

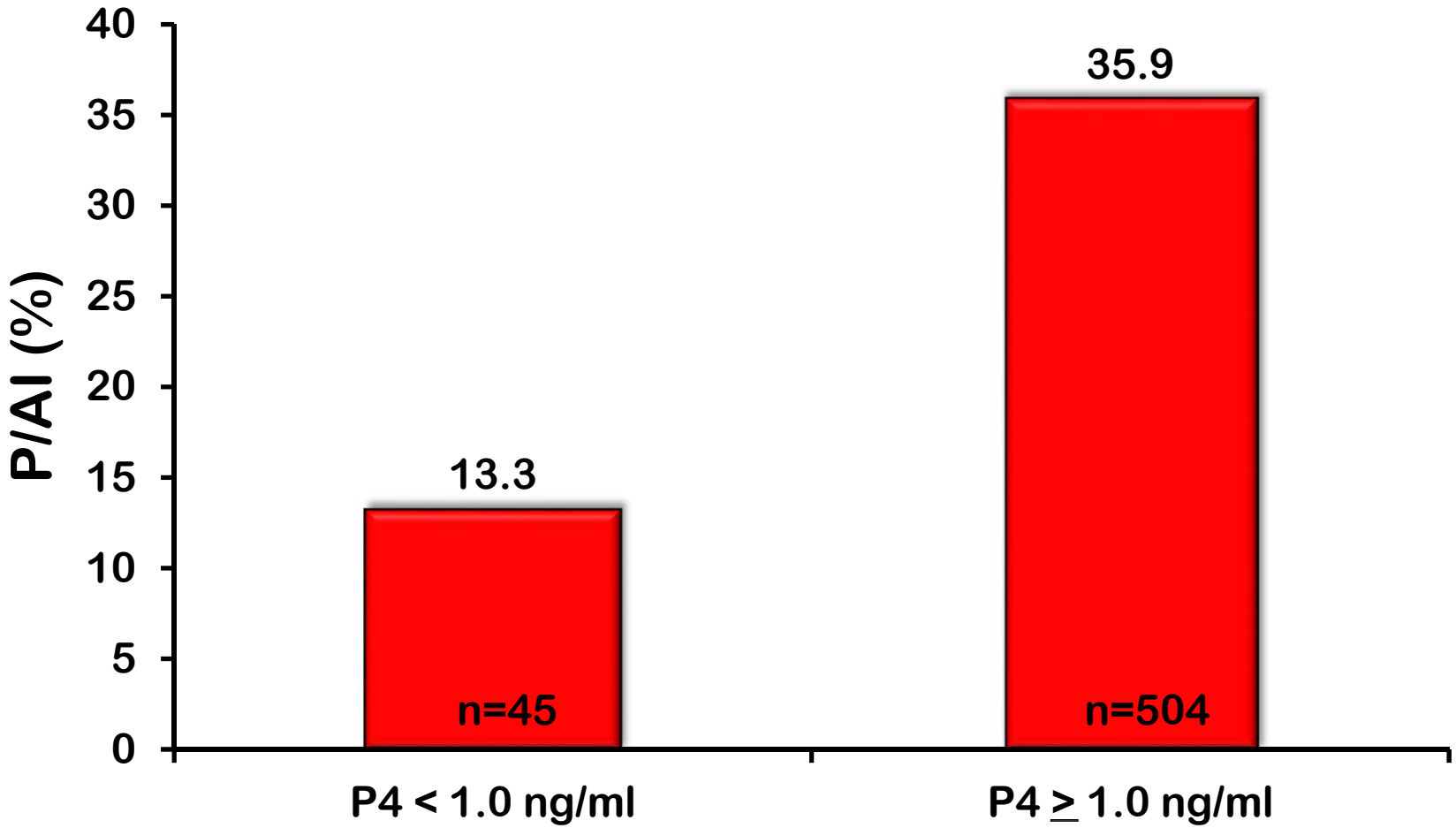
Effect of treatment on P/AI 39 d after TAI by parity

Effect	P-value
Treatment	0.04
Parity	<.0001



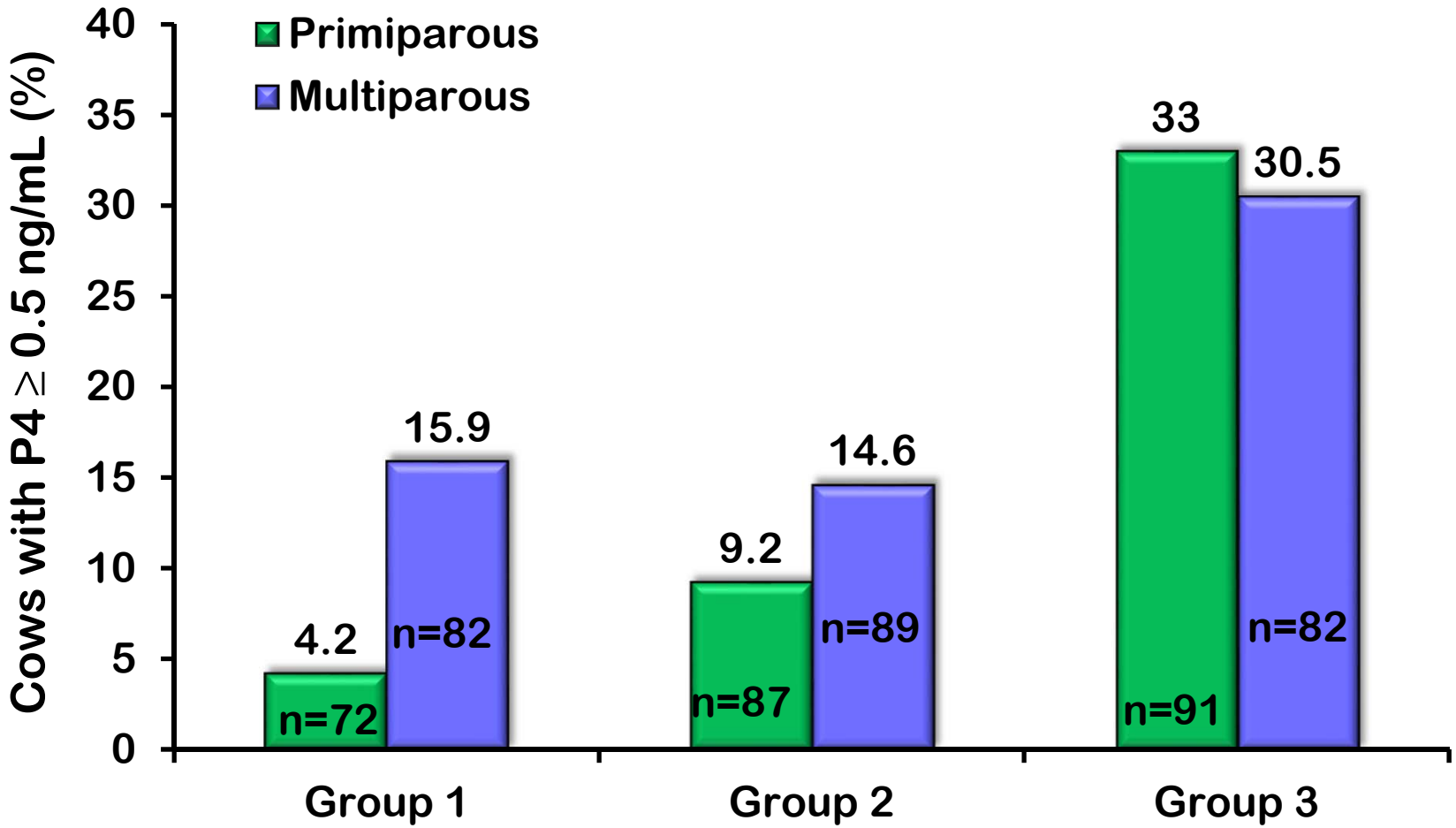
Effect of low (<1.0 ng/mL) vs. high P4 (≥1.0 ng/mL) at PGF on P/AI 39 d after TAI

Effect	P-value
P4	0.0041



P4 ≥ 0.5 ng/mL at G2 for cows with P4 > 1.0 ng/mL at PGF

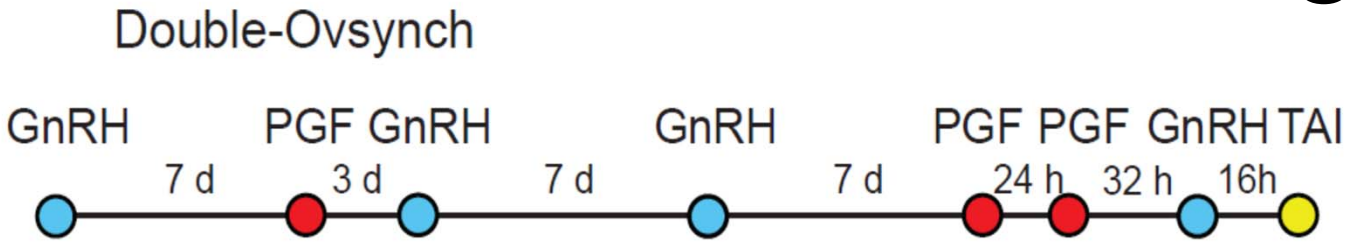
Effect	P-value
Treatment	<0.0001
Parity	0.1684



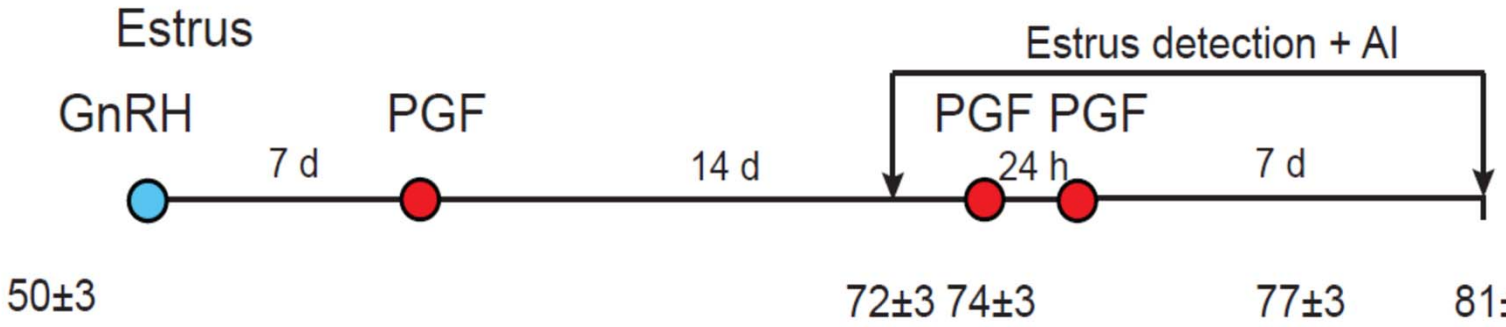
Fertility of lactating Holstein cows after synchronization of ovulation and TAI vs. AI after a synchronized estrus

Santos et al., 2017. J. Dairy Sci. (abstr).

SR=100%



50%
(135/268)

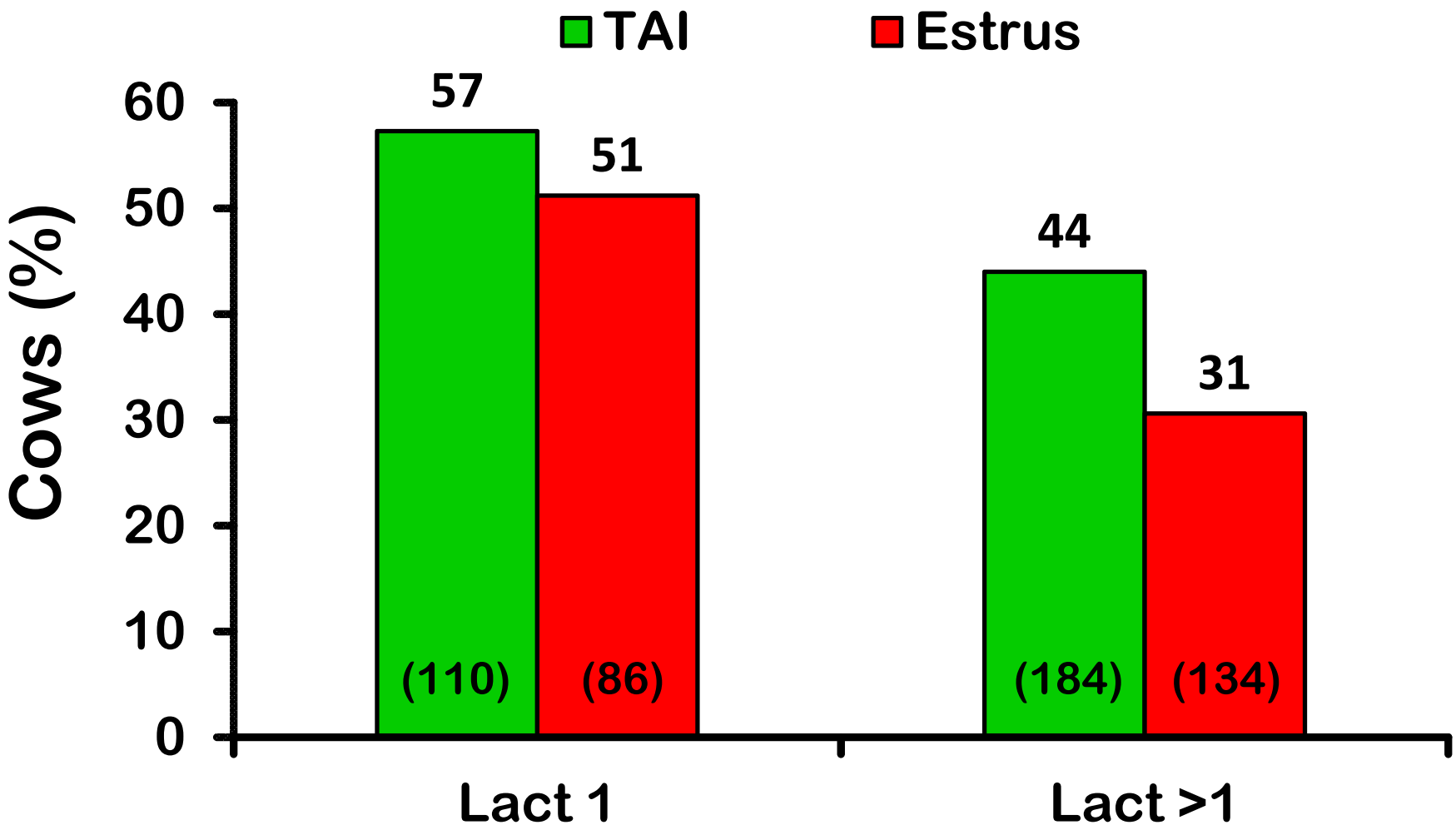


39%
(79/205)

SR=77%

Effect of lactation on P/AI

Santos et al., 2017. J. Dairy Sci. (abstr).



Strategies for Resynchronization

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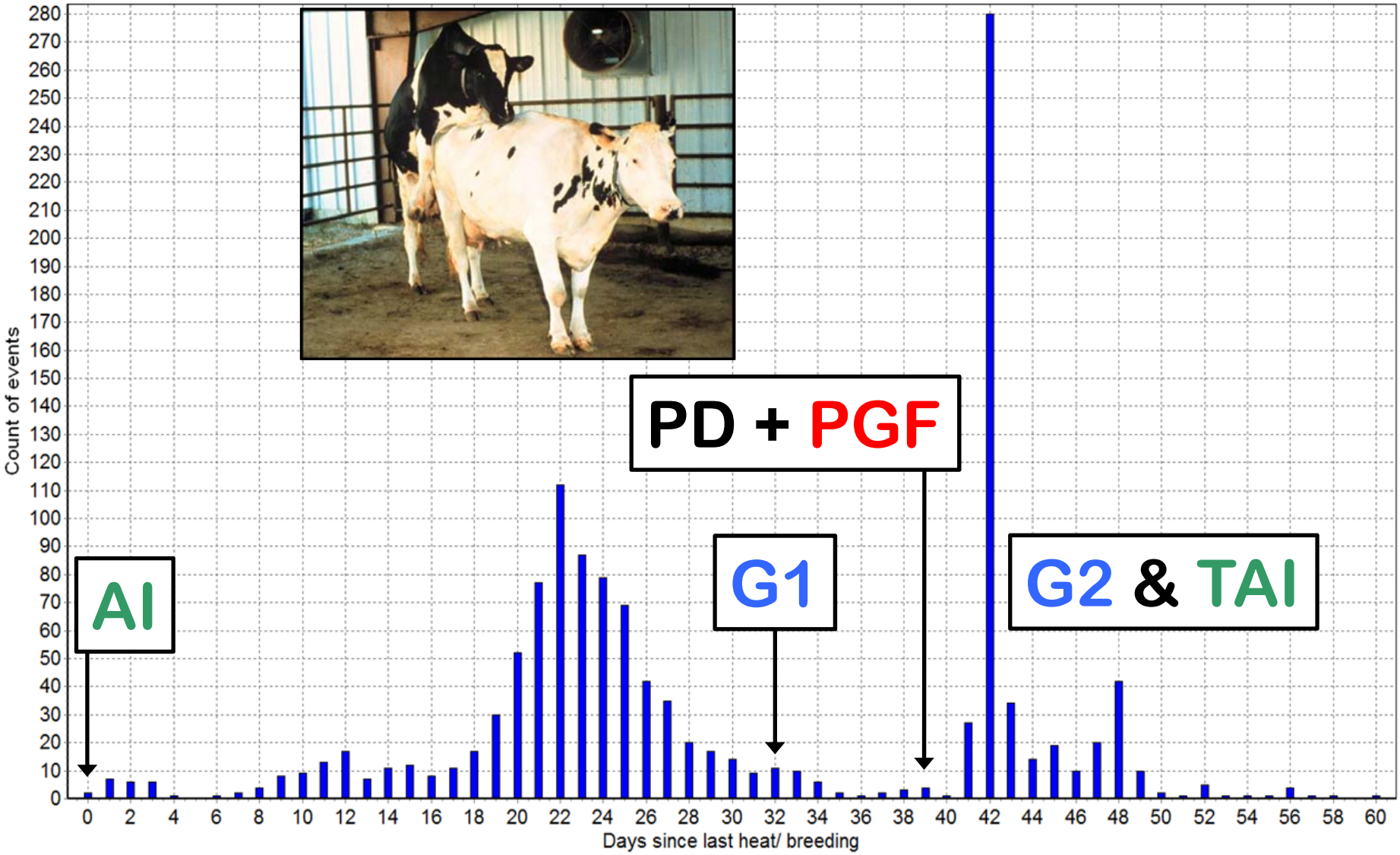
Pregnancy Diagnosis & Resynch



Poor Fertility to Resynch TAI

Bred #	%Conc	#Preg	#Open	Other	Abort	%Tot
1	47	211	237	181	19	36
2	30	81	187	84	9	20
3	27	58	159	62	9	16
4	30	44	104	59	2	12
5	28	25	63	42	2	7
6	32	12	25	18	0	3
OTHERS	33	8	16	9	0	2
TOTALS	35	445	821	474	42	100

Double Ovsynch

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

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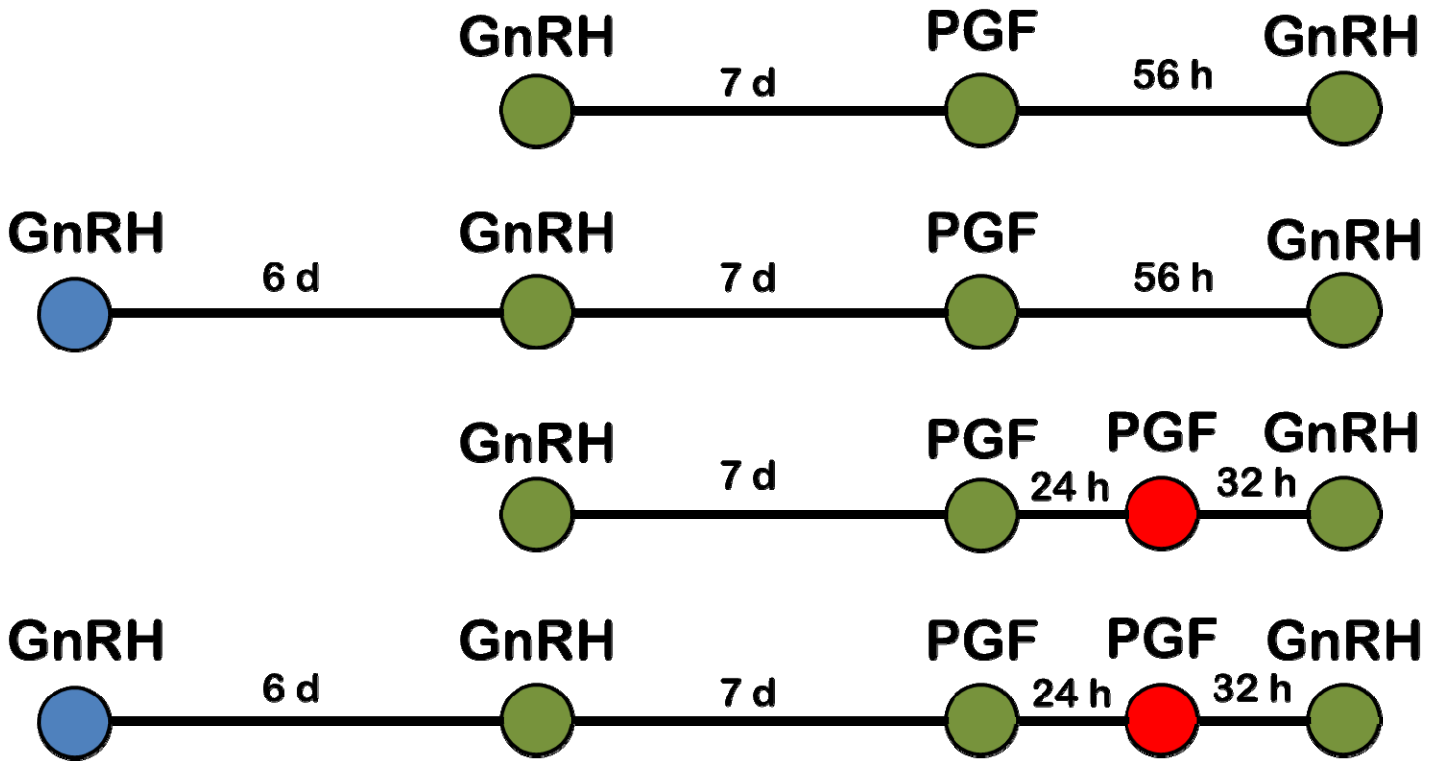
*Department of Dairy Science, University of Wisconsin, Madison 53706
†Brodhead Veterinary Clinic, Brodhead, WI 53520

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

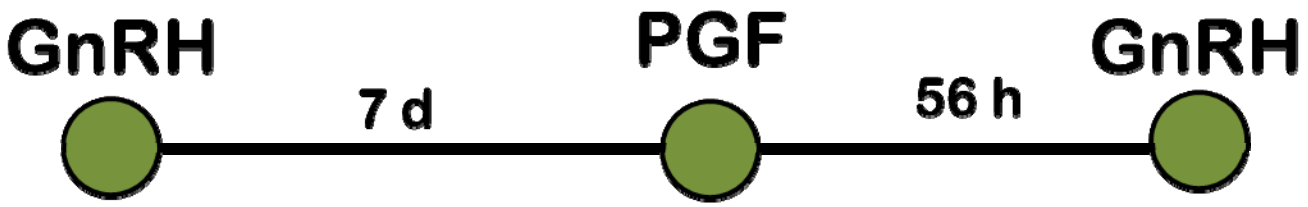
Modifications to Ovsynch improve fertility during resynchronization: Evaluation of presynchronization with gonadotropin-releasing hormone 6 d before initiation of Ovsynch and addition of a second prostaglandin $F_{2\alpha}$ treatment

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



Effect of 2nd PGF on P/AI to Resynch

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



27%
(78/288)

35%
(100/258)

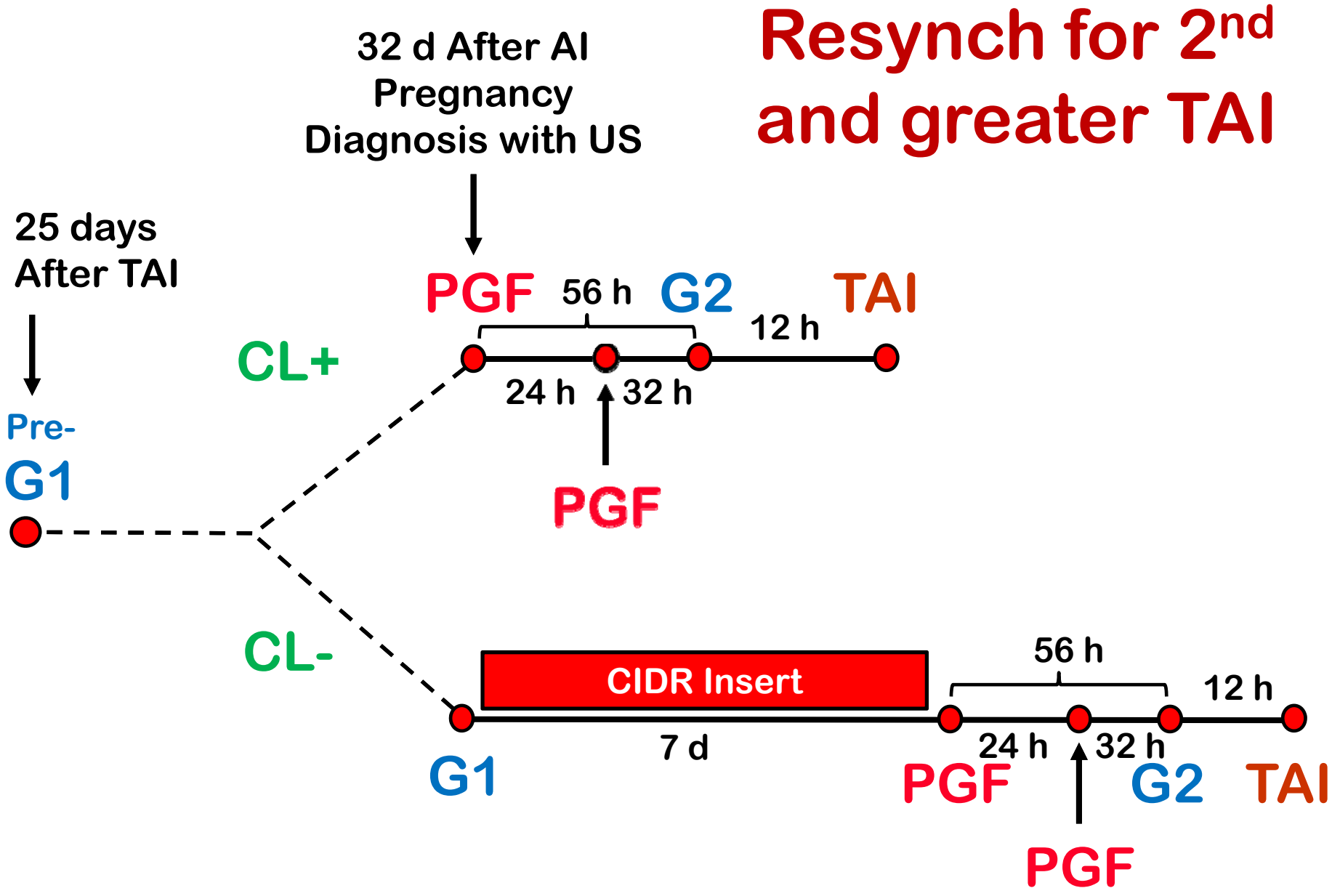
Outline

- 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

Double Ovsynch for First TAI

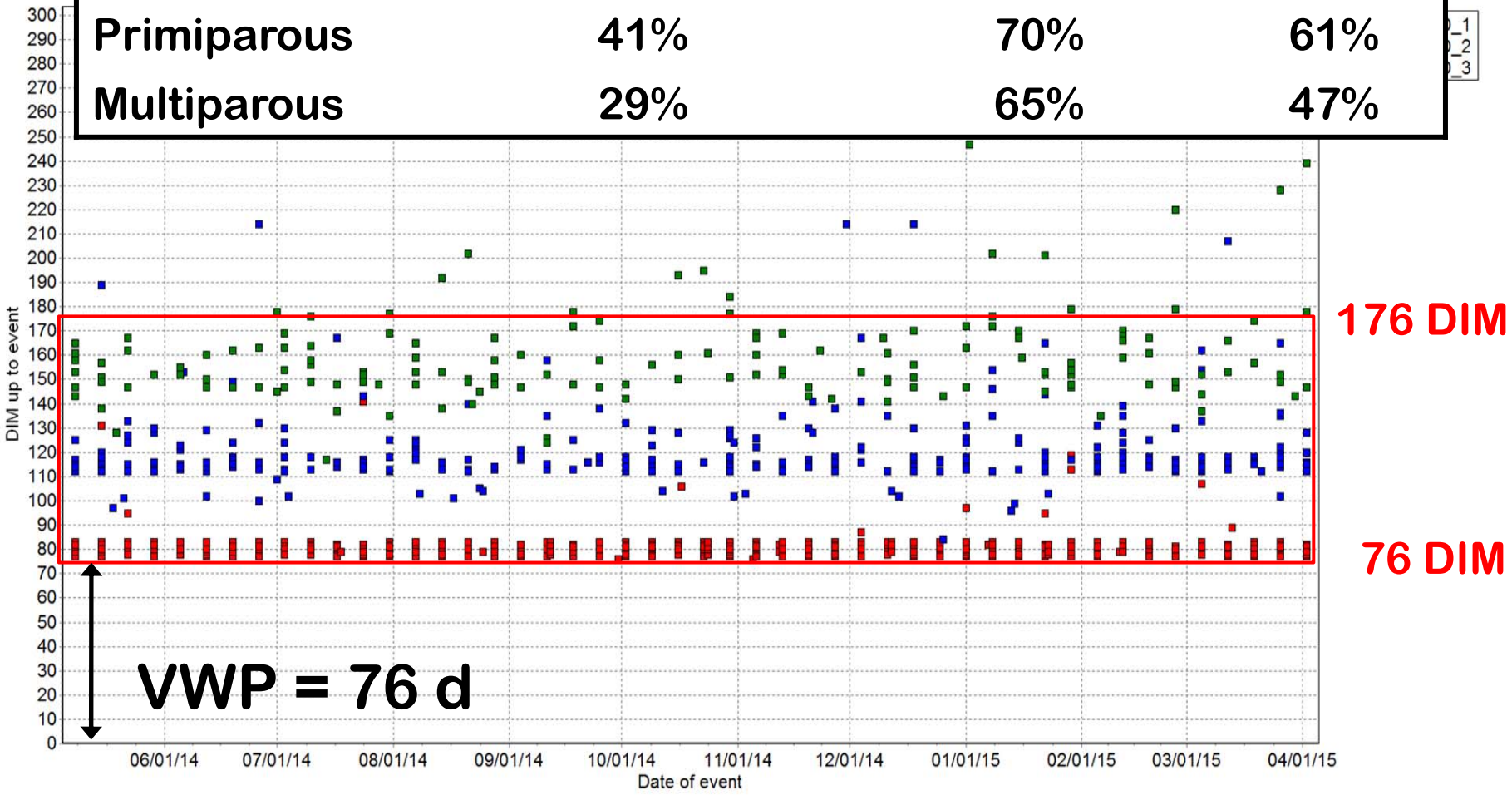
Sun	Mon	Tue	Wed	Thu	Fri	Sat
					GnRH	
					PGF	
	GnRH					
	GnRH					
	PGF	PGF	GnRH	TAI		

Resynch for 2nd and greater TAI



TAI for First Three Breedings

Parity	21-d Preg Rate	Service Rate	P/AI
All cows	31%	66%	50%
Primiparous	41%	70%	61%
Multiparous	29%	65%	47%



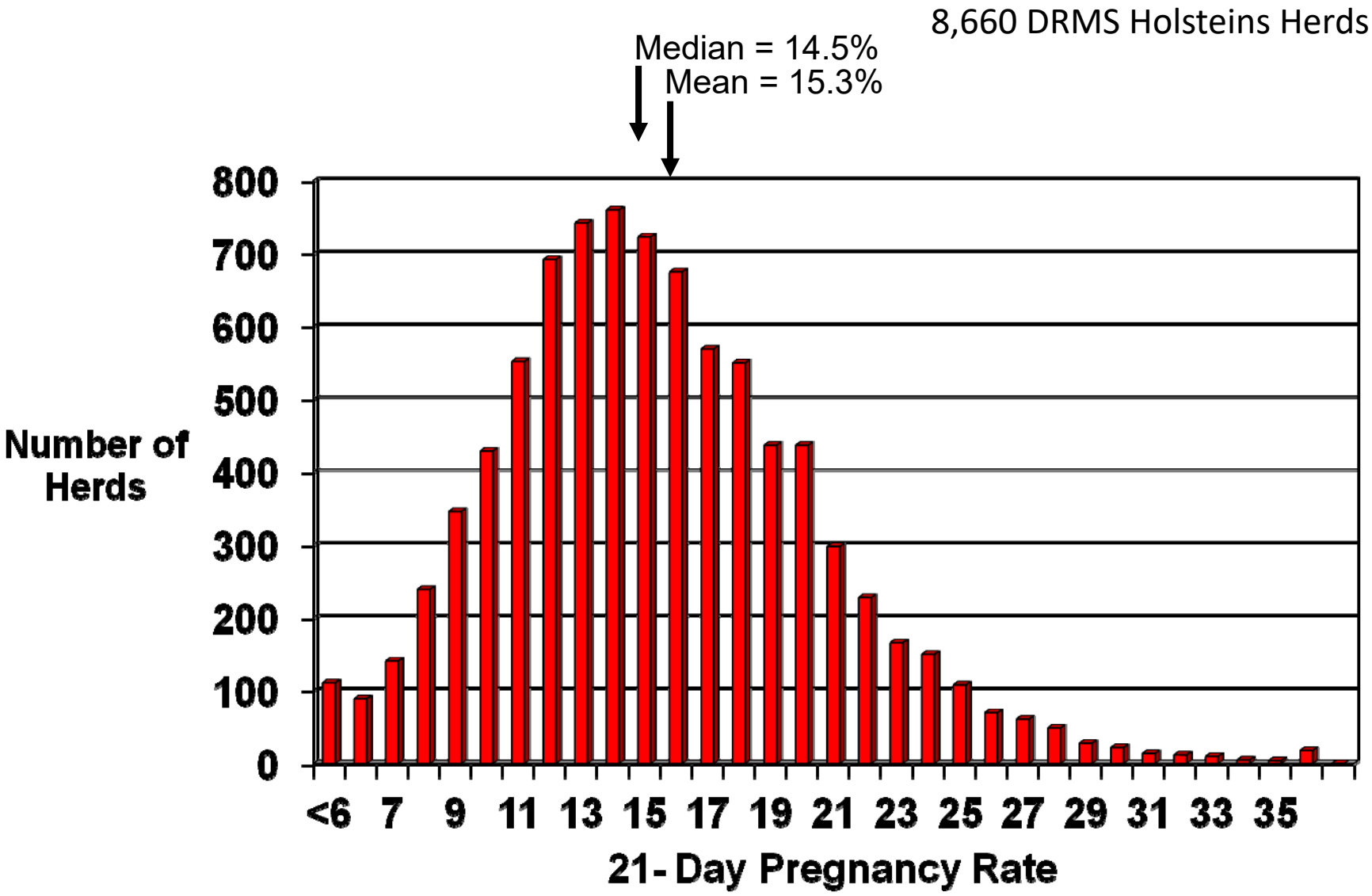
BREDSUM By Times Bred

January, 2015 to January, 2016

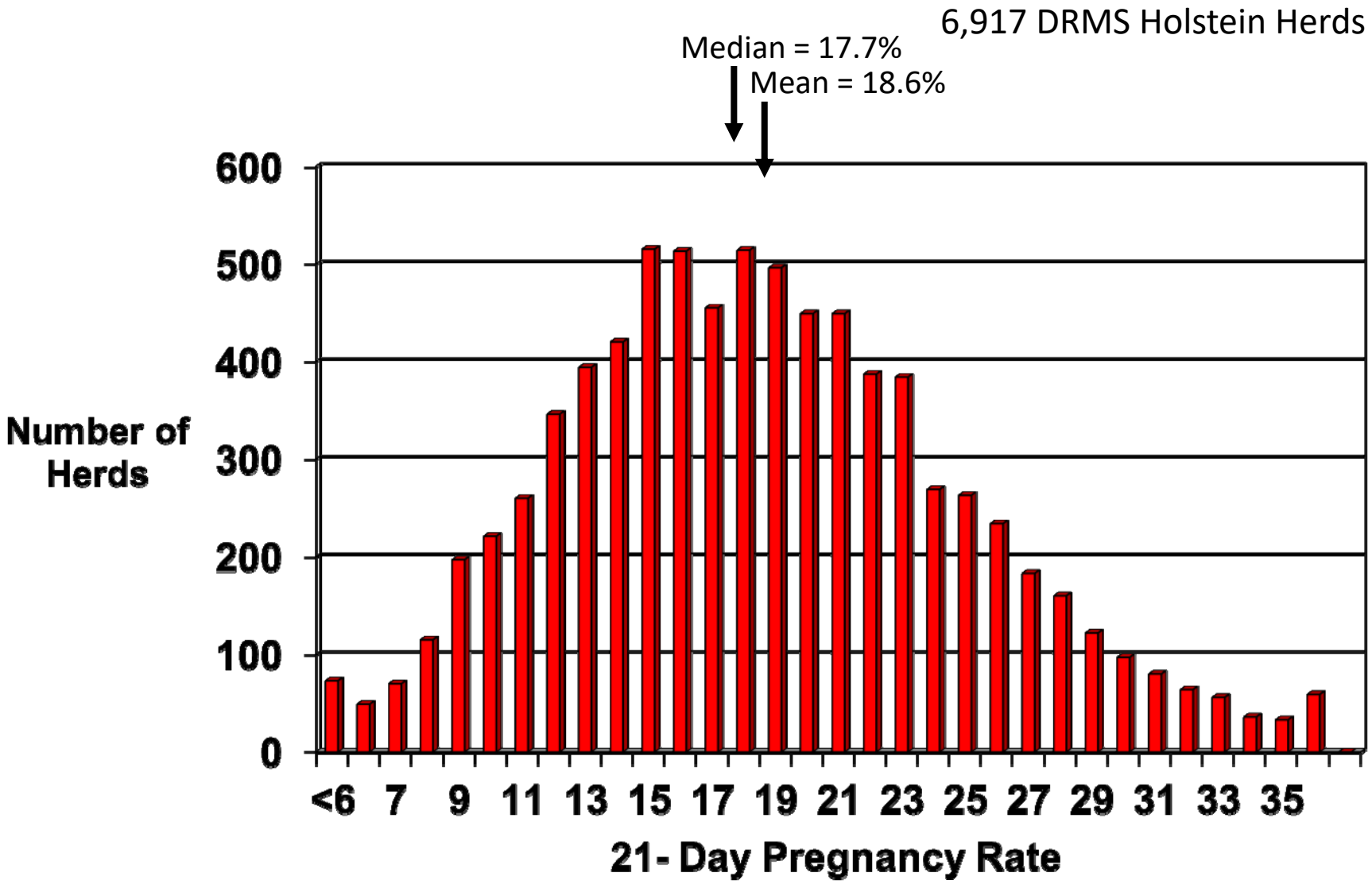
	95% CI	%Conc	#Preg	#Open	Other	Abort	Total	%Tot	SPC
1	46-55	50	269	266	5	35	540	49	2.0
2	47-58	53	153	137	4	13	294	27	1.9
3	42-58	50	75	75	1	6	151	14	2.0
4	34-57	46	31	37	1	2	69	6	2.2
5	21-54	36	10	18	0	1	28	3	2.8
6	-	62	10	6	0	0	16	1	1.6
7	-	50	1	1	0	0	2	0	2.0
8	-	100	1	0	0	0	1	0	1.0
TOTALS	47-53	50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

90%
pregnant
after 3 AI

21-day Pregnancy Rate - 2007



21-day Pregnancy Rate - 2015



DEPARTMENT OF
DAIRY SCIENCE
University of Wisconsin-Madison