Five Keys for Reproductive Success

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Measuring Reproductive Performance

Reproductive performance in a dairy herd is determined by how rapidly the herd management system turns open cows into pregnant cows

Key Question to ask:

- How rapidly are cows becoming pregnant in this herd?

21-d Pregnancy Rate

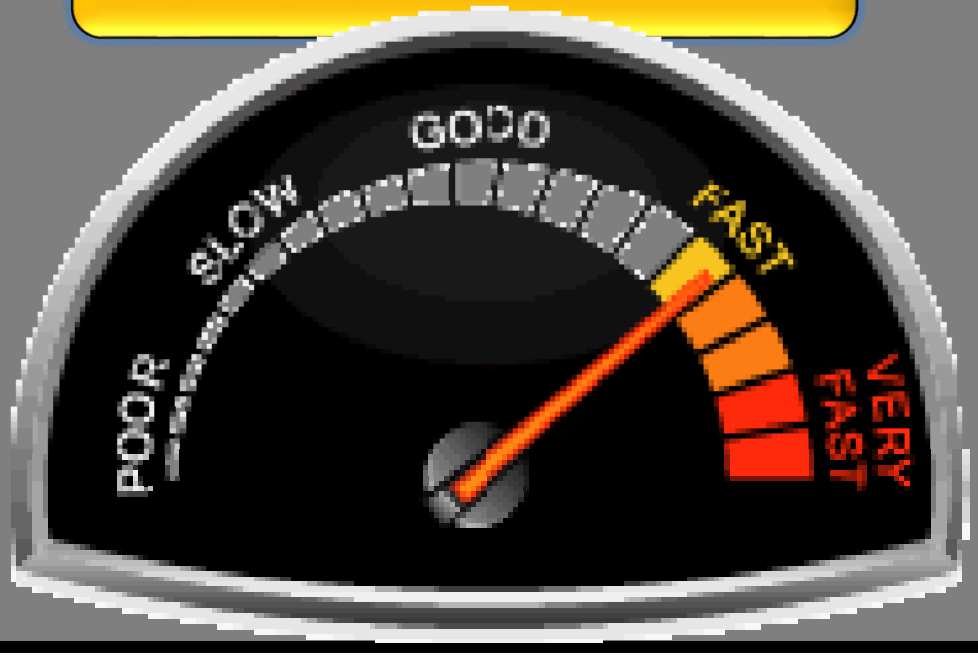
- Proportion of eligible cows that become pregnant every 21 days
- This is the key measure of reproduction

21 - Day Pregnancy Rate

Service Rate

Conception Rate

21d-Preg Rate



Five Keys to Reproductive Success

Key 1:

Inseminate cows quickly after the end of the voluntary waiting period

Improves Pregnancy Rate by improving Service rate and Conception Rate at first service

Reproductive Management of Lactating Dairy Cows Using Synchronization of Ovulation

1997 J Dairy Sci 80:301–306

J. R. PURSLEY, MICHAEL R. KOSOROK,[1] and MILO C. WILTBANK[2]
Department of Dairy Science, University of Wisconsin, Madison 53706

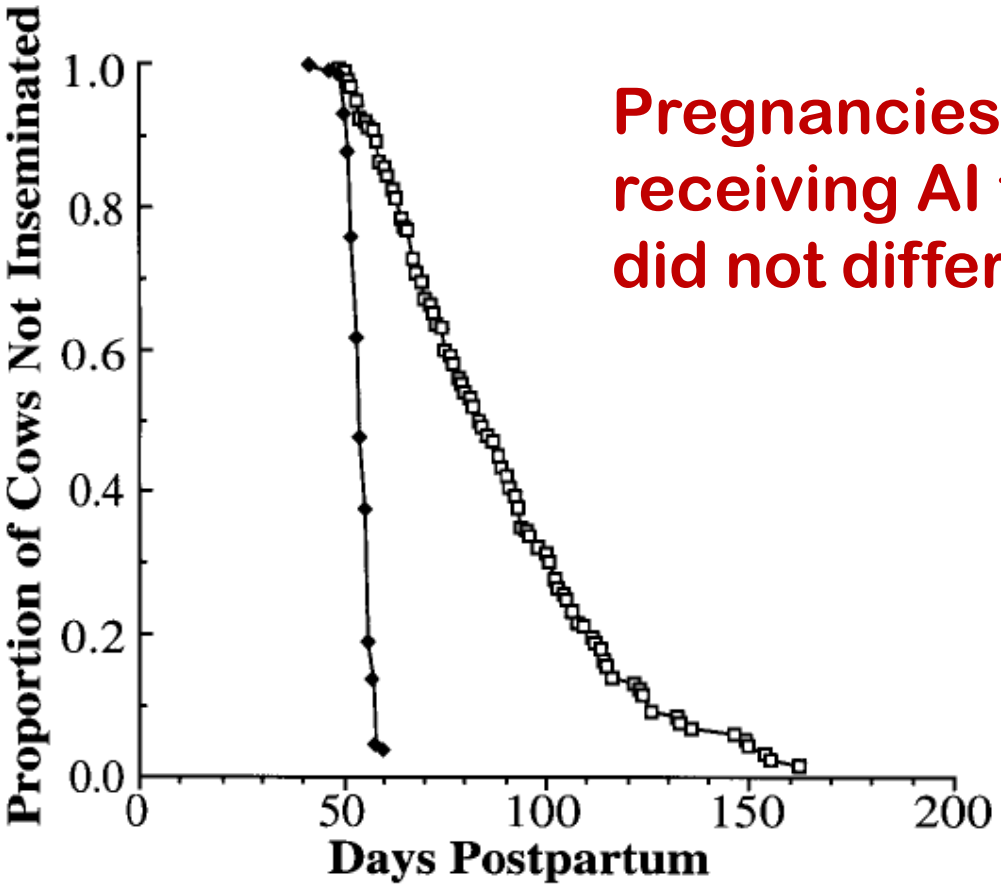


Figure 1. Survival curves for days to first AI in lactating Holstein cows managed with standard reproductive strategies (□) versus timed AI after synchronization of ovulation (♦).

Pregnancies per AI between cows receiving AI to estrus vs. Timed AI did not differ (39% vs. 37%)

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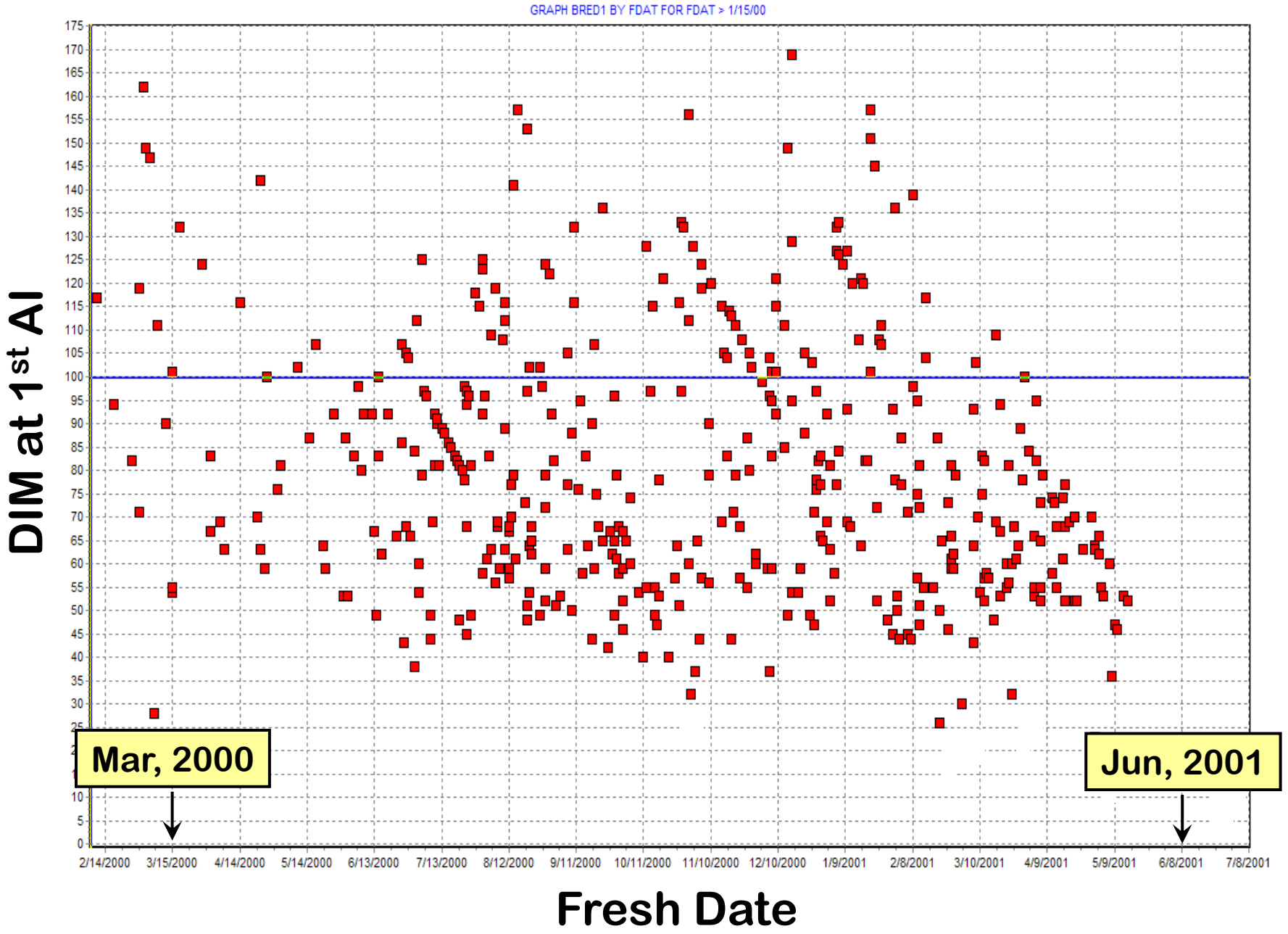
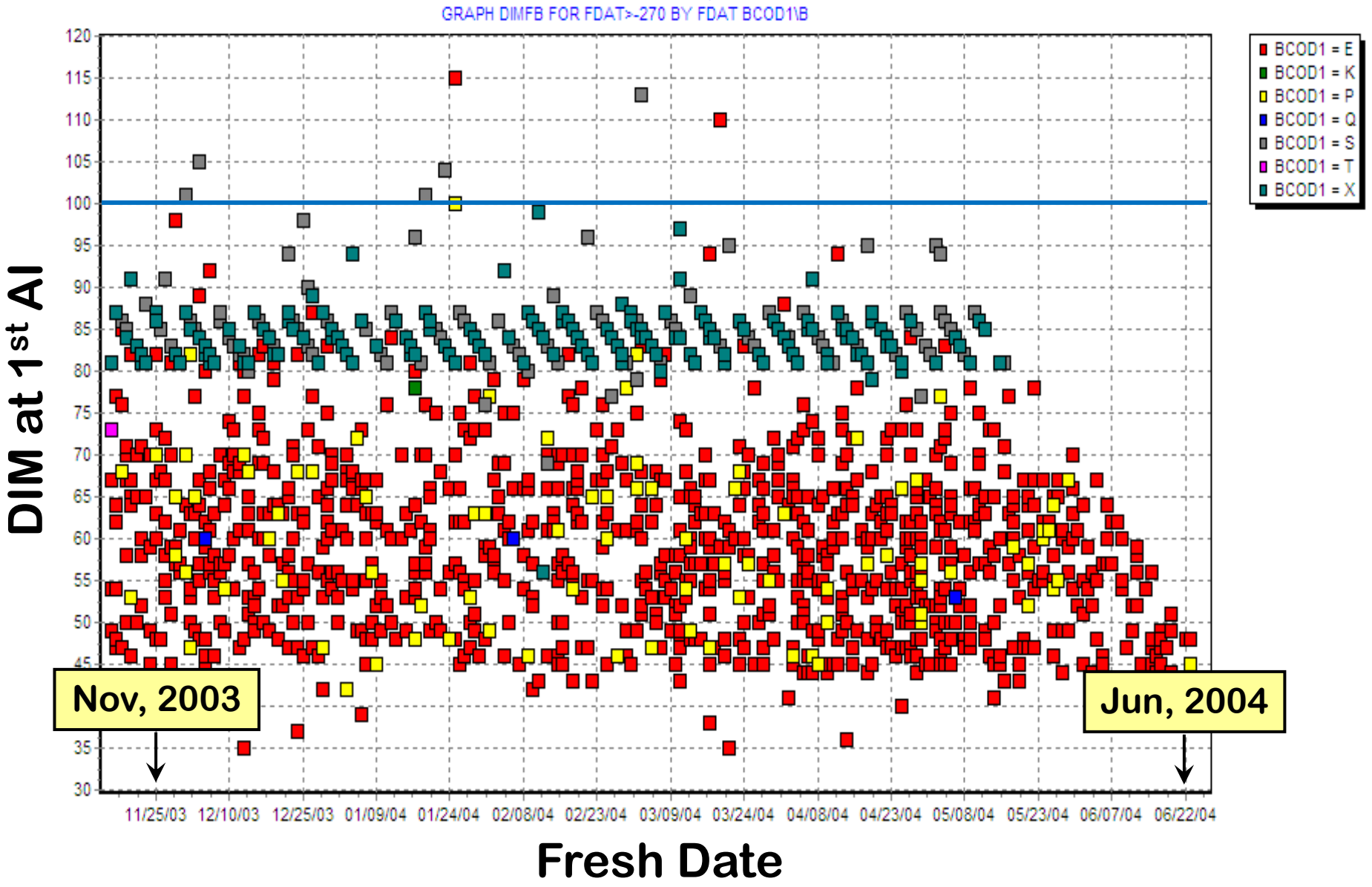
Ovsynch Schedule

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	GnRH					
	PGF		GnRH	TAI		

Distribution of DIM at 1st AI Service



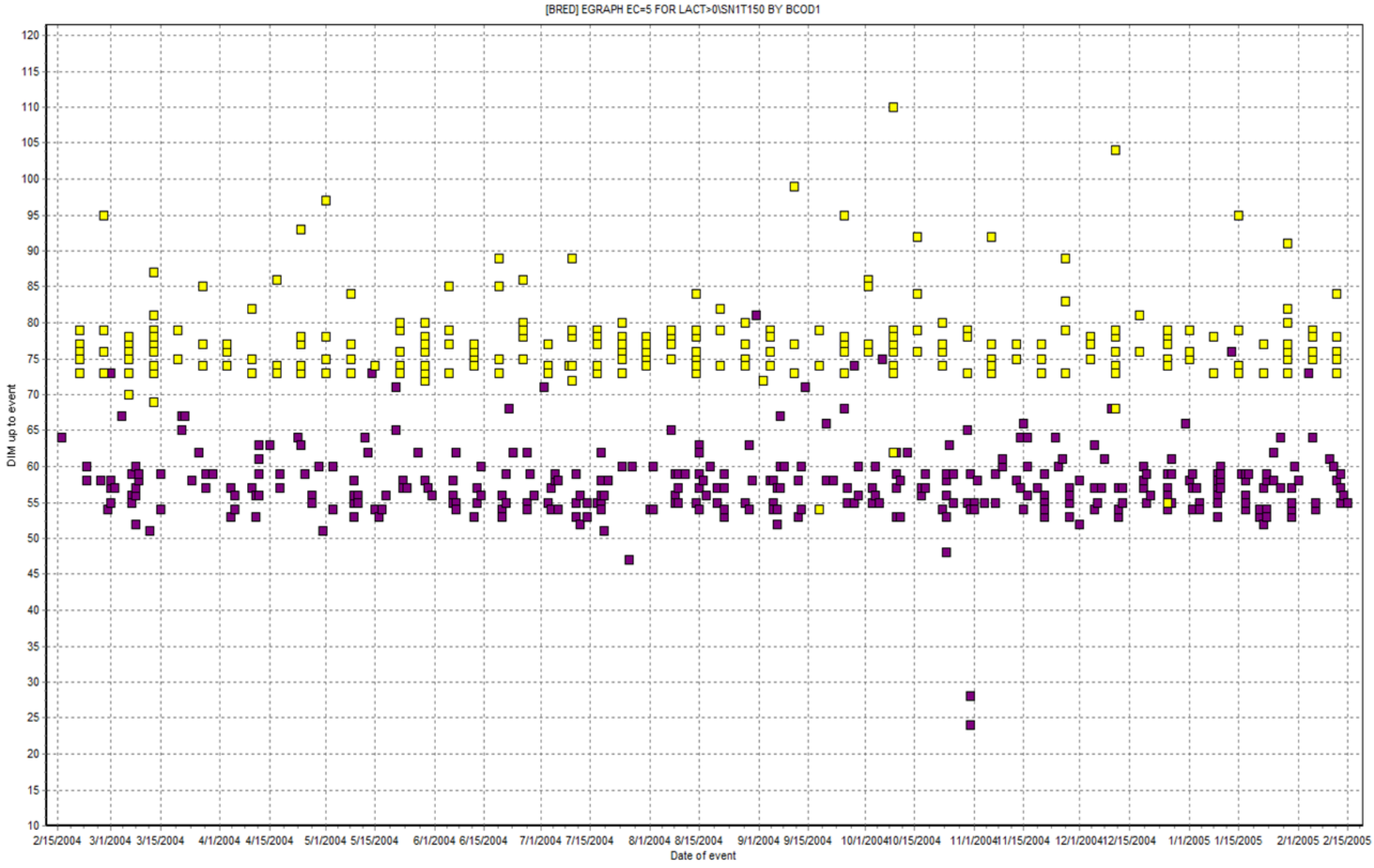
Detection of estrus followed by Ovsynch



Presynch/Ovsynch Schedule for first TAI

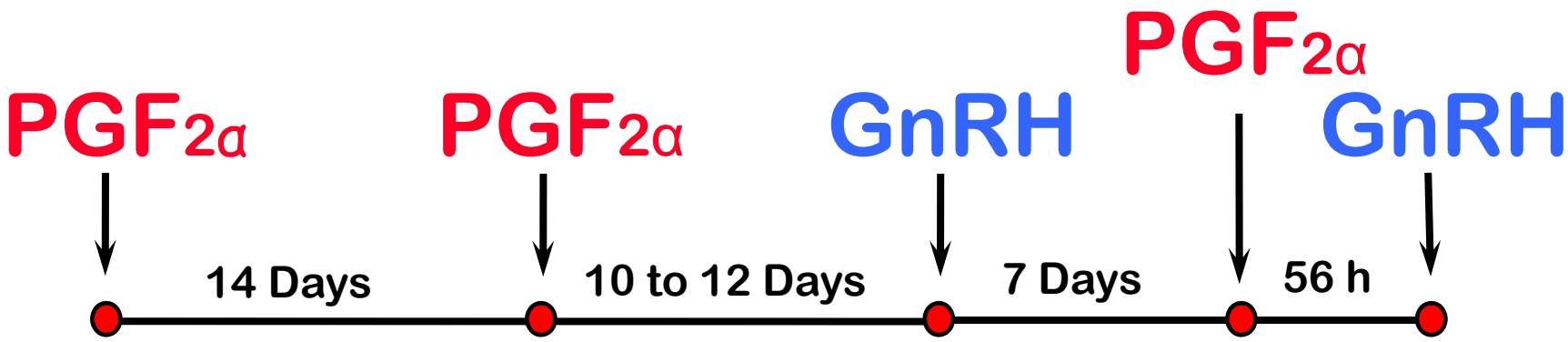
Sun	Mon	Tue	Wed	Thu	Fri	Sat
				PGF		
				PGF		
		GnRH				
		PGF		GnRH	TAI	

Presynch/Ovsynch + Detection of Estrus



Presynch/Ovsynch Limitations

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

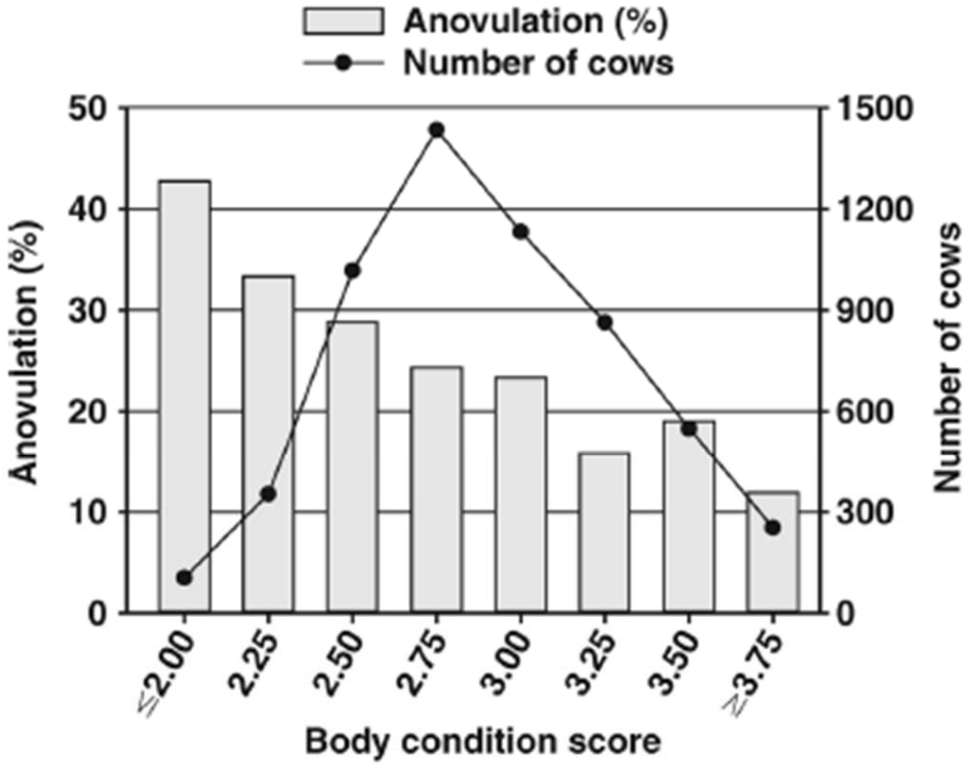


Figure 1. Observed prevalence of anovulation (bars) and number of cows (line) by category of BCS. An additional 118 records without BCS had 13.6% prevalence.

5,818 records from
13 studies in 8 herds

prevalence = 23.3%

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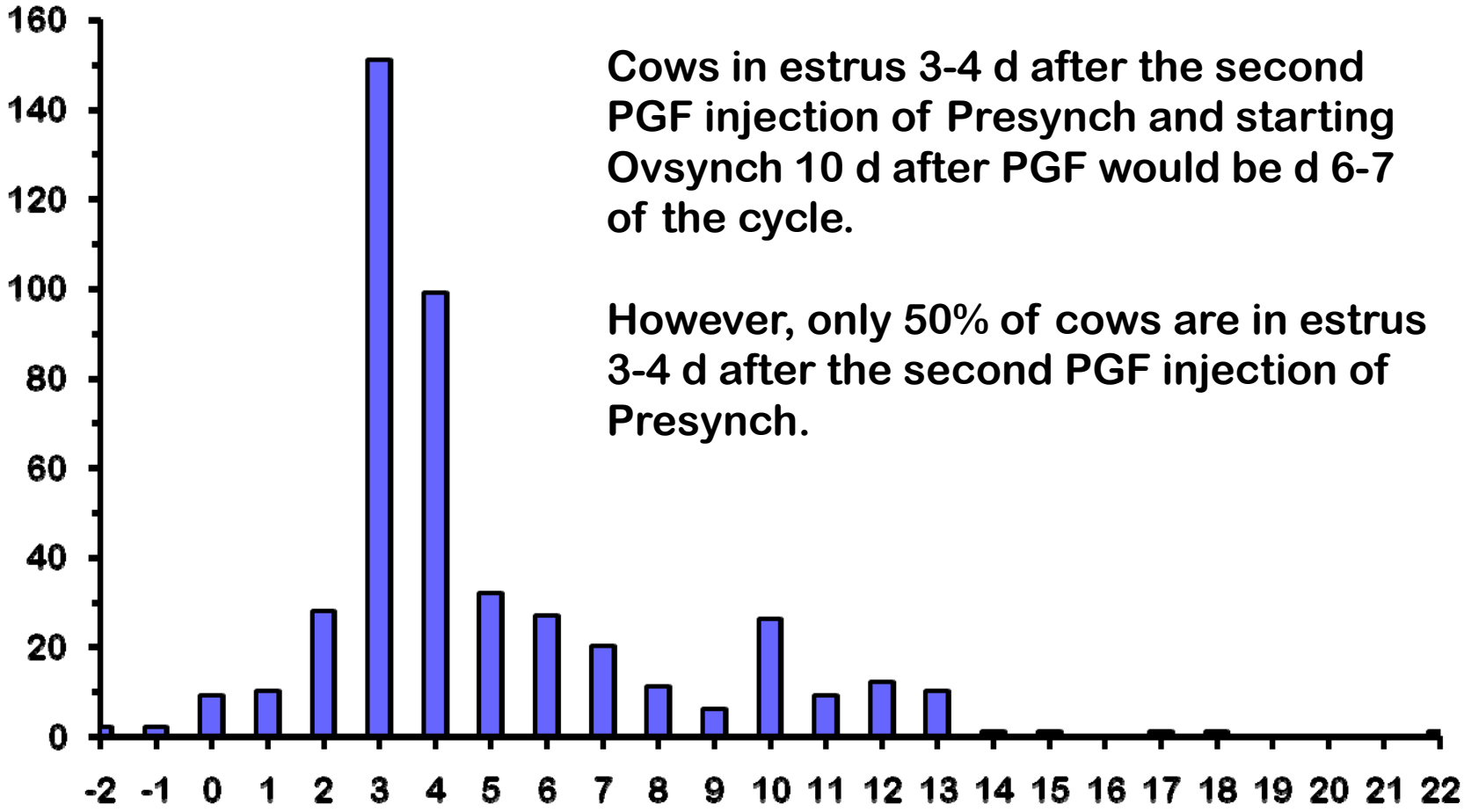
Frequency of AI Relative to the Second PGF Injection of Presynch



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

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

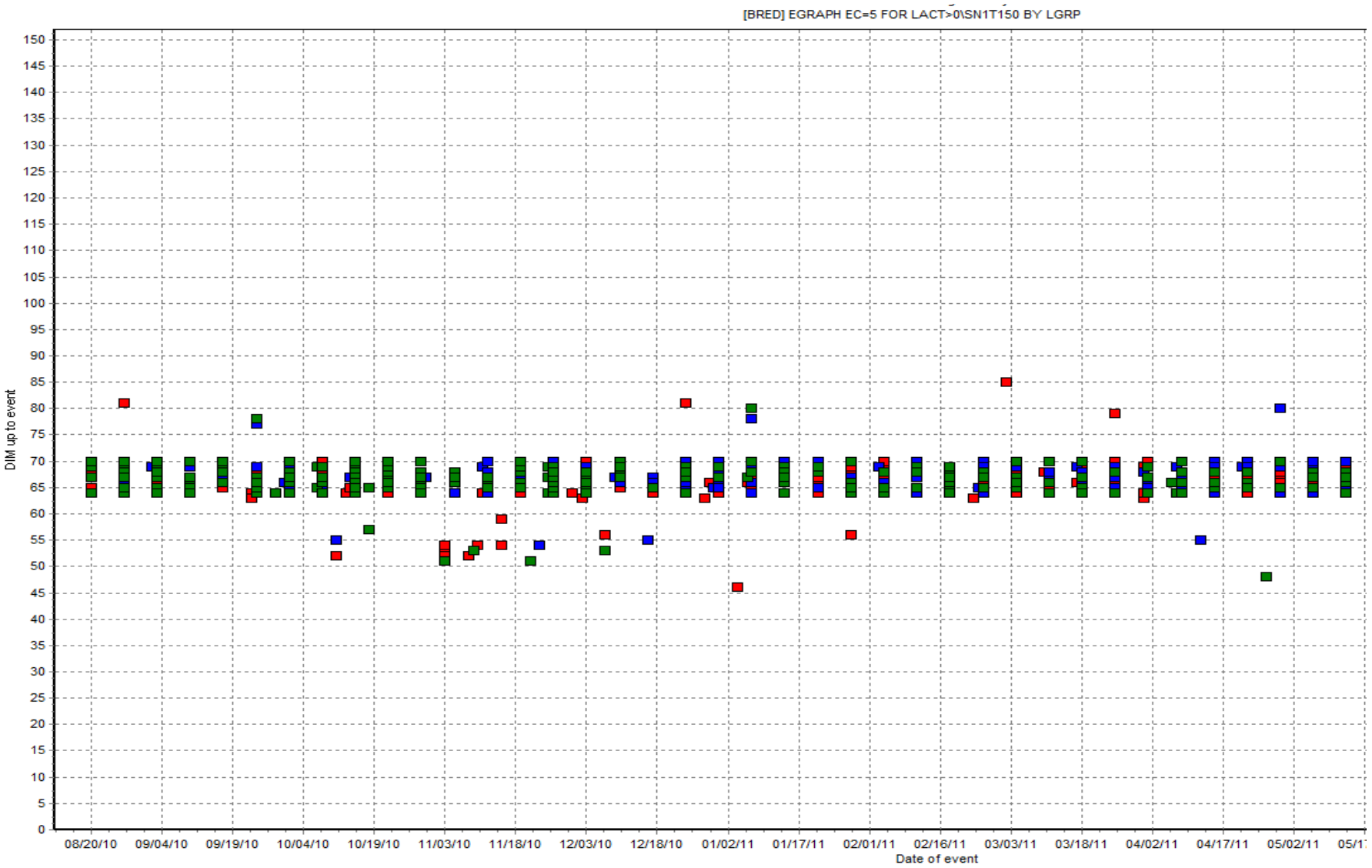
G6G protocol for first TAI

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

Double Ovsynch protocol for first TAI

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

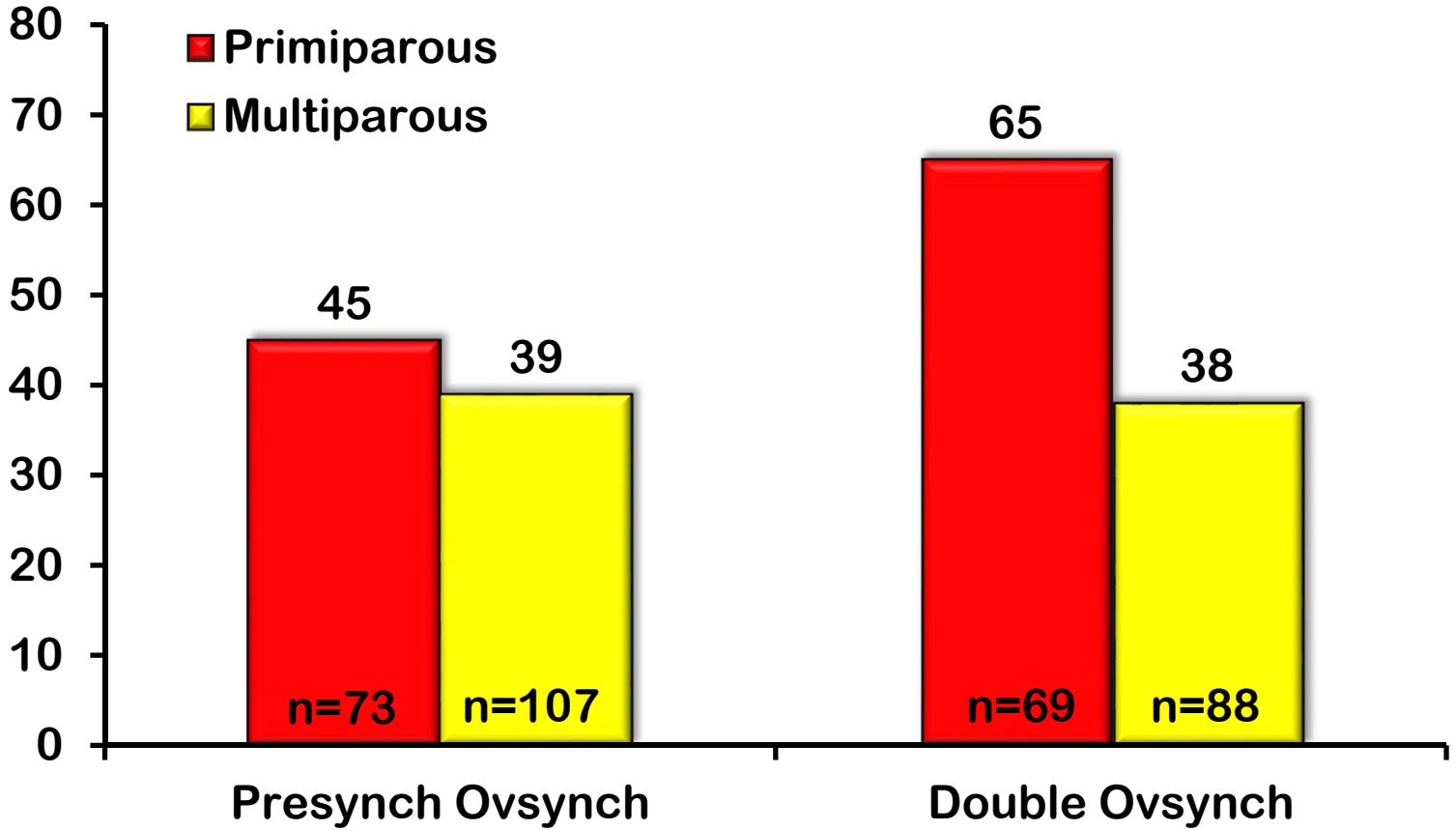
Double-Ovsynch for first timed AI



Effect of treatment on fertility 39 to 45 d after TAI

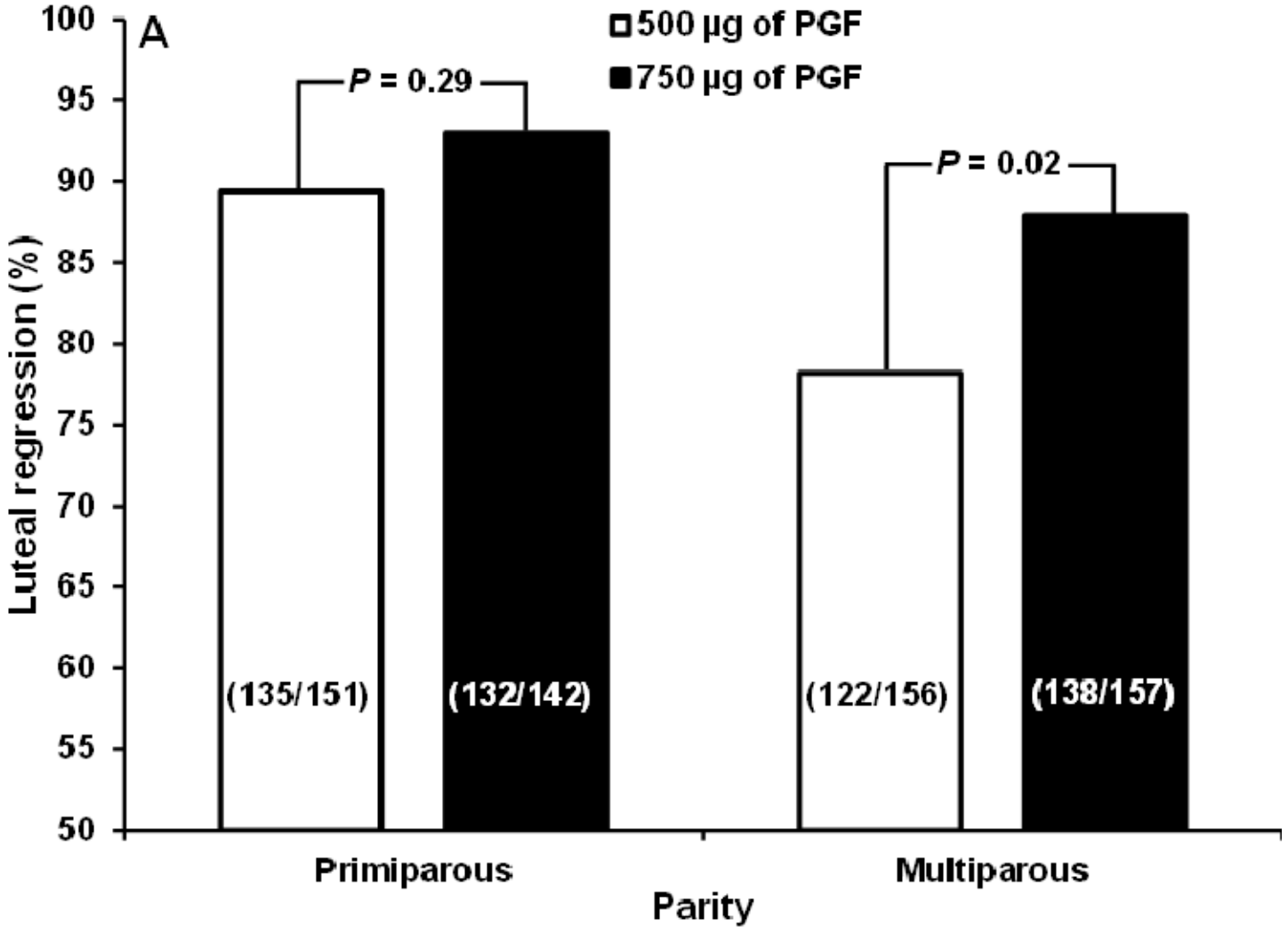
Souza et al., 2009; Theriogenology 70:208-215.

Effect	P-value
Treatment	0.03
Parity	0.02



Effect of cloprostenol dose on luteal regression

Giordano et al. 2013; Theriogenology 80:773-783



Double Ovsynch with or without second PGF

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	Overall P/AI (%)	Low P4 (%)
1 x PGF	42 (163/393)	85 (301/356)
2 x PGF	45 (169/379)	96 (326/341)
P-value	0.34	<0.001

HOARD'S DAIRYMAN
The National Dairy Farm Magazine

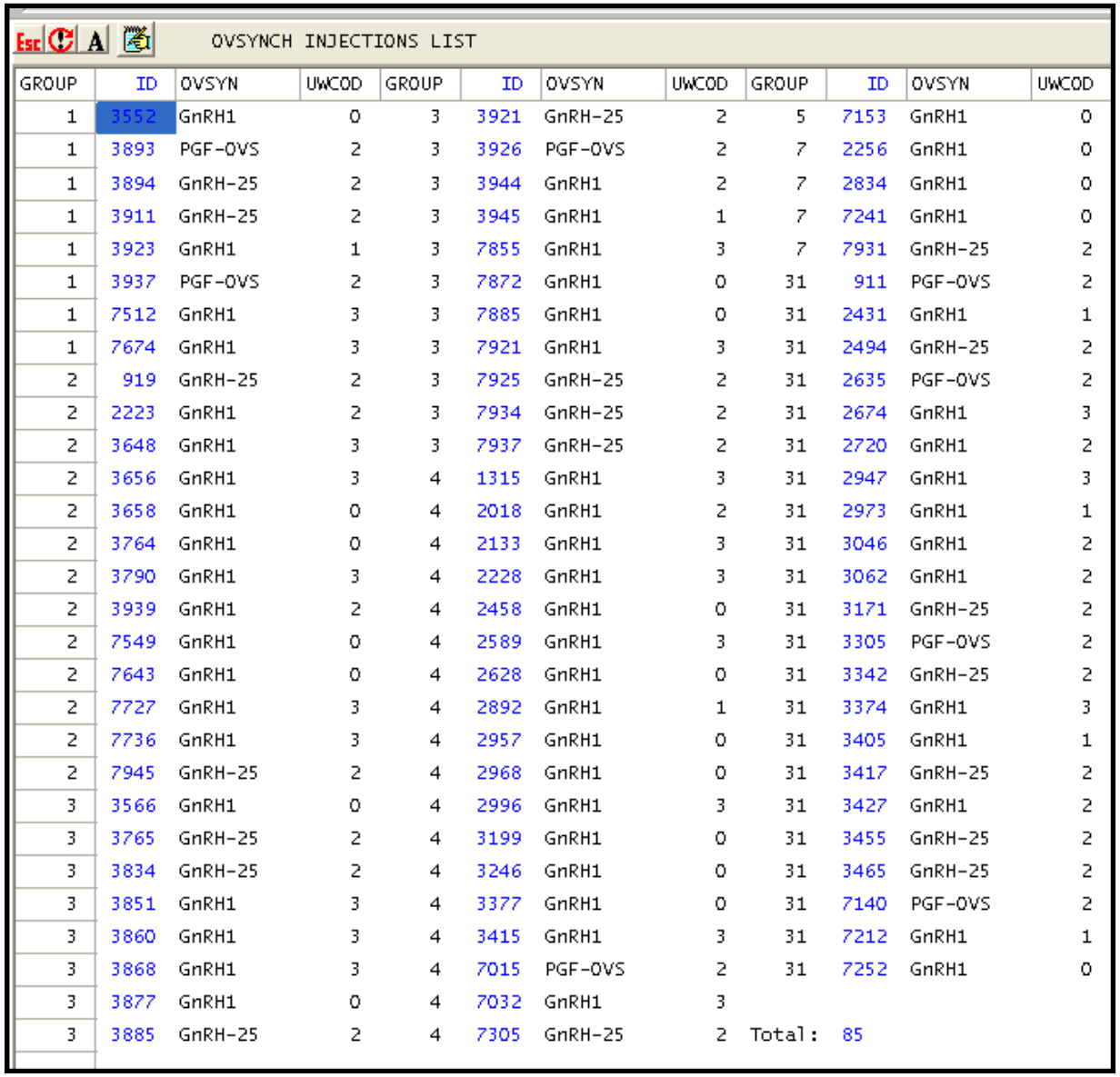
August 25, 2005; p. 555

Don't shortcut your synch program

Full compliance is key when using hormonal synchronization programs

by Paul Fricke and Steven Stewart

Compliance is the KEY



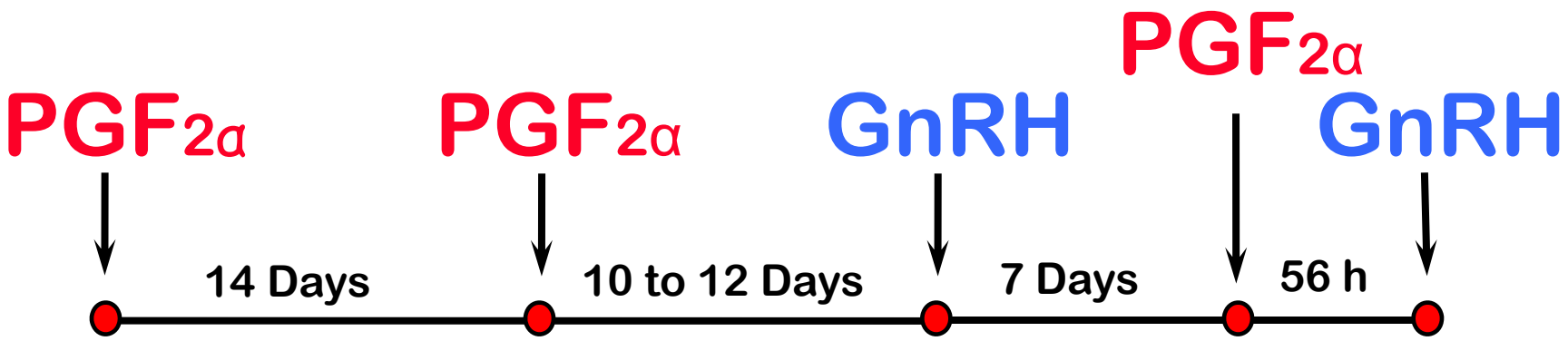
OVSYNCH INJECTIONS LIST

GROUP	ID	OVSYN	UWCOD	GROUP	ID	OVSYN	UWCOD	GROUP	ID	OVSYN	UWCOD
1	3552	GnRH1	0	3	3921	GnRH-25	2	5	7153	GnRH1	0
1	3893	PGF-OVS	2	3	3926	PGF-OVS	2	7	2256	GnRH1	0
1	3894	GnRH-25	2	3	3944	GnRH1	2	7	2834	GnRH1	0
1	3911	GnRH-25	2	3	3945	GnRH1	1	7	7241	GnRH1	0
1	3923	GnRH1	1	3	7855	GnRH1	3	7	7931	GnRH-25	2
1	3937	PGF-OVS	2	3	7872	GnRH1	0	31	911	PGF-OVS	2
1	7512	GnRH1	3	3	7885	GnRH1	0	31	2431	GnRH1	1
1	7674	GnRH1	3	3	7921	GnRH1	3	31	2494	GnRH-25	2
2	919	GnRH-25	2	3	7925	GnRH-25	2	31	2635	PGF-OVS	2
2	2223	GnRH1	2	3	7934	GnRH-25	2	31	2674	GnRH1	3
2	3648	GnRH1	3	3	7937	GnRH-25	2	31	2720	GnRH1	2
2	3656	GnRH1	3	4	1315	GnRH1	3	31	2947	GnRH1	3
2	3658	GnRH1	0	4	2018	GnRH1	2	31	2973	GnRH1	1
2	3764	GnRH1	0	4	2133	GnRH1	3	31	3046	GnRH1	2
2	3790	GnRH1	3	4	2228	GnRH1	3	31	3062	GnRH1	2
2	3939	GnRH1	2	4	2458	GnRH1	0	31	3171	GnRH-25	2
2	7549	GnRH1	0	4	2589	GnRH1	3	31	3305	PGF-OVS	2
2	7643	GnRH1	0	4	2628	GnRH1	0	31	3342	GnRH-25	2
2	7727	GnRH1	3	4	2892	GnRH1	1	31	3374	GnRH1	3
2	7736	GnRH1	3	4	2957	GnRH1	0	31	3405	GnRH1	1
2	7945	GnRH-25	2	4	2968	GnRH1	0	31	3417	GnRH-25	2
3	3566	GnRH1	0	4	2996	GnRH1	3	31	3427	GnRH1	2
3	3765	GnRH-25	2	4	3199	GnRH1	0	31	3455	GnRH-25	2
3	3834	GnRH-25	2	4	3246	GnRH1	0	31	3465	GnRH-25	2
3	3851	GnRH1	3	4	3377	GnRH1	0	31	7140	PGF-OVS	2
3	3860	GnRH1	3	4	3415	GnRH1	3	31	7212	GnRH1	1
3	3868	GnRH1	3	4	7015	PGF-OVS	2	31	7252	GnRH1	0
3	3877	GnRH1	0	4	7032	GnRH1	3				
3	3885	GnRH-25	2	4	7305	GnRH-25	2	Total:	85		

You have to develop a system to administer the right shots to the right cows on the right days

Compliance – Presynch-Ovsynch

On any given day, 95% of your cows get the correct injection



0.95 x 0.95 x 0.95 x 0.95 x 0.95 = 77%

0.9 x 0.9 x 0.9 x 0.9 x 0.9 = 59%

Five Keys to Reproductive Success

Key 2:

Inseminate cows at the correct time in relation to estrus or ovulation

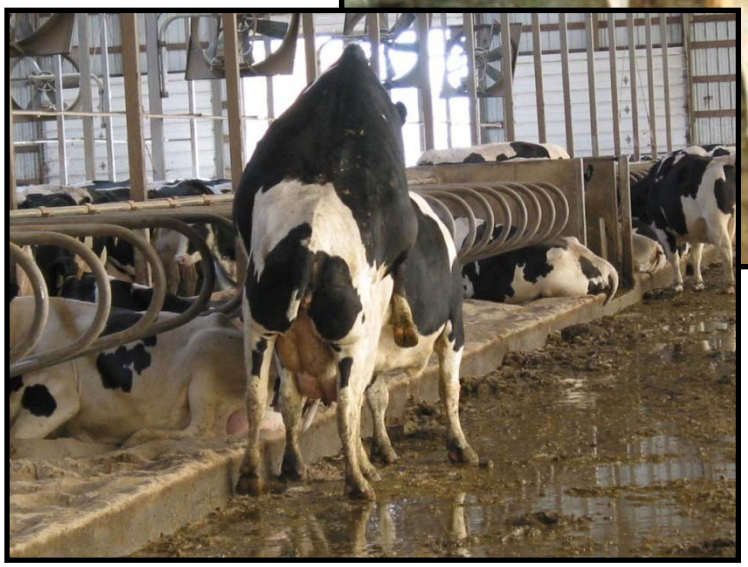
Improves Pregnancy Rate by improving Conception Rate

Four Factors Influence Conception Rate:

Timing of AI x **AI Efficiency** x **Male Fertility** x **Female Fertility**

Timing of AI – refers to the timing of insemination in relation to behavioral estrus and/or ovulation (i.e., estrous detection accuracy).

Behavioral Estrus in Dairy Cattle



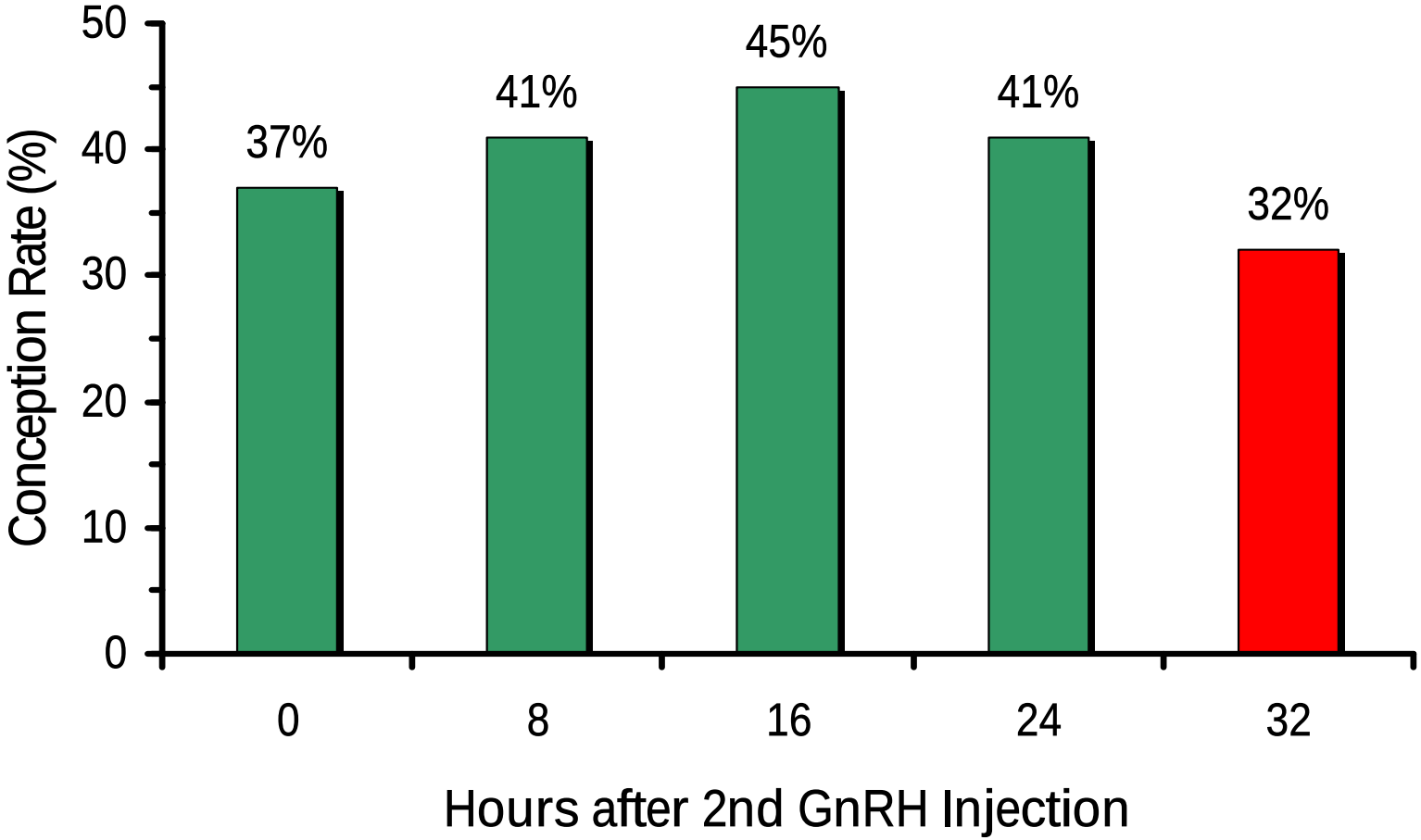
Effect of time of AI relative to a detected estrus on fertility

Interval (h)	# of AI	75 d Nonreturn Rate (%)
0-6	1126	59.9[a]
6-12	2352	60.7[a]
12-18	2455	55.5[b]
18-24	962	53.4[bc]
24-30	99	49.6[c]

Nebel et al., 1994. J. Dairy Sci. 77:3185-3191

Conception Rates of Lactating Cows Receiving TAI at Various Intervals from the Second GnRH Injection of Ovsynch

Pursley et al., 1998. J. Dairy Sci. 81:2139-2144

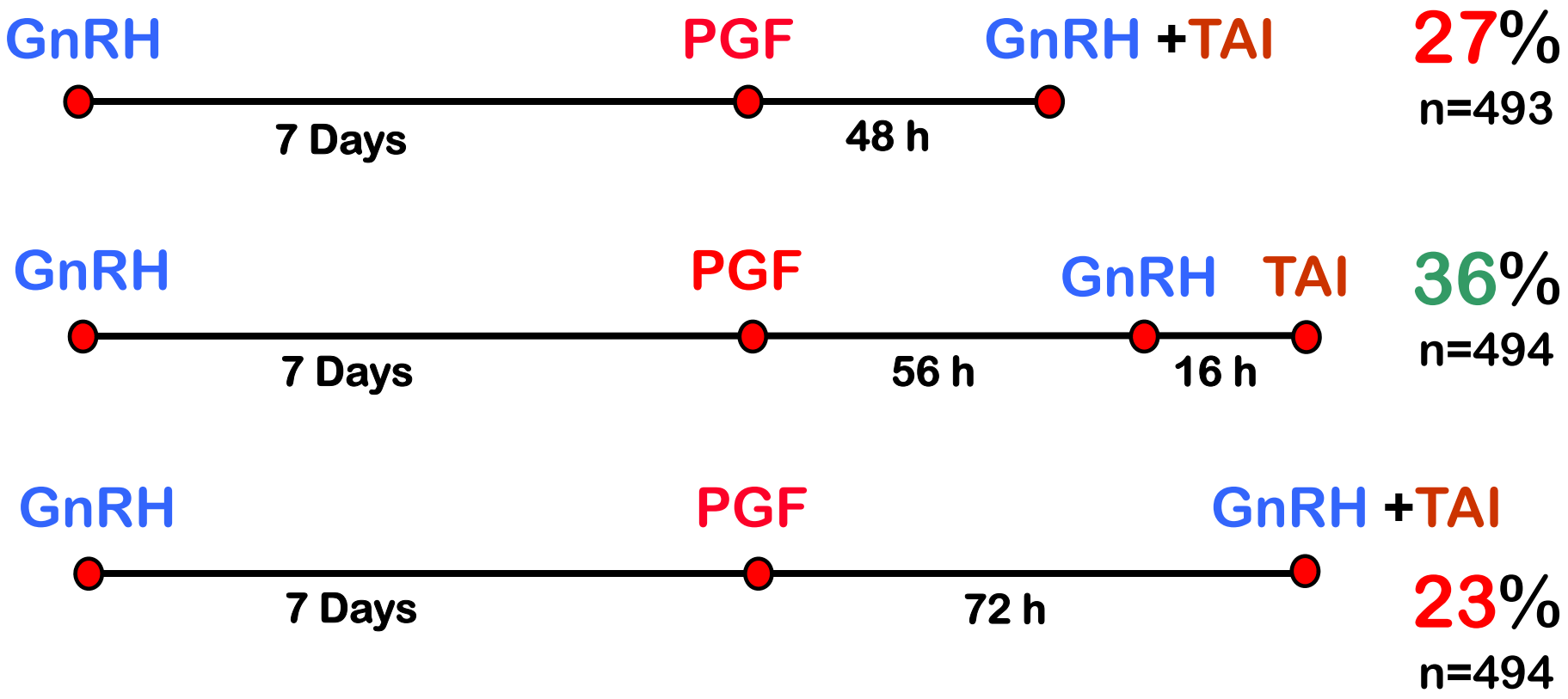


Comparison among Cosynch and Ovsynch 56 protocols

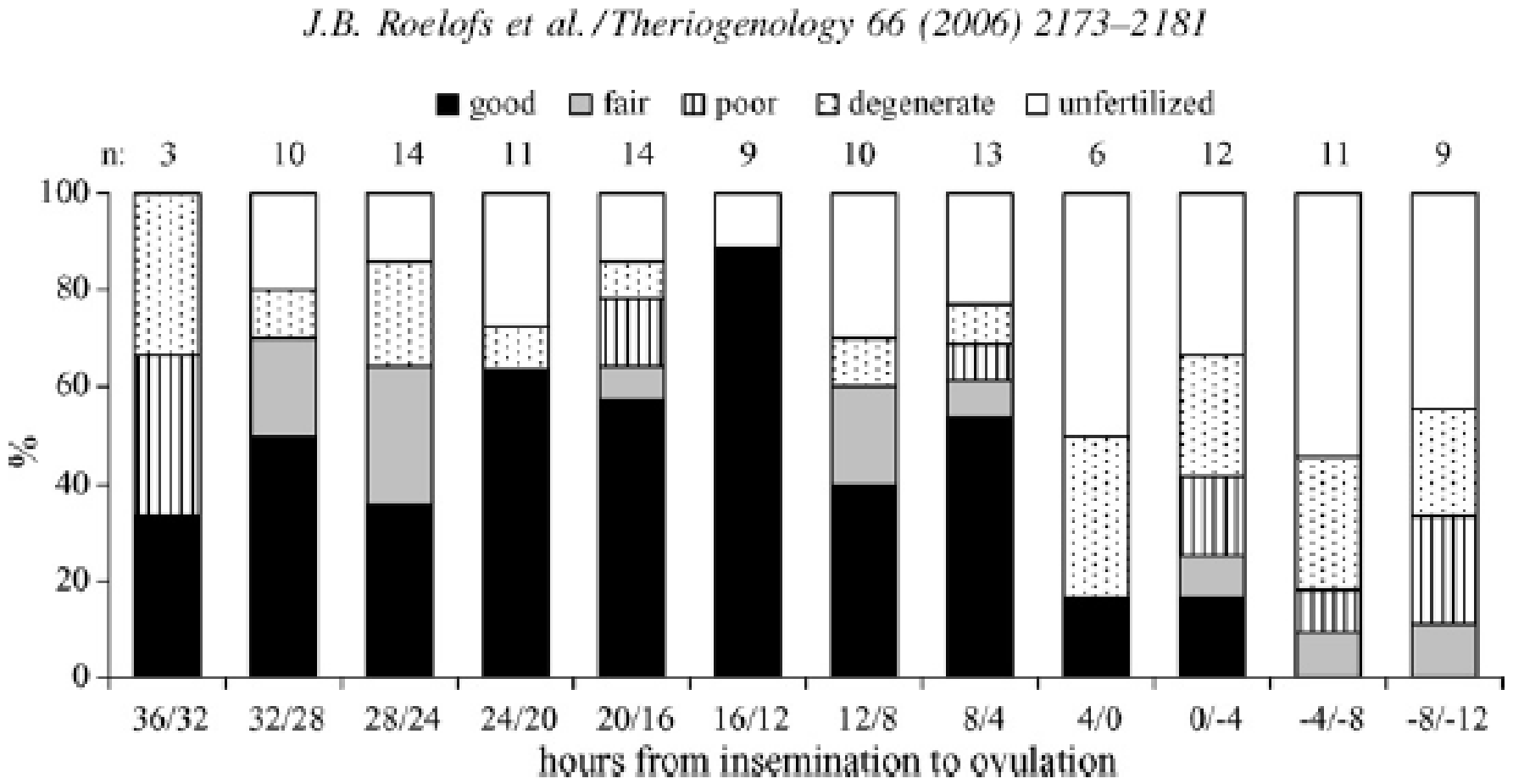
Brusveen et al., 2008; J. Dairy Sci. 91:1044-1052.

Cows were submitted for TAI after Presynch or as Resynch treatment

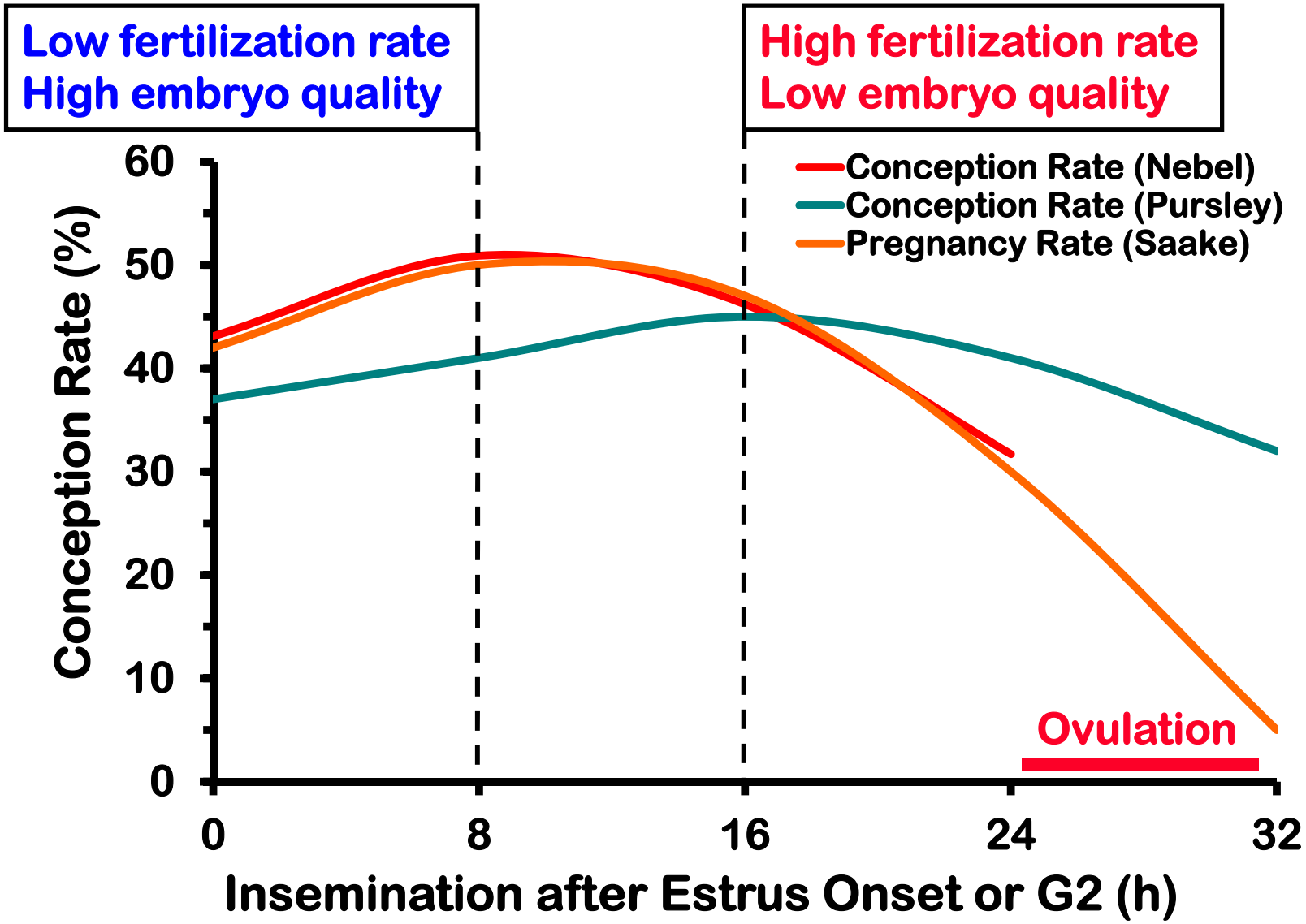
1507 TAI in 927 lactating Holstein cows



Effect of AI to Ovulation Iterval on Embryo Quality



Compromise for Time of AI



Five Keys to Reproductive Success

Key 3:

Improve AI efficiency

Improves Pregnancy Rate by improving Conception Rate

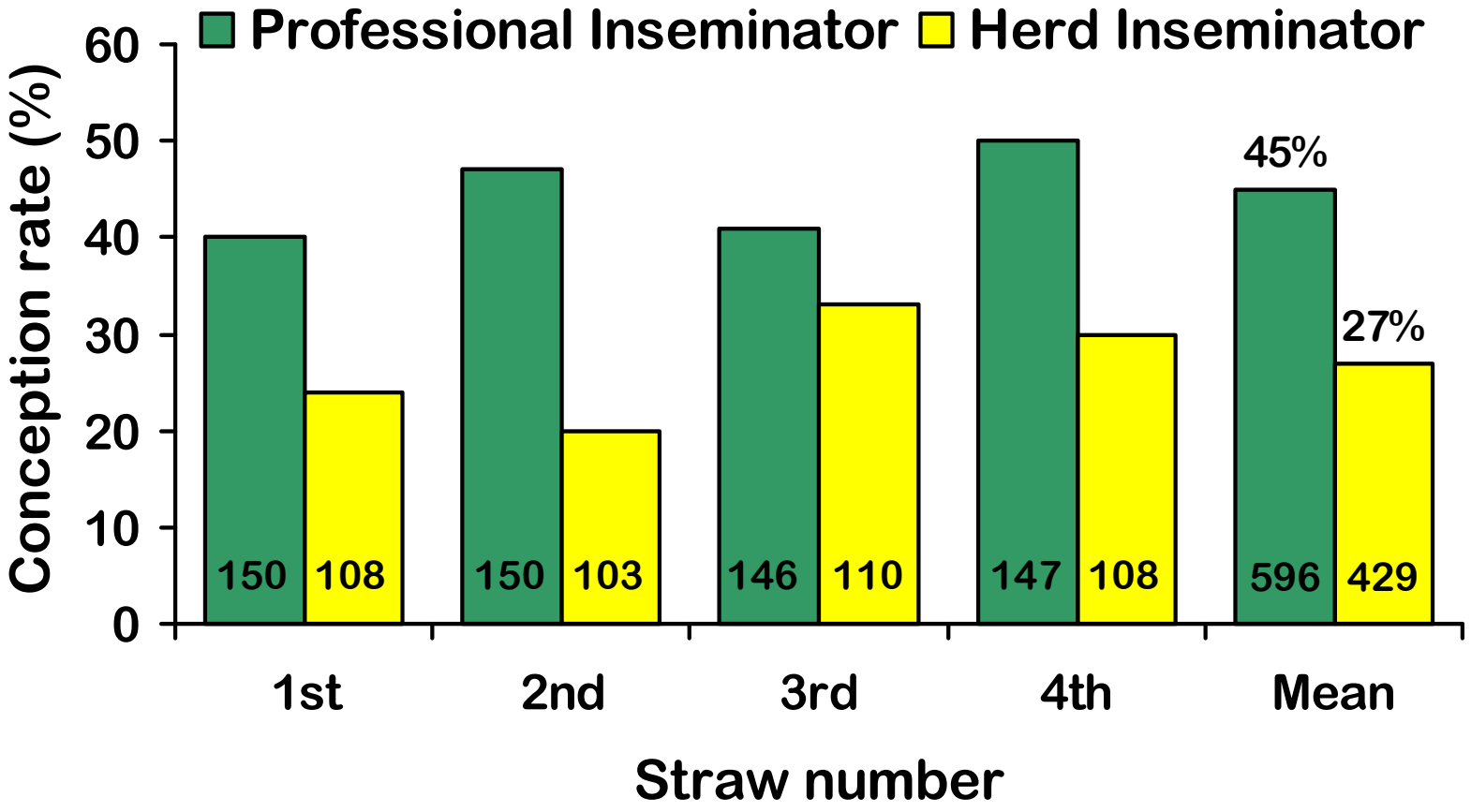
Four Factors Influence Conception Rate:

Timing of AI x AI Efficiency x Male Fertility x Female Fertility

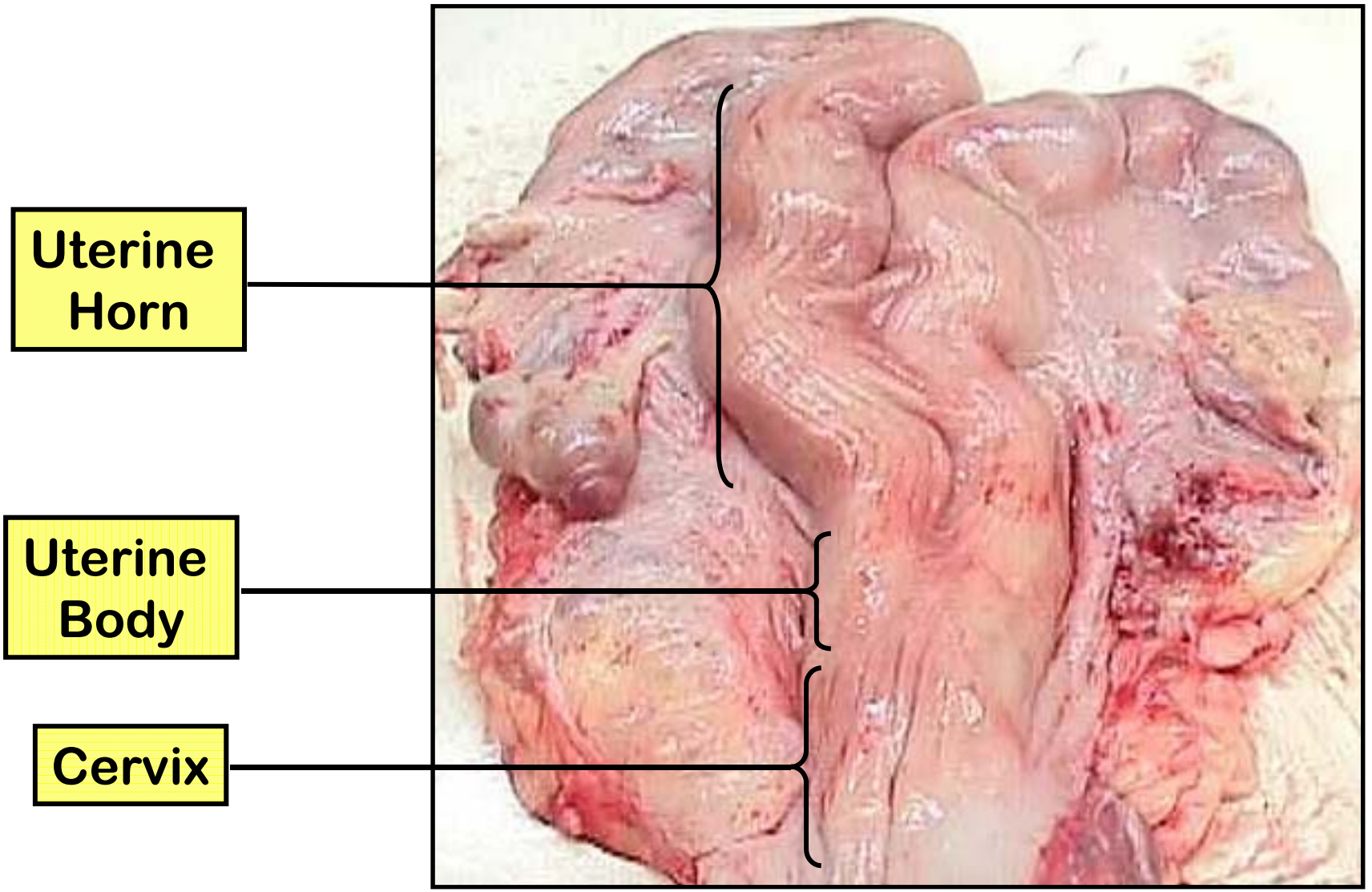
AI Efficiency – semen handling and inseminator technique

Effect of straw number and inseminator on fertility of lactating cows

Dalton et al., 2004; J. Dairy Sci. 87:972



Semen Placement



2002 Heifer Field Trial Results

J. Dairy Sci. 87:2051–2061

Fertility of Holstein Dairy Heifers after Synchronization of Ovulation and Timed AI or AI after Removed Tail Chalk

H. Rivera, H. Lopez, and P. M. Fricke
Department of Dairy Science, University of Wisconsin, Madison 53706

	Inseminator		
	1	2	3
Treatment	% (no./no.)	% (no./no.)	% (no./no.)
Overall	24.8[a] (28/113)	30.0[a] (18/60)	58.0[b] (101/174)

[a,b] Within a row, percentages with different superscripts differ

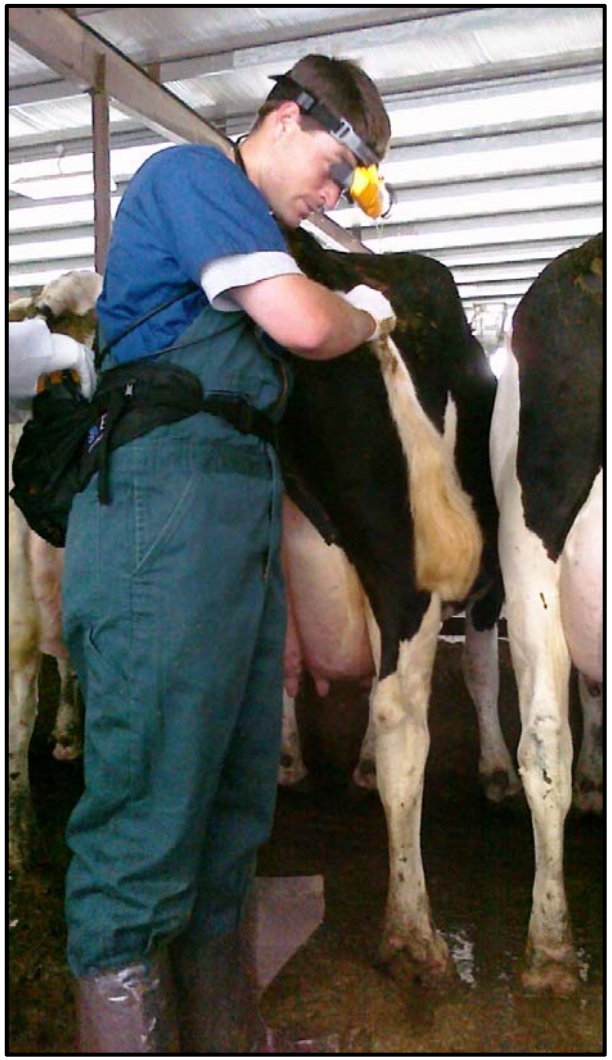
Five Keys to Reproductive Success

Key 4:

Identify nonpregnant cows early after an insemination (but not too early)

Improves Pregnancy Rate by improving Service Rate

Practical Application of Early Nonpregnancy Diagnosis



The key to early pregnancy diagnosis is to couple:

1) identification of nonpregnant cows with
2) a strategy to rapidly return these cows to an AI service

Pregnancy loss based on cows diagnosed pregnant with an embryo, pregnant based on uterine fluid and a CL, or questionable pregnant 29 d after TAI using ultrasonography

Giordano and Fricke, J. Dairy Sci. 95(Suppl. 2):75; 2012 (abstr.)

Item	Pregnant		Quest. Pregnant (%)
	Pregnant Embryo (%)	Pregnant (%)	
Day 29 after TAI	68 (758/1116)	29 (322/1116)	3 (36/1116)

Pregnancy loss based on cows diagnosed pregnant with an embryo, pregnant based on uterine fluid and a CL, or questionable pregnant 29 d after TAI using ultrasonography

Giordano and Fricke, J. Dairy Sci. 95(Suppl. 2):75; 2012 (abstr.)

Item	Pregnant		Quest. Pregnant (%)
	Pregnant Embryo (%)	Pregnant (%)	
Day 29 after TAI	68 (758/1116)	29 (322/1116)	3 (36/1116)
Loss, 29 to 39 d	4 (30/758)	18 (57/322)	69 (25/36)
Loss, 39 to 74 d	5 (39/728)	12 (32/265)	46 (5/11)
Total loss, 29 to 74 d	9 (69/758)	28 (89/322)	83 (30/36)

HOARD'S DAIRYMAN
The National Dairy Farm Magazine

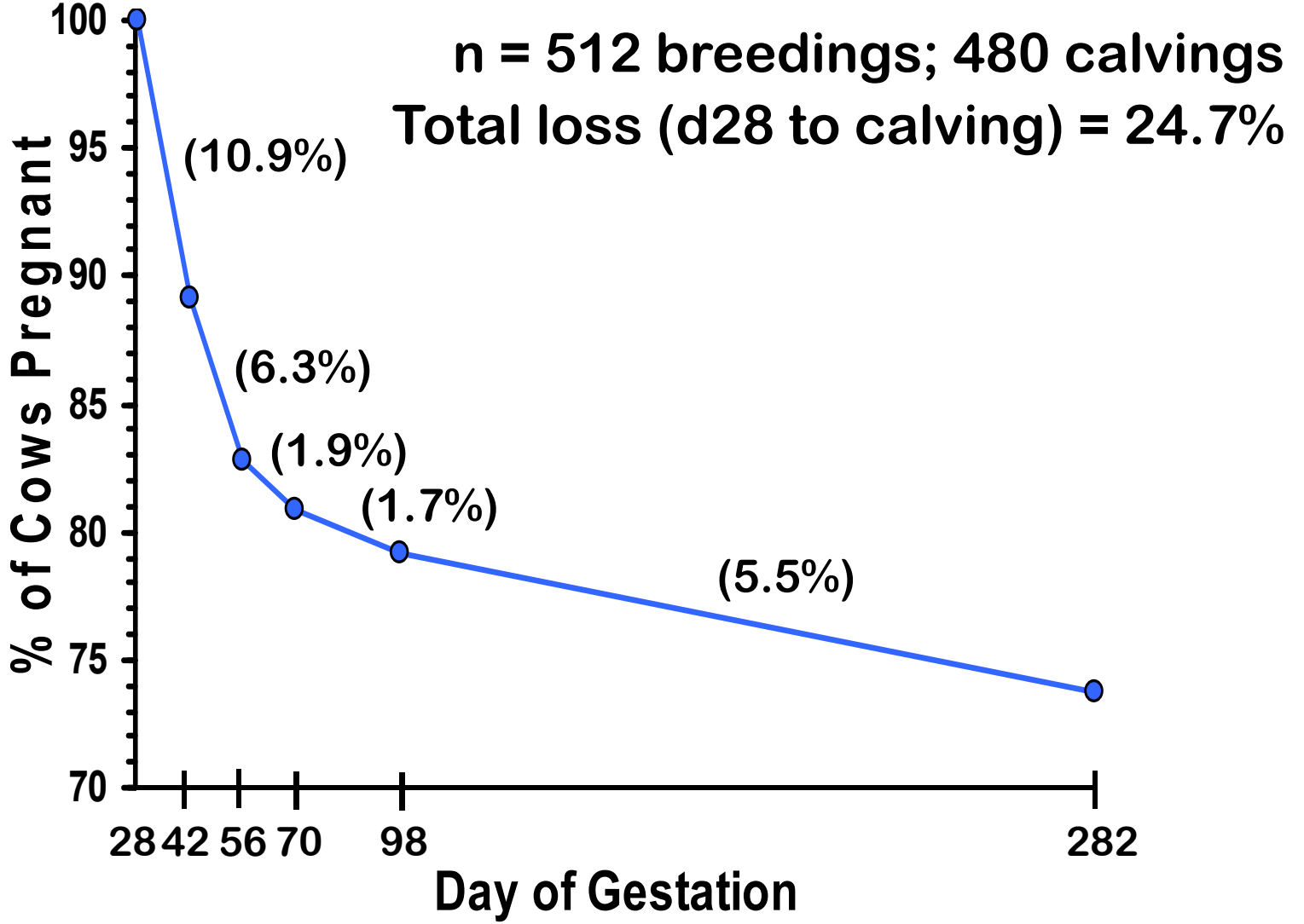
February 10, 2005; p. 81

Preg checks – How early is too early?

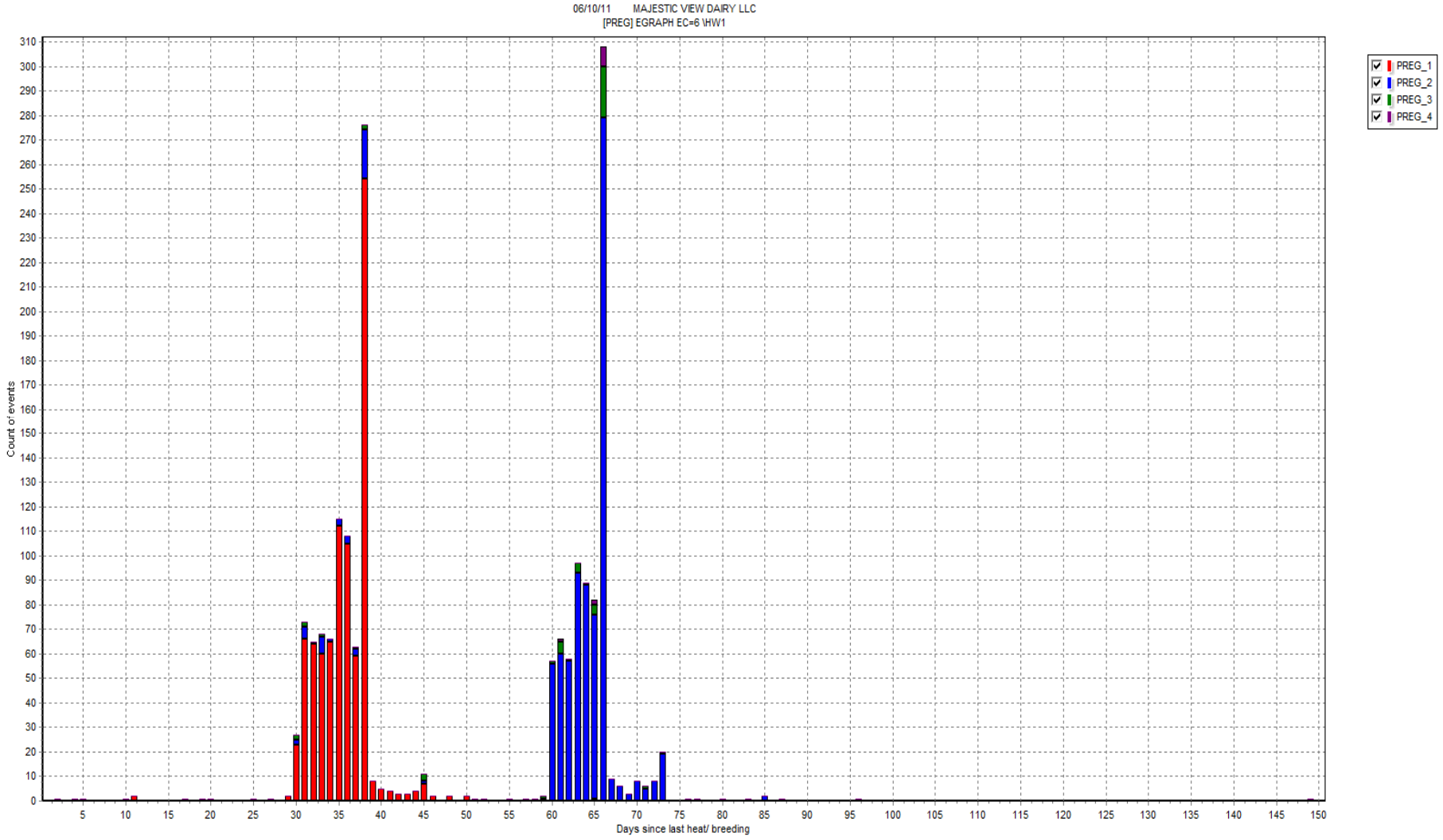
by Paul Fricke, Steven Stewart, and Paul Rapnicki

Pregnancy Loss in Lactating Dairy Cows

Vasconcelos et al., 1997; Biol. Reprod. 56(Suppl 1):140 abstr.



Timing of first pregnancy diagnosis and pregnancy recheck



Chemical Pregnancy Tests

- **Three commercial assays have been developed to determine pregnancy status in cattle by measuring PSPB** (Sasser *et al.*, 1986) **and PAG's** (Zoli *et al.*, 1991, Green *et al.*, 2005) **in maternal blood.**

bio PRYN
a division of BioTracking

IDEXX LABORATORIES

J. Dairy Sci. 90:4612–4622
doi:10.3168/jds.2007-0276

Accuracy of a Pregnancy-Associated Glycoprotein ELISA to Determine Pregnancy Status of Lactating Dairy Cows Twenty-Seven Days After Timed Artificial Insemination

E. Silva,* R. A. Sterry,* D. Kolb,† N. Mathialagan,‡ M. F. McGrath,‡ J. M. Ballam,‡ and P. M. Fricke*[1]
*Department of Dairy Science, University of Wisconsin, Madison 53706
†Lodi Veterinary Clinic, Lodi, WI 53555
‡Monsanto Agricultural Company, St. Louis, MO 63167

Sensitivity[1] % (no./no.)	Specificity[2] % (no./no.)	PPV[3] % (no./no.)	NPV[4] % (no./no.)	Accuracy[5] % (no./no.)	Kappa
95.4 (596/625)	94.2 (987/1048)	90.7 (596/657)	97.1 (987/1016)	94.6 (1583/1673)	0.89

[1]Proportion of samples from pregnant cows with a positive PAG ELISA.
[2]Proportion of samples from not-pregnant cows with a negative PAG ELISA.
[3]Proportion of PAG ELISA with a pregnant outcome that truly were pregnant.
[4]Proportion of PAG ELISA with a not-pregnant outcome that truly was not-pregnant.
[5]Proportion of pregnancy status, pregnant and not-pregnant, that was correctly classified.

IDEXX Introduces Milk-based Bovine Pregnancy Test That Simplifies and Streamlines Pregnancy Diagnosis in Dairy Cattle [Trade]

The first of its kind, the IDEXX milk-based test optimizes reproductive efficiency and helps milk recording laboratories expand their services

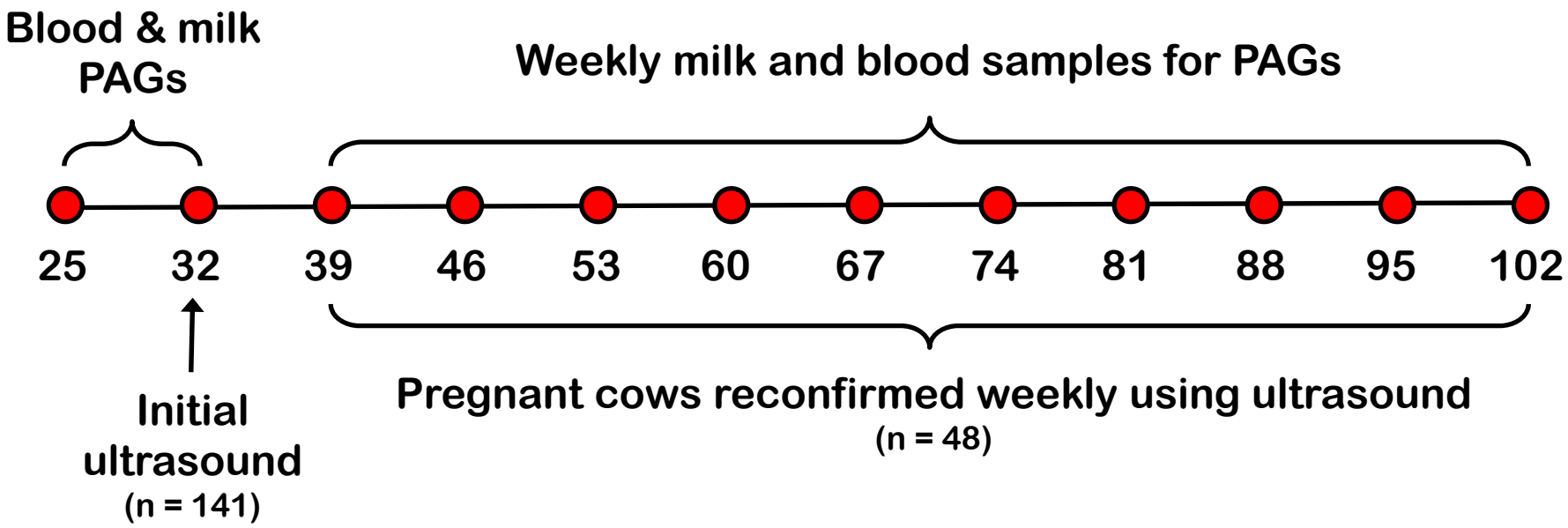
WESTBROOK, Maine, October 18, 2012—At the recent World Dairy Expo in Madison, Wisconsin, IDEXX announced the launch of the IDEXX Milk Pregnancy Test, the first milk-based test for detecting pregnancy as a means of optimizing reproductive efficiency in dairy herds. The ELISA-format test detects pregnancy-associated glycoproteins (PAGs) to determine pregnancy status while minimizing animal handling. With a high level of sensitivity and specificity from ≥35 days postbreeding and ≥ 60 days postcalving, producers can work with dairy herd improvement (DHI) organizations to get early, accurate confirmation of open cows in less than 3.5 hours.

"Expanding the use of DHI milk samples to include confirmation of pregnancy is a simple, cost-effective way for producers to increase the efficiency of their total operation," says Olivier te Boekhorst, VP General Manager, IDEXX Livestock and Poultry Diagnostics. "At the same time, the IDEXX Milk Pregnancy Test also helps recording laboratories make their herd health management programs more attractive to their customers."

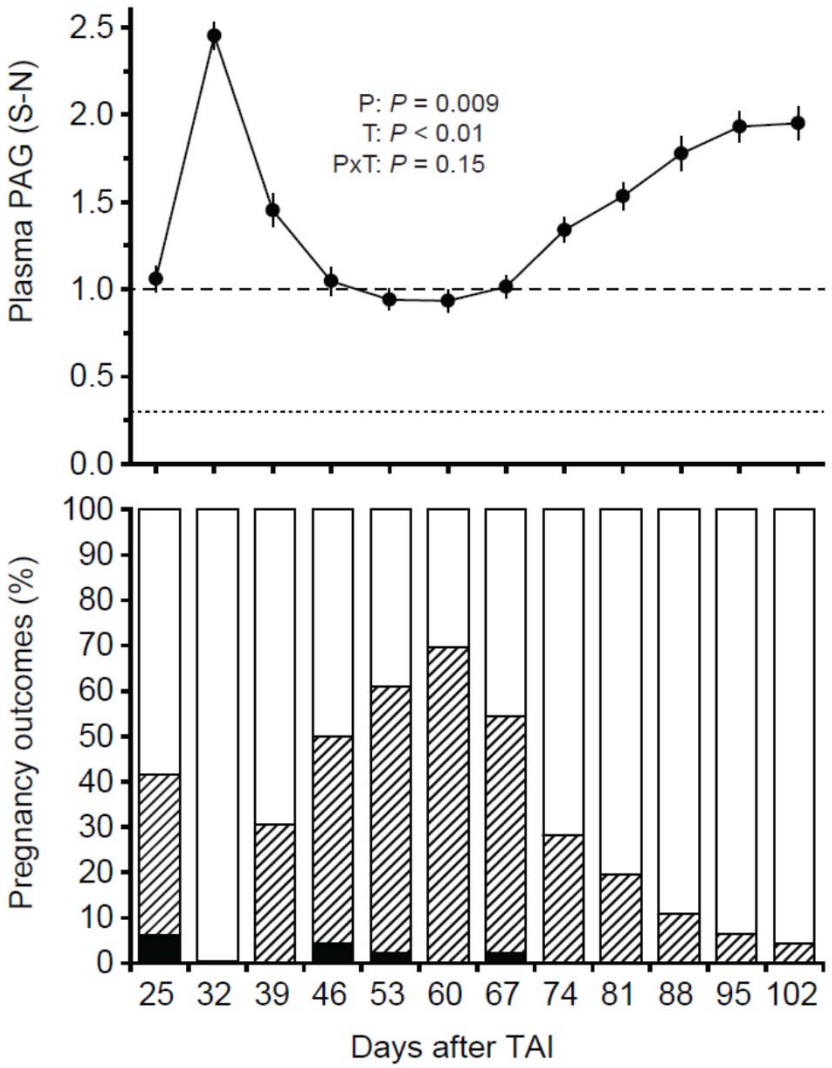
≥28 days postbreeding and 60 days postcalving
Frequency of testing is a consideration

Experimental Design

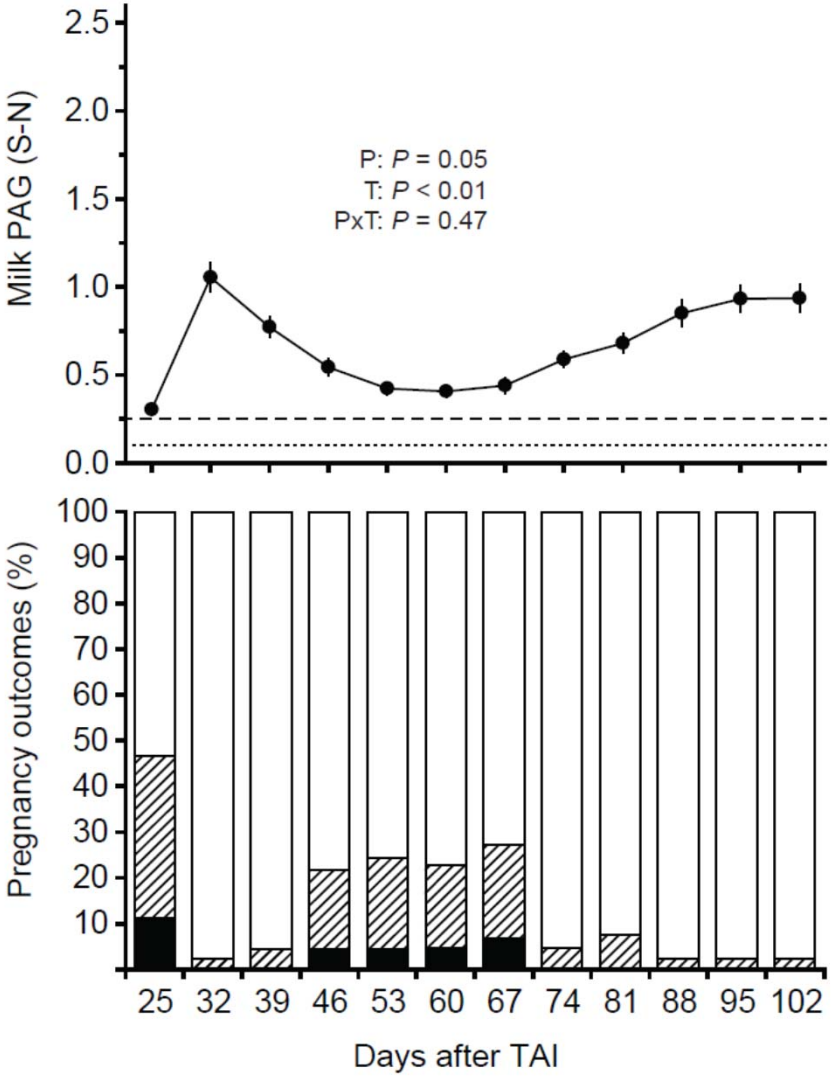
Ricci et al., 2014; J. Dairy Sci. 97(Suppl. 1):694 (abstr.)



Plasma PAGs



Milk PAGs



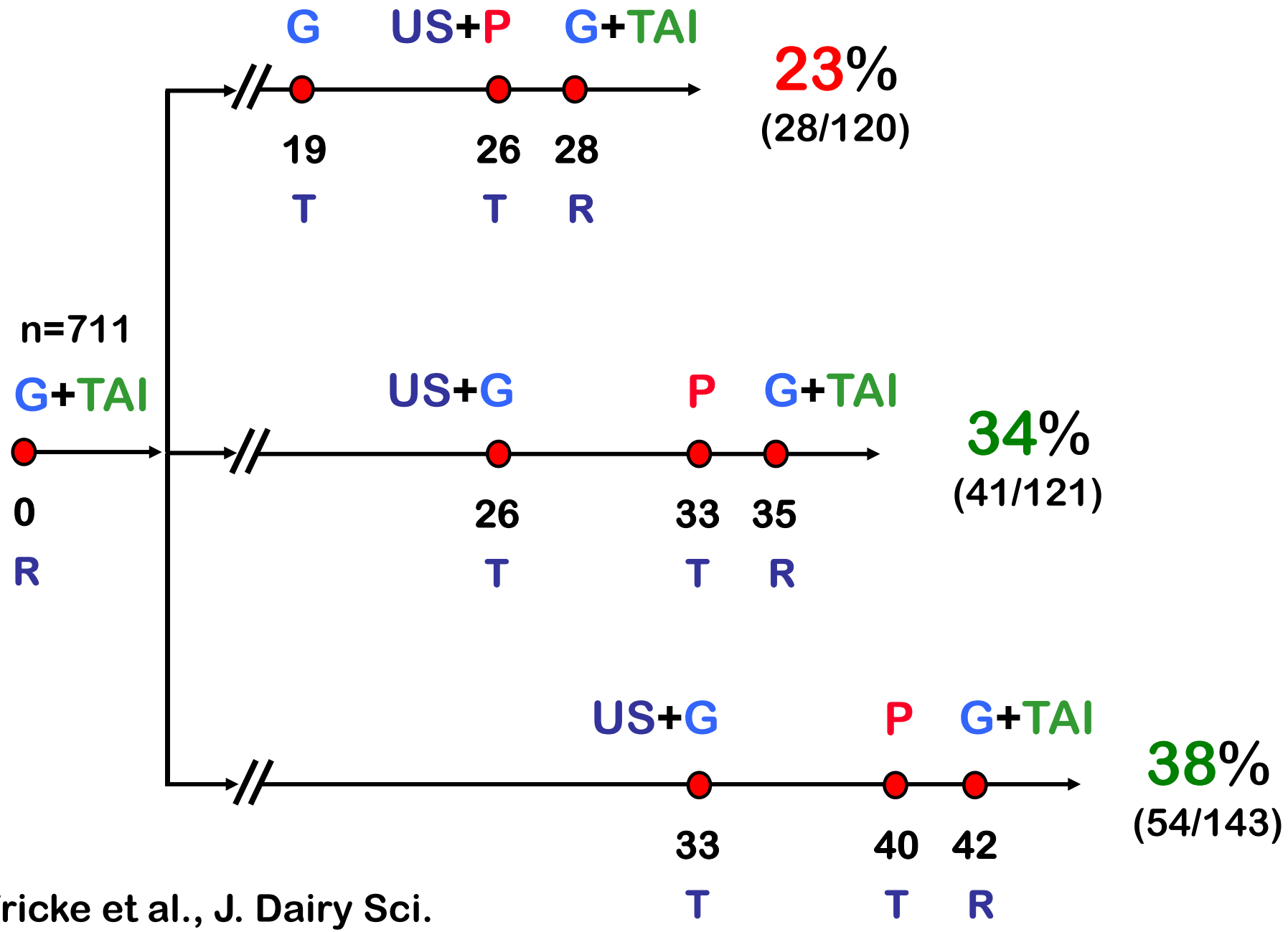
Ricci et al., 2014; J. Dairy Sci. 97(Suppl. 1):694 (abstr.)

Five Keys to Reproductive Success

Key 5:

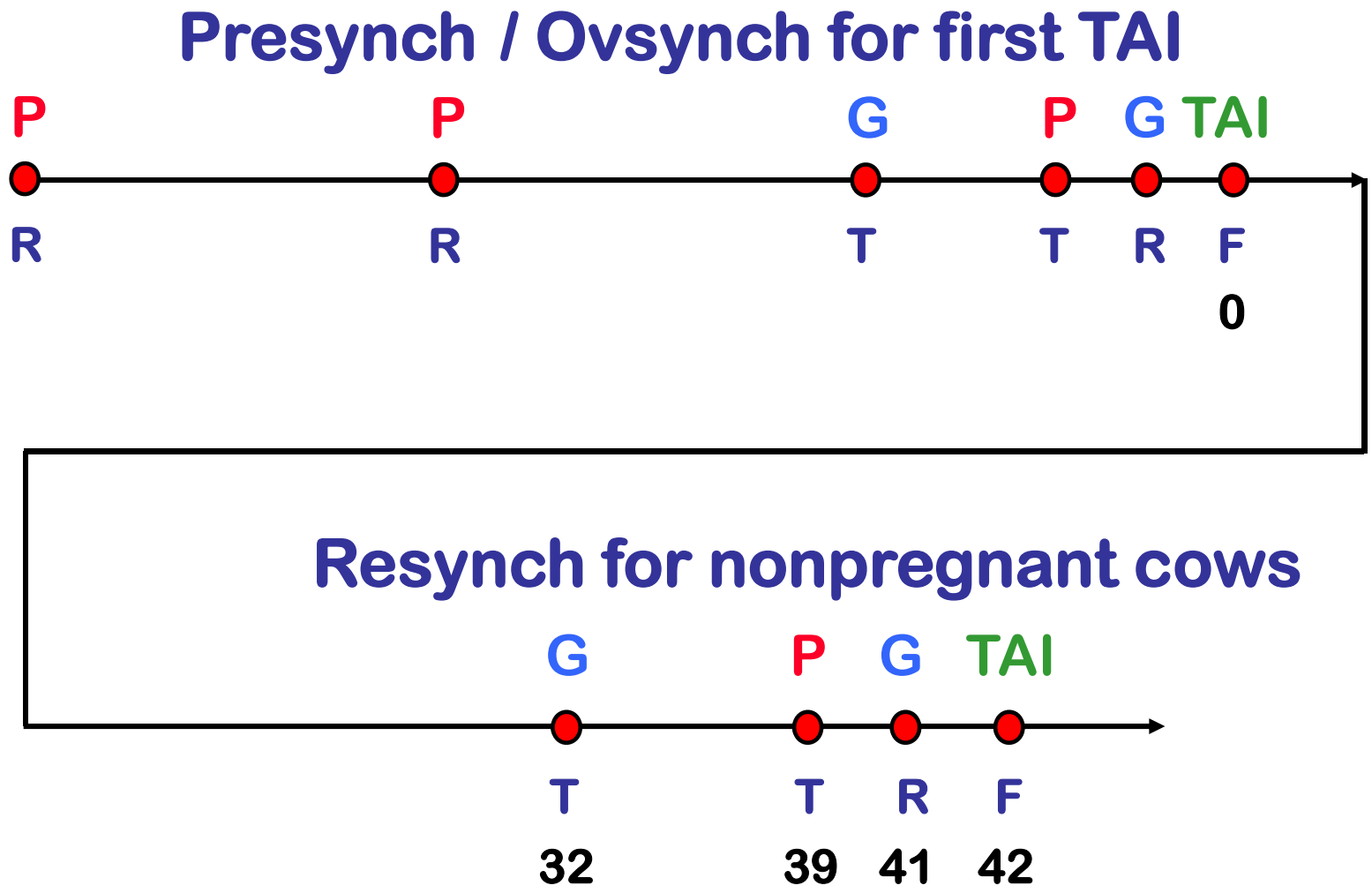
Aggressively re-inseminate nonpregnant cows

Improves Pregnancy Rate by improving Service Rate and Conception Rate



Fricke et al., J. Dairy Sci.
86:3941-3950; 2003

Synch and Resynch



Fertility to TAI by AI Number

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

J. Dairy Sci. 96:3788–3798
http://dx.doi.org/10.3168/jds.2012-6429

Effect of timing of initiation of resynchronization and presynchronization with gonadotropin-releasing hormone on fertility of resynchronized inseminations in lactating dairy cows

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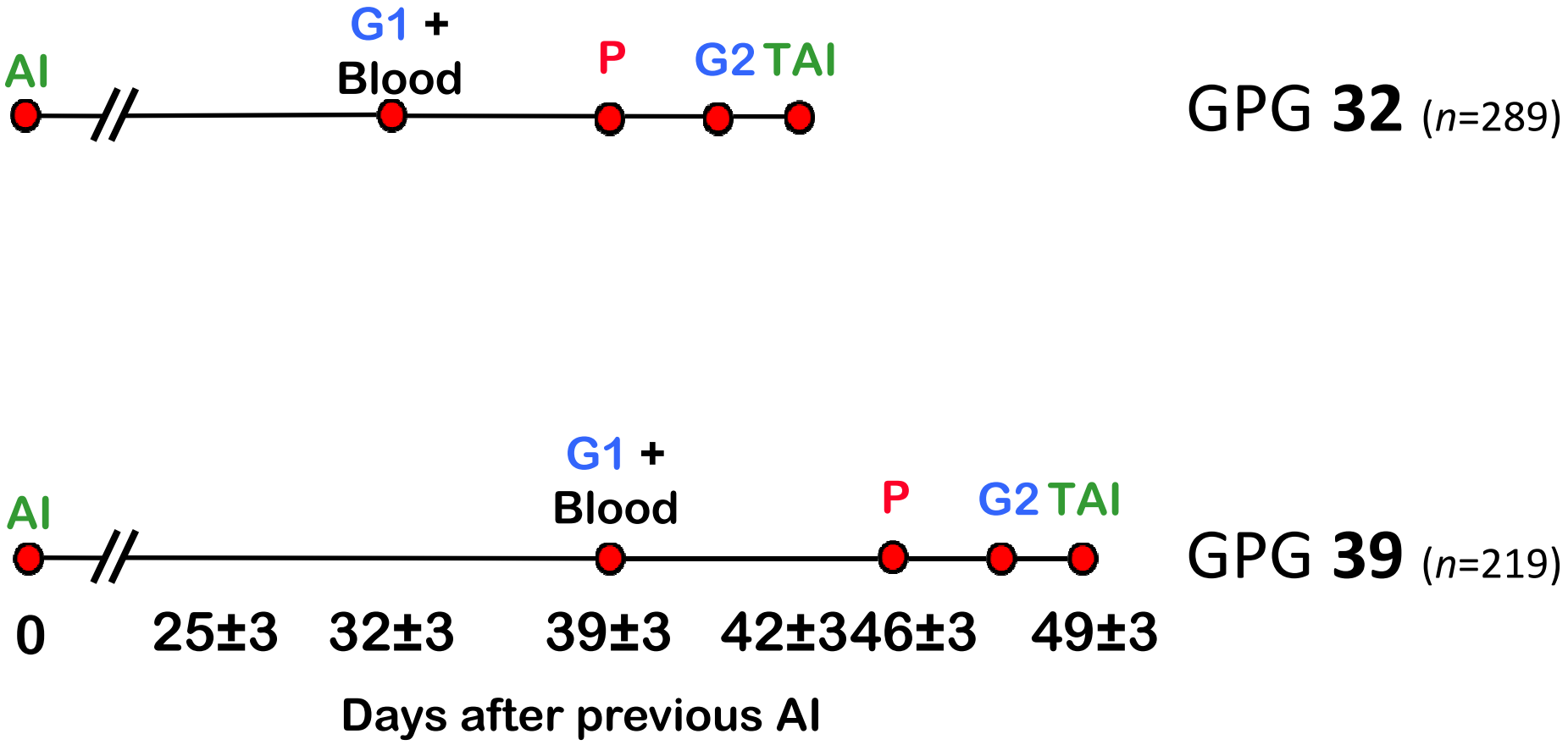
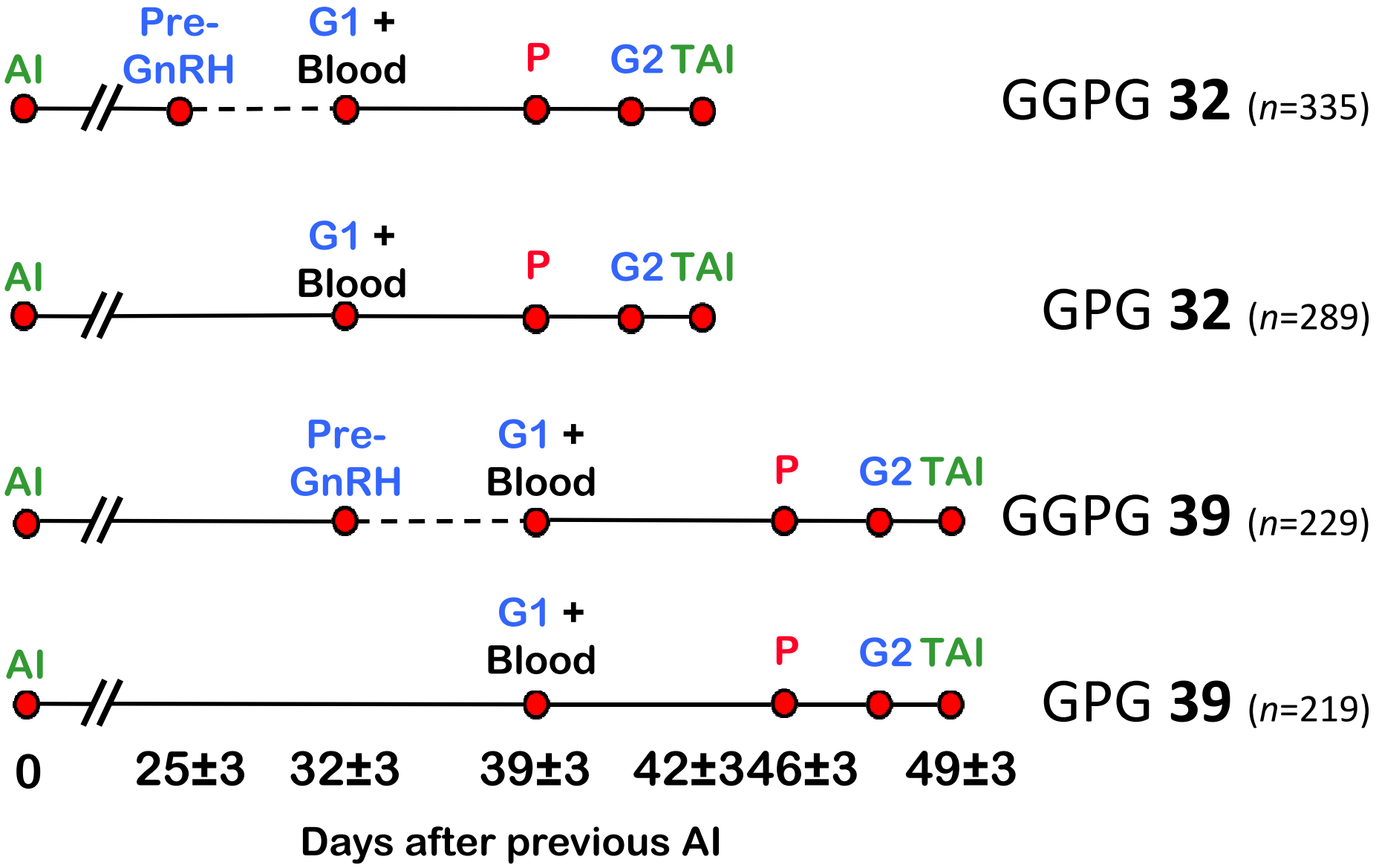
Materials and Methods

- Conducted on a commercial Farm in Wisconsin milking 8,000 cows from April to December 2010.
- Cows were enrolled at 25 ± 3 days after a previous AI.
- Pregnancy diagnoses were performed using transrectal ultrasonography at 32 ± 3 days after AI.

Experimental Design

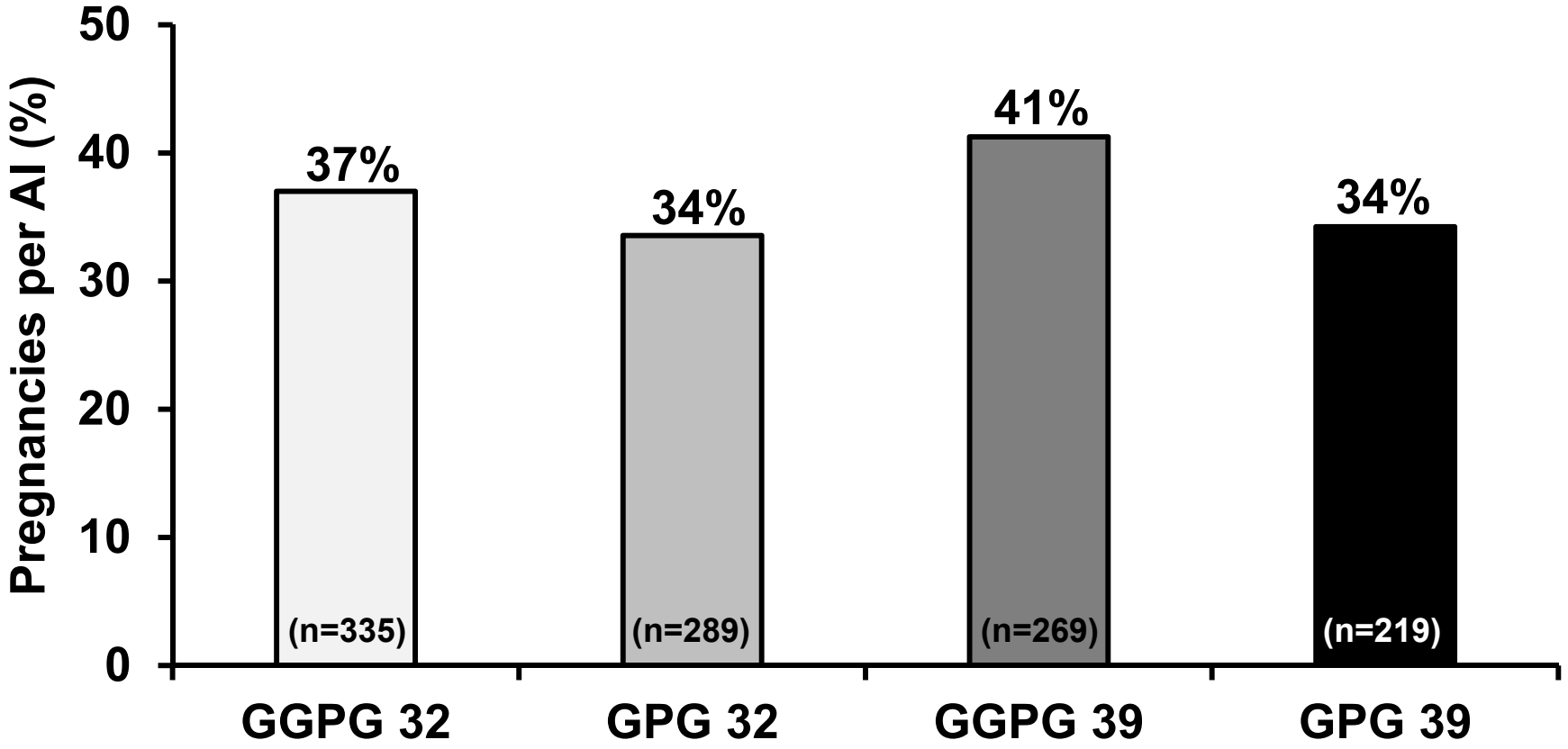


Experimental Design

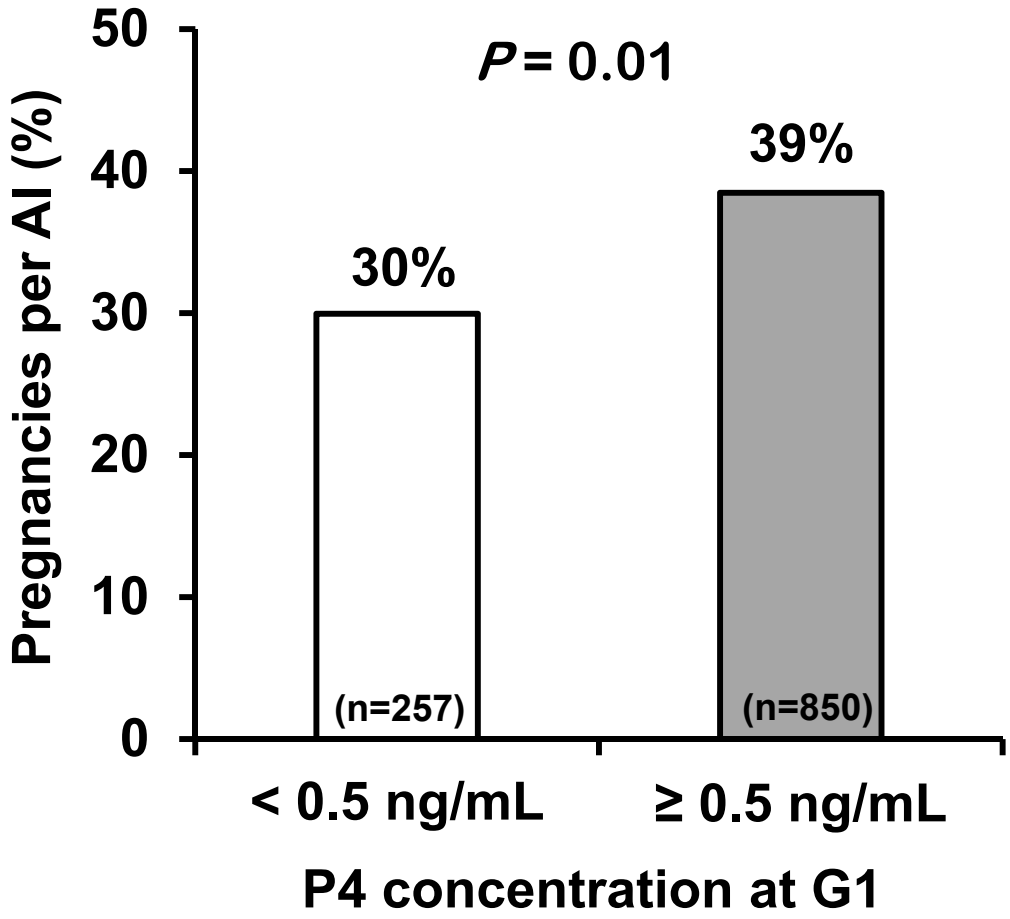


Effect of Treatment on Fertility 32 days after Resynch TAI Lopes et al., 2013

Effect	*P-value*
Day	0.33
GnRH	0.03
Day x GnRH	0.55

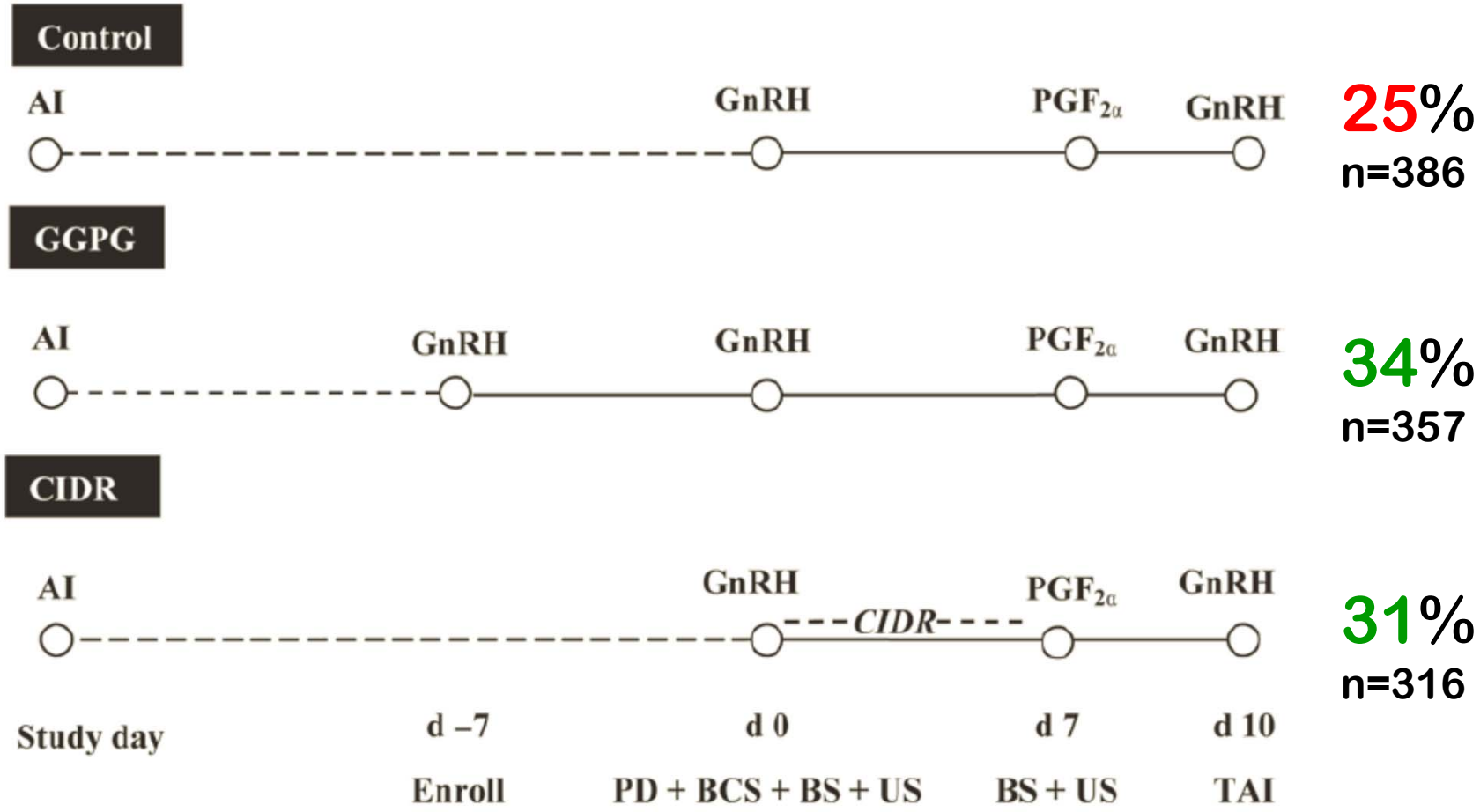


Effect of P4 at G1 on fertility 32 d after Resynch TAI Lopes et al., 2013; J. Dairy Sci. 96:3788-3798



Resynchronization strategies to improve fertility in lactating dairy cows utilizing a presynchronization injection of GnRH or supplemental progesterone

Dewey et al., 2010; J. Dairy Sci. 93:4086–4095



J. Dairy Sci. 96:1–11
http://dx.doi.org/10.3168/jds.2013-6960

Supplemental progesterone and timing of resynchronization on pregnancy outcomes in lactating dairy cows

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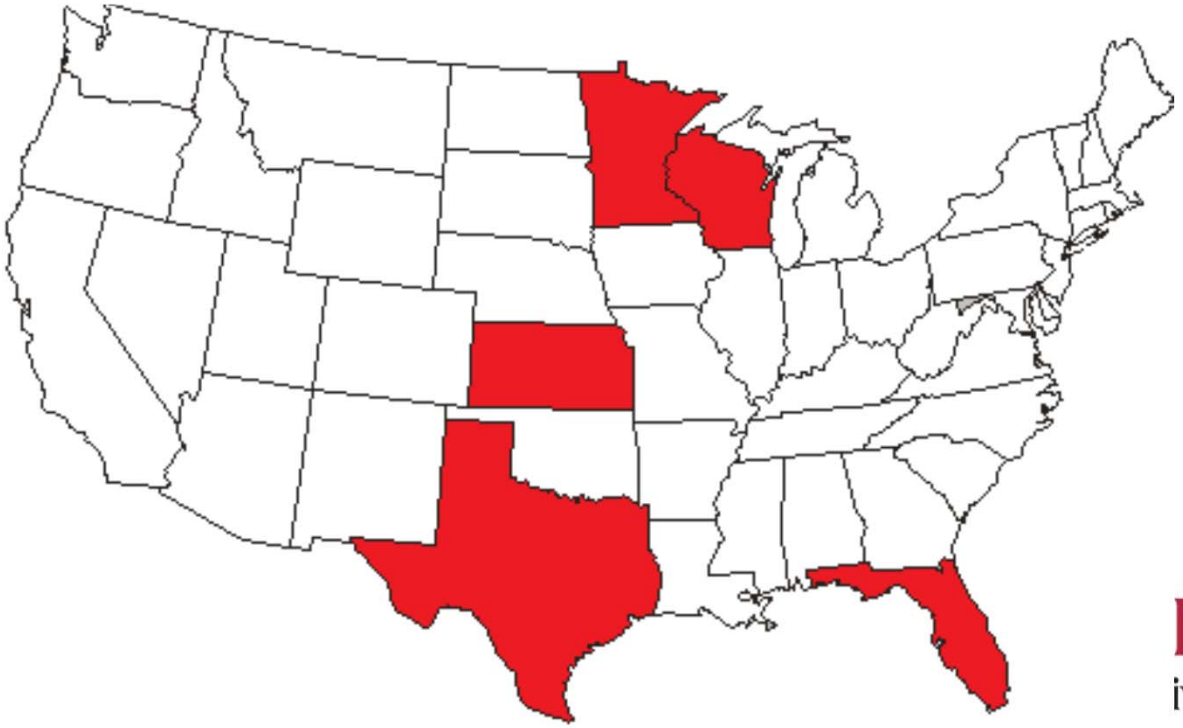

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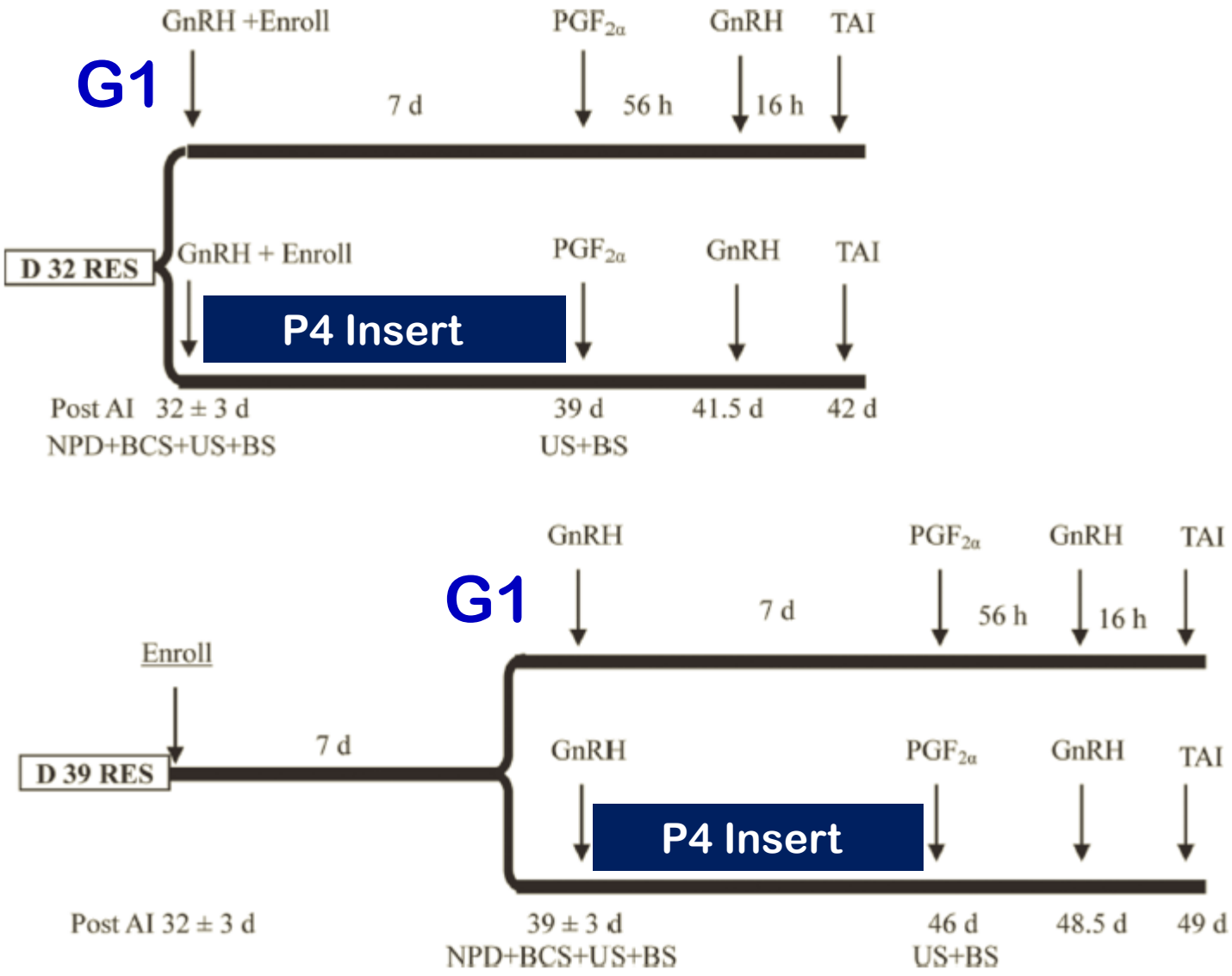
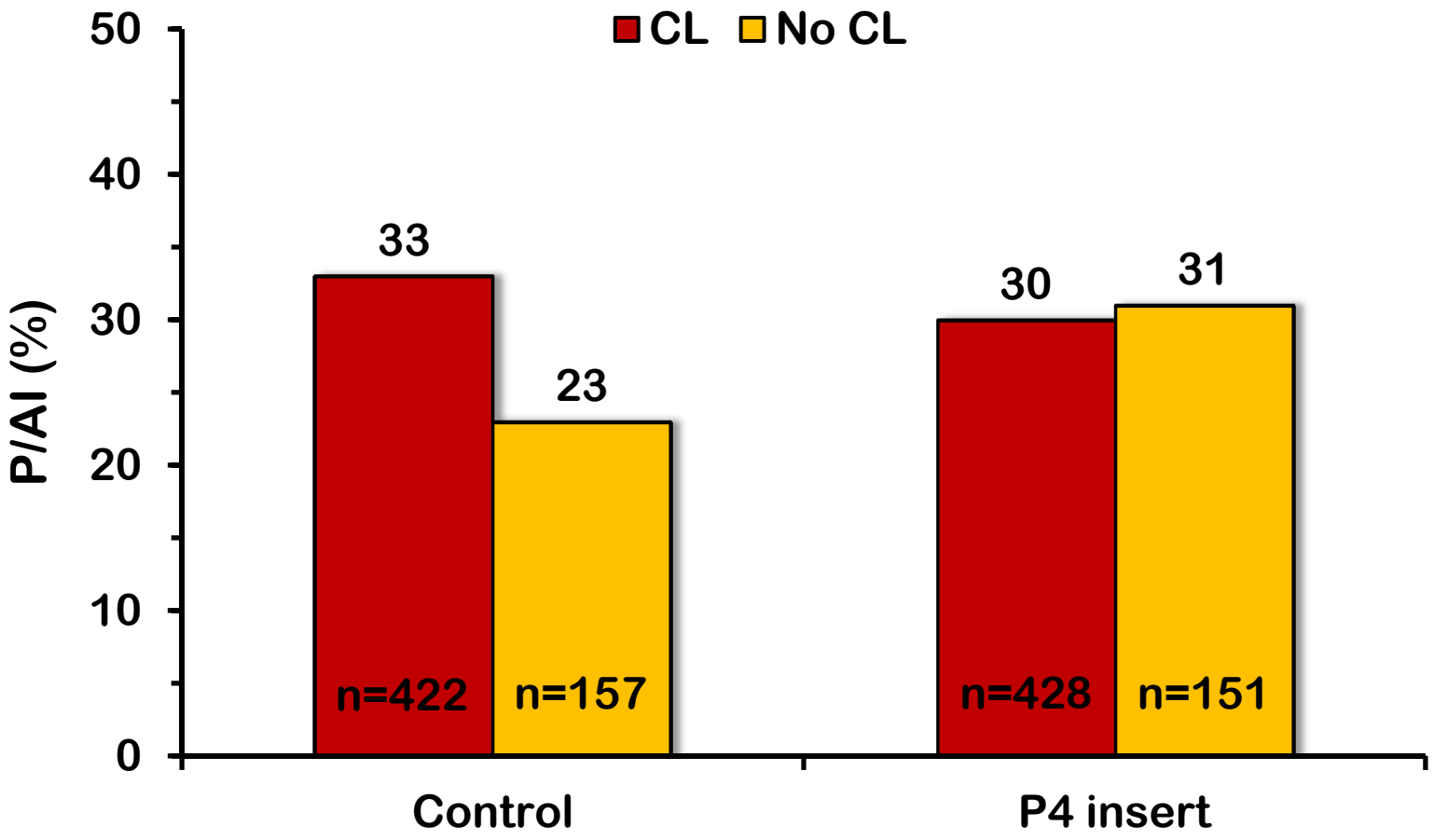
Experimental Design



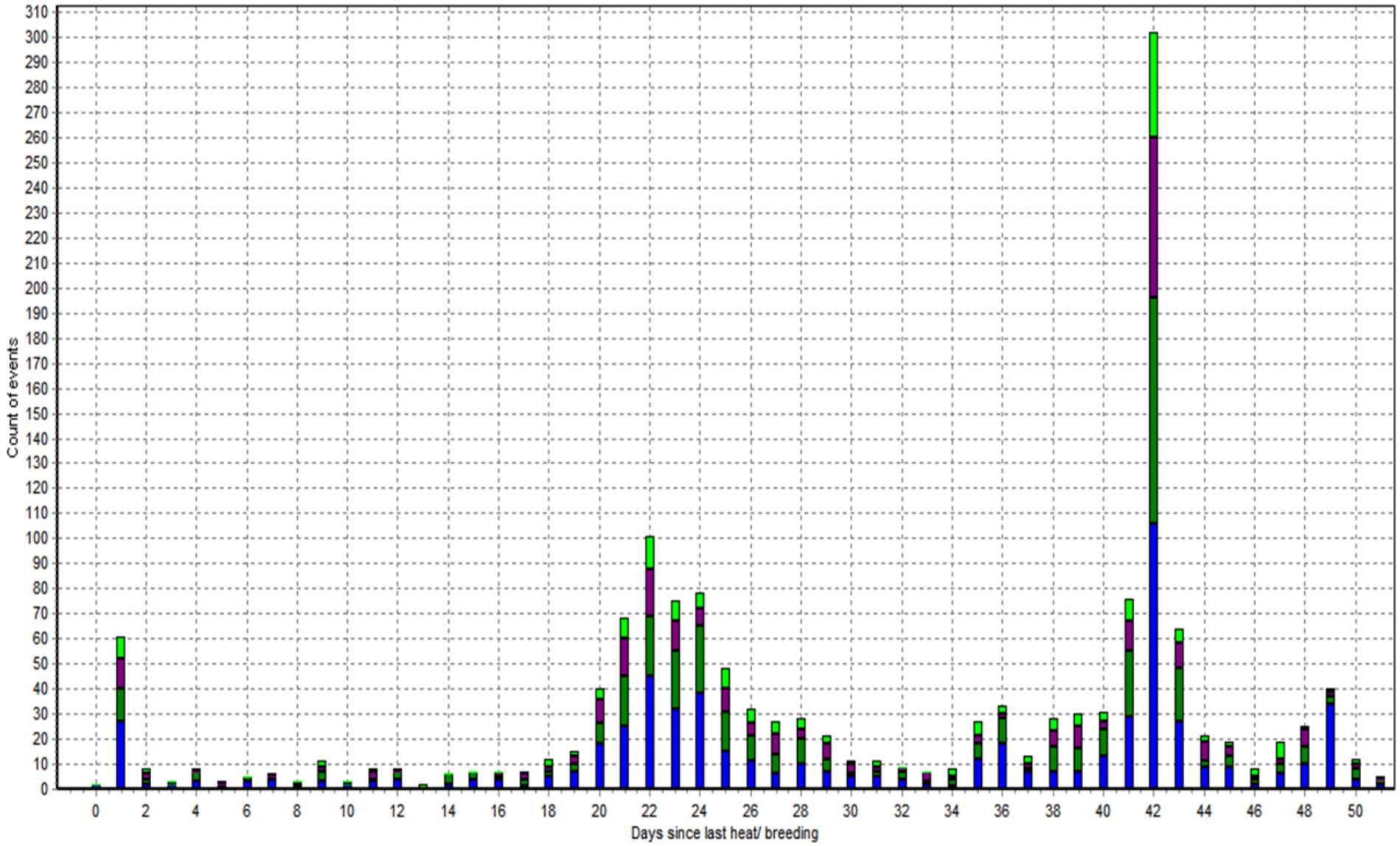
Effect of P4 insert and CL status at G1 on P/AI 32 d after TAI

Bilby et al., 2013; J. Dairy Sci. 96:1-11

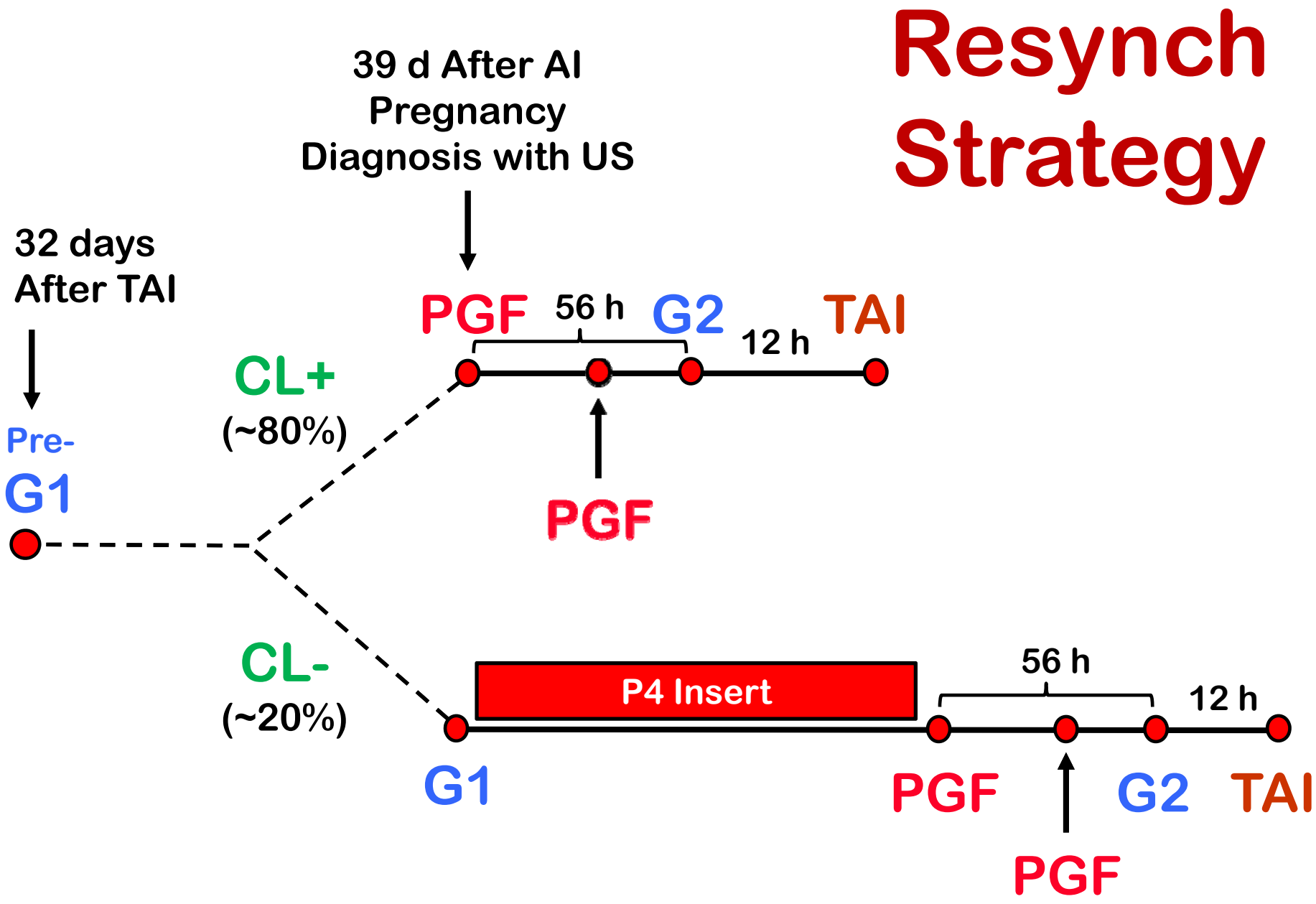
Effect	P-value
P4 insert	0.65
CL status	0.15
Interaction	0.06



Return to Estrus after AI



Resynch Strategy



Five Keys to Reproductive Success

1) Inseminate cows quickly after the end of the voluntary waiting period
2) Inseminate cows at the correct time in relation to estrus or ovulation
3) Improve AI efficiency
4) Identify nonpregnant cows early after an insemination (but not too early)
5) Aggressively re-inseminate nonpregnant cows