Effect of Timing of AI Relative to a Synchronized Ovulation or Increased Activity on Fertility in Lactating Dairy Cows

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1

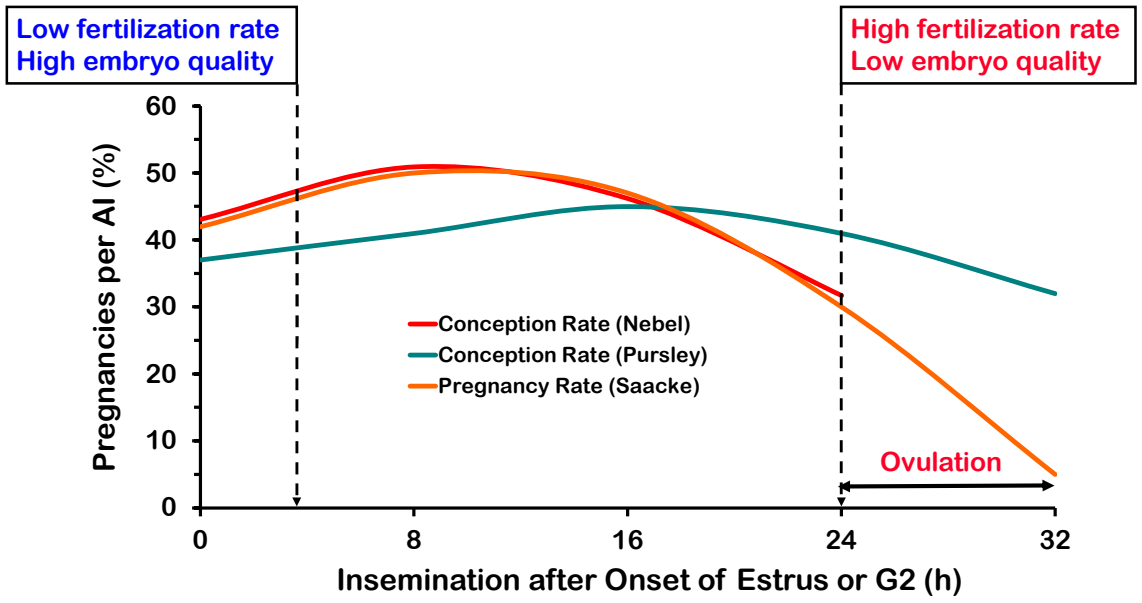
Four Factors Influence Conception Rate (Pregnancies/AI):

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

Timing of AI – refers to the timing of insemination relative to behavioral **estrus** and/or **ovulation**.

2

Timing of AI Relative to Ovulation affects Fertility



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Behavioral Estrus in Dairy Cattle

- Ovulation occurs 27.6 ± 5.4 h after the first standing event of estrus. Walker et al., 1996. J. Dairy Sci. 79:1555
- Insemination must occur before ovulation to allow time for sperm capacitation and transport.

4

The am/pm Rule

- A cow observed in estrus in the morning (a.m.) should be inseminated 12 h later (p.m.)
- A cow observed in estrus in the afternoon or evening (p.m.) should be inseminated 12 h later the next morning (a.m.)

Where did the recommendation for the a.m./p.m. rule originate?

5

Origin of the am/pm Rule

Trimberger & Davis, 1943. Nebraska Agric. Exp. Sta. Bull. No. 129.

Time of AI	n	Pregnancies per AI (%)
Start of Estrus	25	44
Middle of Estrus	40	82
End of Estrus	40	75
After estrus (h)		
6	40	36
12	25	32
18	25	28
24	25	12
36	25	8
48	25	0

6

Once daily AI vs. the am/pm Rule

Lactating dairy cows

Treatment	# of cows	75 d Nonreturn Rate (%)
a.m./p.m. Rule	3,659	60.1
Once daily AI	3,581	60.6

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

Nonlactating dairy heifers

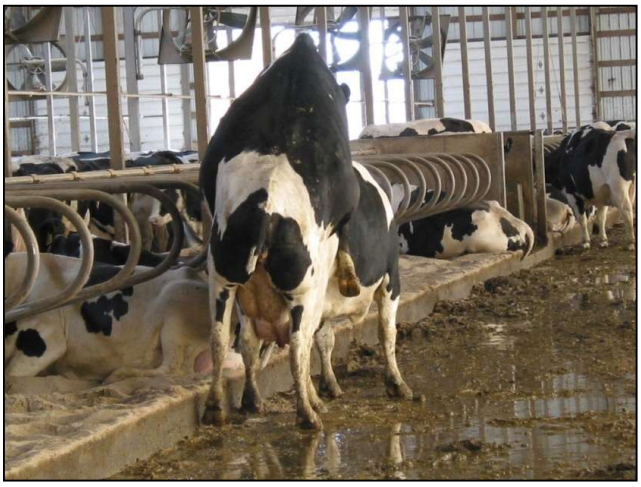
Treatment	# of heifers	Conception Rate (%)
a.m./p.m. Rule	132	62.9
Once daily AI	129	62.0

Gonzalez et al., 1985. Theriogenology 24:495-500.

7

Timing of AI to a visual estrus

- It is not necessary to strictly adhere to the am/pm Rule!
- Once daily AI programs result in acceptable fertility.
  - True for conventional semen
  - May not be true for sexed semen
- A cow observed in estrus can be inseminated immediately rather than waiting 12 h.



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

J. R. Pursley[1], M. O. Mee[2], and M. C. Wiltbank[1]

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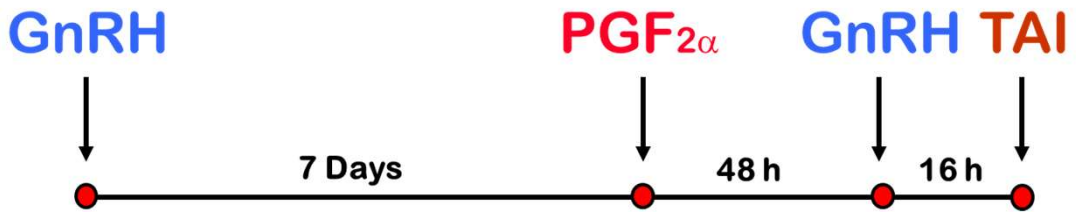
Received for publication: *February 28, 1995*
Accepted: *April 28, 1995*

Theriogenology 44:915; 1995

Where did the recommendation for TAI at 16 h after G2 originate?



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Effect of Time of Artificial Insemination on Pregnancy Rates, Calving Rates, Pregnancy Loss, and Gender Ratio After Synchronization of Ovulation in Lactating Dairy Cows

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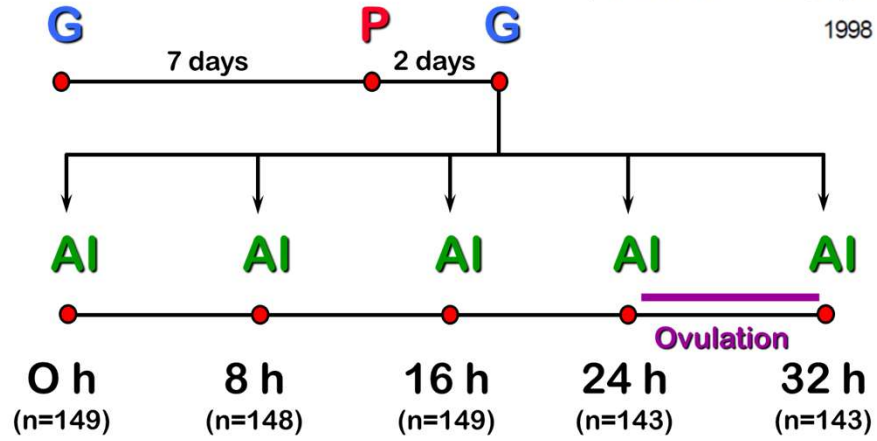
1998 J Dairy Sci 81:2139–2144



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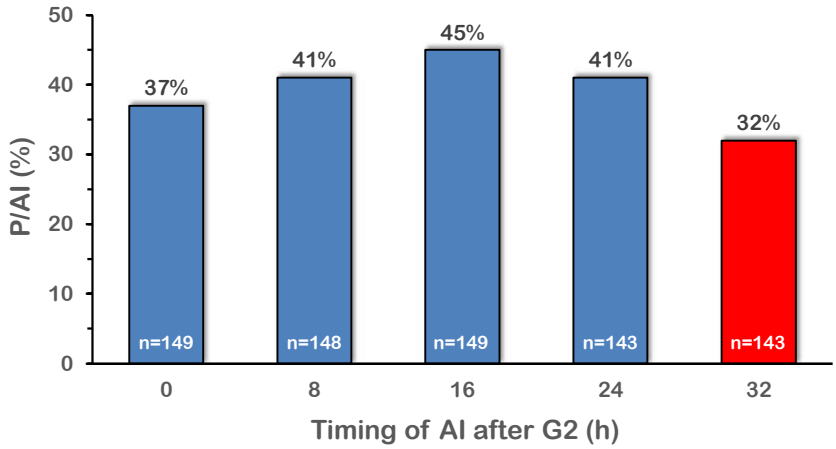

- No statistical difference in P/AI when TAI occurred at 0, 8, 16, or 24 h after G2 of Ovsynch.
- TAI at 32 h after G2 of Ovsynch yielded P/AI that was worse than all other time points combined.

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J. Dairy Sci. 91:1044–1052
doi:10.3168/jds.2007-0409
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Altering the Time of the Second Gonadotropin-Releasing Hormone Injection and Artificial Insemination (AI) During Ovsynch Affects Pregnancies per AI in Lactating Dairy Cows

D. J. Brusveen, A. P. Cunha, C. D. Silva, P. M. Cunha, R. A. Sterry, E. P. B. Silva, J. N. Guenther, and M. C. Wiltbank[1]
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Conventional Semen

"CoSynch" protocol

GnRH — 7 Days — PGF — 48 h — GnRH +TAI

27%
n=493

"Ovsynch56" protocol

GnRH — 7 Days — PGF — 56 h — GnRH — 16 h — TAI

36%
n=494

17% Increase!

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2023 Timing of AI Case Study

1,850-cow Holstein herd in Wisconsin

Cow – 1st Service CoSync vs OvSync56

Below you'll find cow conception rates for 1st service ONLY by semen type for the different protocols.

The chart below is ONLY 1st service CoSync – up to Nov 24th

Semen Type	95% CI	%Conc	#Preg	#Open	Other	Abort	Total	%Tot	SPC
Sexed	22-32	26	79	221	6	2	306	70	3.8
Beef	45-62	54	69	59	6	3	134	30	1.9
TOTALS	30-39	35	148	280	12	5	440	100	2.9

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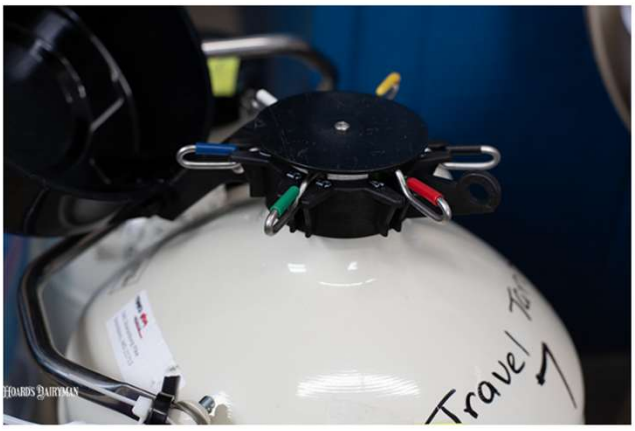
HOARD'S DAIRYMAN INTEL June 2 2025 08:01 AM

26 Total Shares

Stop doing cosynch

BY PAUL FRICKE, THE UNIVERSITY OF WISCONSIN-MADISON

HOARD'S DAIRYMAN INTEL



Take-Home message:

Doing Cosynch!

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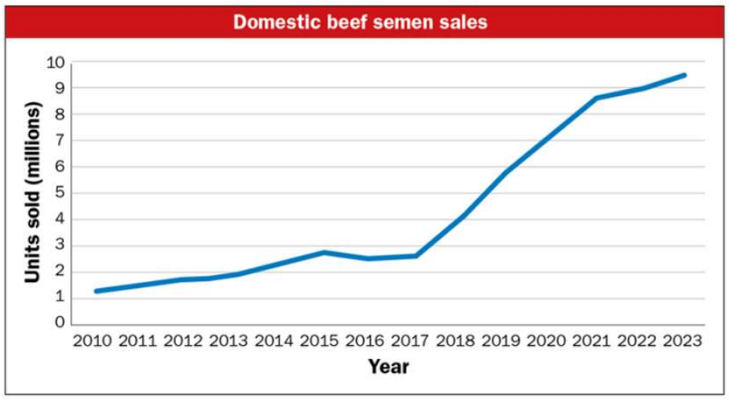
HOARD'S DAIRYMAN

Domestic beef semen sales hit a new high

April 15 2024

By Abby Bauer, Managing Editor



- Of the 9.4 million units of beef semen sold domestically in 2024, 7.9 million units were used in dairy herds (NAAB). That was up nearly 1 million units from the year before.
- Sex-sorted dairy semen was at 9.9 million units.
- Conventional dairy semen was at 6.2 million units.

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Dairy Heifer and Calf Values Remain in the Stratosphere

Dairy replacement heifers and beef-cross calves are fetching record-breaking prices this spring, with Holstein springers hitting $4,200 and beef-cross calves surpassing $1,600.

MAUREEN HANSON • June 05, 2025 12:09 PM

Dairy Herd Management

May 2025

	Springing Heifers		Heifer Calves	Beef Cross Calves
Location (sale date)	Supreme/Top	Approved/Medium	90-120 lbs	60-100 lbs
Turlock, Calif. (5-23-25)	$3,100-3,825	$2,700-3,000		
Lomira, Wis. (5-16-25)	$1,800-3,000	$1,200-1,700	$700-900	$1,050-$1,635
Pipestone, Minn. (5-15-25)	$4,000-4,200	$3,800-4,000	No test	$825-1,035
New Holland, Pa. (5-30-25)	No report	No report	$725-965	$1,315-1,587

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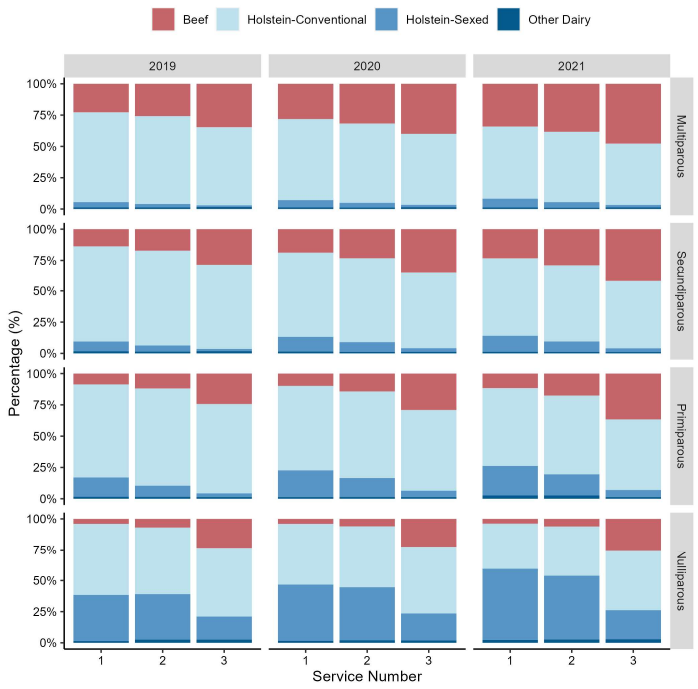

Lauber et al., 2023. Characterization of semen type prevalence and allocation in Holstein and Jersey females in the United States.
J. Dairy Sci. 106:3748–3760

8,284,770 insemination records from 3,115,224 Holstein females from 9,196 herds.

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Theriogenology 85 (2016) 533–539

Contents lists available at ScienceDirect

Theriogenology

journal homepage: www.theriojournal.com

Time of insemination relative to reaching activity threshold is associated with pregnancy risk when using sex-sorted semen for lactating Jersey cows

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Journal of Dairy & Veterinary Sciences
ISSN: 2573-2196

Research Article

Time of Insemination Relative to onset of Activity Threshold of Cow Manager ® is Associated with Pregnancy Risk When Using Gender Selected ™ Semen for Jersey Cattle

Ray Nebel*

Department of animal reproduction, Select Sires Inc, USA

Submission: October 27, 2017; Published: January 25, 2018

Should we inseminate later with sex-sorted semen?

In both observational studies, inseminating later (18 t0 20 hours) after the onset of activity yielded increased fertility with sex-sorted semen.

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J. Dairy Sci. 85:2831–2842
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High Feed Intake Increases Liver Blood Flow and Metabolism of Progesterone and Estradiol-17β in Dairy Cattle

S. Sangsritavong, D. K. Combs, R. Sartori, L. E. Armentano, and M. C. Wiltbank
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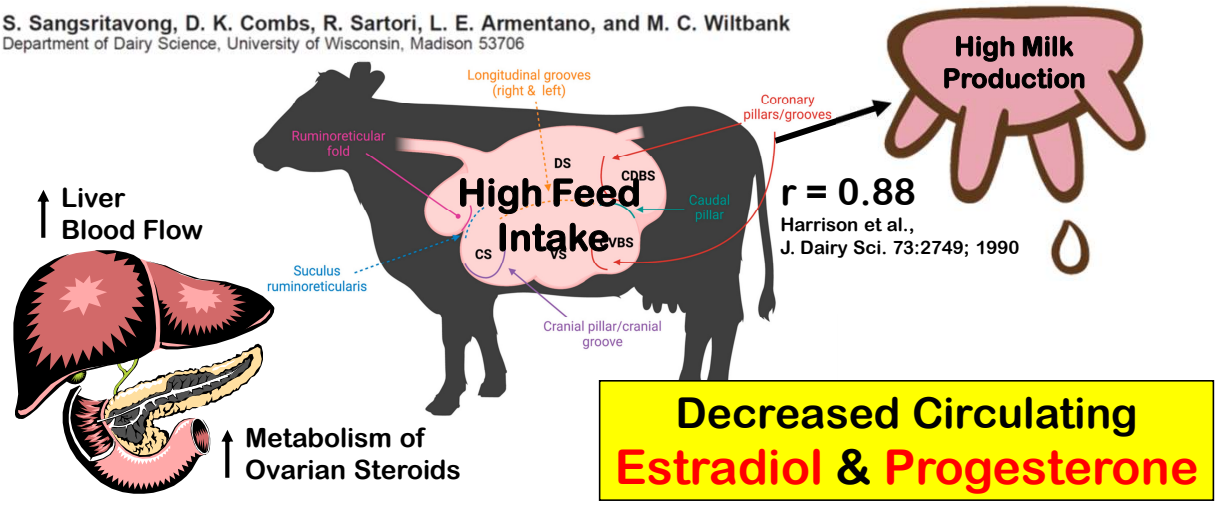

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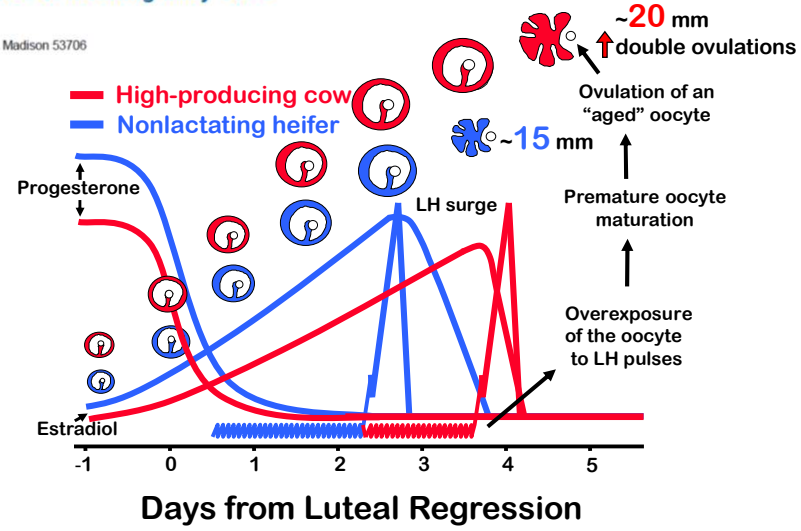
Symposium review: The implications of spontaneous versus synchronized ovulations on the reproductive performance of lactating dairy cows*

P. M. Fricke† and M. C. Wiltbank
Department of Animal and Dairy Sciences, University of Wisconsin-Madison, Madison 53706

- Comparison of hormonal events during the periovulatory period in nonlactating heifers and high-producing cows.
- Hepatic metabolism of estradiol and progesterone cause endocrine changes that affect physiology and fertility.



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J. Dairy Sci. 103:10856–10861
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Short communication: Effect of timing of induction of ovulation relative to timed artificial insemination using sexed semen on pregnancy outcomes in primiparous Holstein cows

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[2]Bridgewater Dairy Group, Montpelier, OH 43543
[3]Department of Animal Sciences, University of Wisconsin-Madison, Madison 53706

Sexcel Sexed Genetics

Hypothesis:

Induction of ovulation (G2) earlier relative to TAI in a Double-Ovsynch protocol will result in more P/AI

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Standard Double-Ovsynch Protocol

G2 to TAI = 16 h

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					GnRH a.m.	
					$PGF_{2\alpha}$ a.m.	
	GnRH a.m.					
	GnRH a.m.		G2-16			
	$PGF_{2\alpha}$ a.m.	$PGF_{2\alpha}$ a.m.	G2 p.m.	TAI a.m.		

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Modified Double-Ovsynch Protocol

G2 to TAI = 24 h

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					GnRH a.m.	
					$PGF_{2\alpha}$ a.m.	
	GnRH a.m.					
	GnRH a.m.		G2-24			
	$PGF_{2\alpha}$ a.m.	$PGF_{2\alpha}$ a.m.	G2 a.m.	TAI a.m.		

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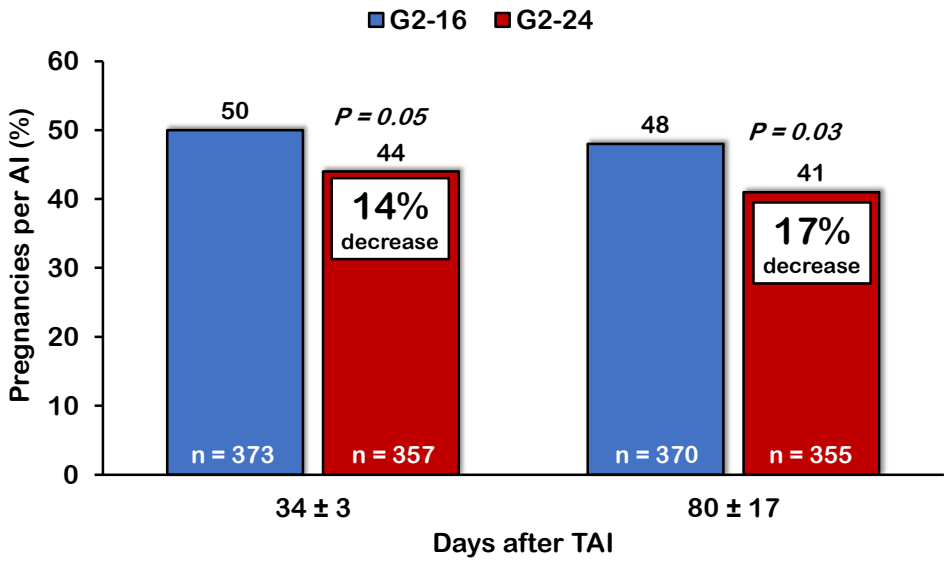
Effect of Treatment on Pregnancies/AI



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J. Dairy Sci. 103:12059–12068
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Evaluation of delayed timing of artificial insemination with sex-sorted sperm on pregnancy per artificial insemination in seasonal-calving, pasture-based lactating dairy cows

E. Drake,[1,2] S. A. Holden,[1] V. Aublet,[1] R. C. Doyle,[1] C. Millar,[1] S. G. Moore,[1] C. Maicas,[1,2] F. Randi,[3] A. R. Cromie,[4] P. Lonergan,[2] and S. T. Butler[1]*
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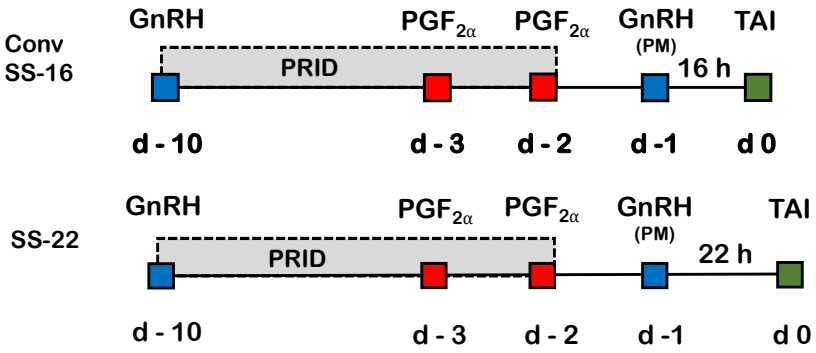

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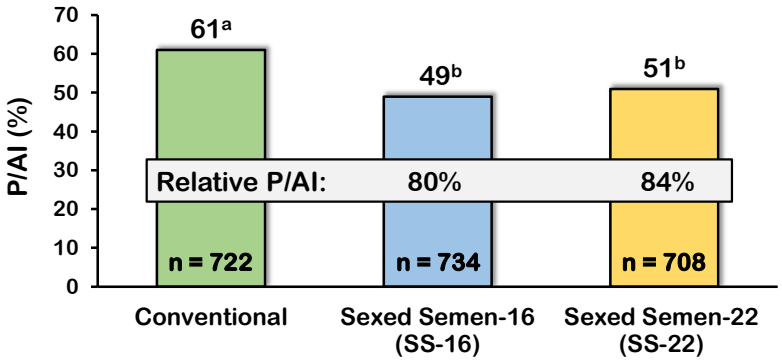

No statistical increase in P/AI when TAI with sexed semen was delayed by 6 h after G2.

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Double-Ovsynch Protocol

Keep the standard timing of G2 and TAI

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					GnRH a.m.	
					$PGF_{2\alpha}$ a.m.	
	GnRH a.m.					
	GnRH a.m.					
	$PGF_{2\alpha}$ a.m.	$PGF_{2\alpha}$ a.m.	G2 p.m.	TAI a.m.		

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J. Dairy Sci. 108:8945–8958
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Effect of timing of artificial insemination with conventional or sex-sorted semen on fertility of lactating dairy cows

V. G. Santos,[1,2]* P. D. Carvalho,[3,4] A. H. Souza,[3] S. Priskas,[5] J. A. L. Castro,[1] A. M. F. Pereira,[1,2] P. J. Ross,[4] J. Moreno,[4] M. C. Wiltbank,[3] and P. M. Fricke[3]
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[3]Department of Animal and Dairy Sciences, University of Wisconsin–Madison, Madison, WI 53706
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[5]Bovis PC, Serres, 62100, Greece

Three data sets were analyzed:

- One randomized, controlled experiment
- Two large observational studies

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Experiment 1 – conventional semen

Randomized, controlled trial comparing TAI at 0 vs. 16 h after a Double-Ovsynch protocol for first TAI in multiparous Holstein cows.

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					GnRH	
					PGF	
	GnRH					
	GnRH					
	PGF		GnRH	TAI 0 vs. 16 h		

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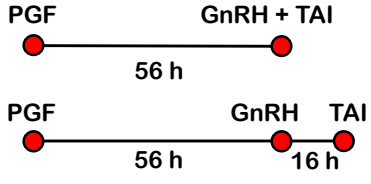
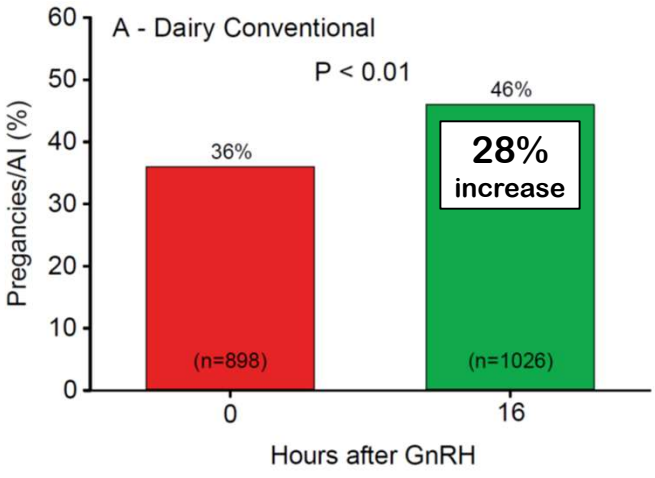
Effect of timing of AI relative to G2 on P/AI

Multiparous lactating Holstein cows (n = 2,225) from 6 dairy herds in Wisconsin were submitted for TAI with conventional semen after a Double-Ovsynch protocol and were randomized to receive TAI at G2 (0 h) or 16 h after G2.





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Experiment 2 – conventional and sexed semen

Observational study assessing variability of TAI after G2 of Double-Ovsynch

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					GnRH	
					PGF	
	GnRH					
	GnRH					
	PGF		GnRH	TAI 13 to 23 h		

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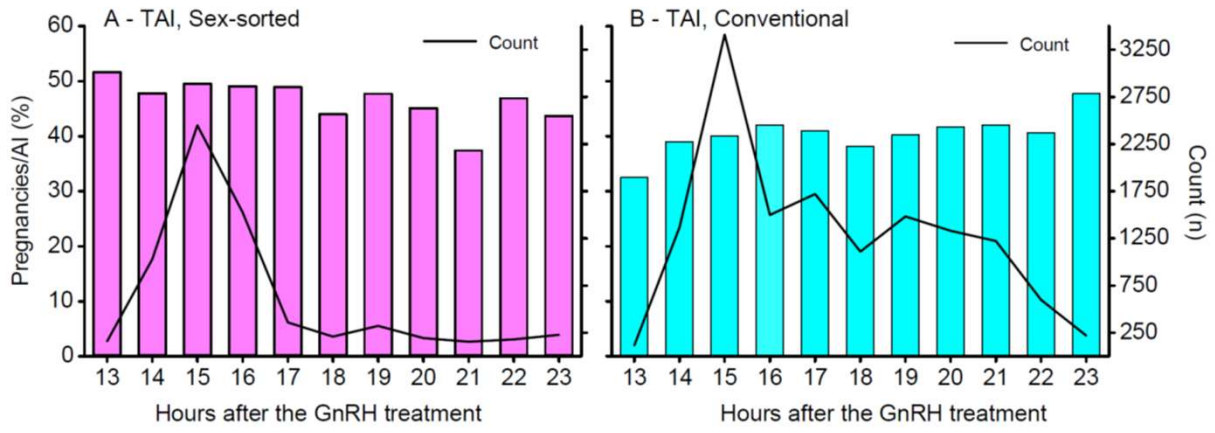
Timing of AI 13 to 23 h after G2 of Double-Ovsynch

Lactating Holstein cows (n = 13,318) from 2 herds in Texas were submitted to a Double-Ovsynch protocol to receive their first TAI (14,089 inseminations) or to a GGPPG protocol for second and greater TAI (6,806 inseminations).



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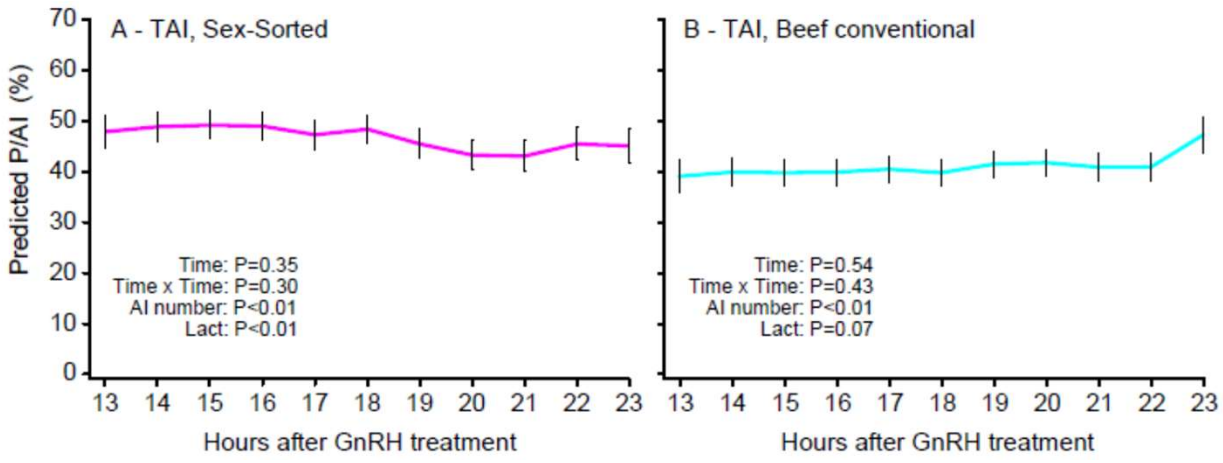
Timing of AI 13 to 23 h after G2 of Double-Ovsynch



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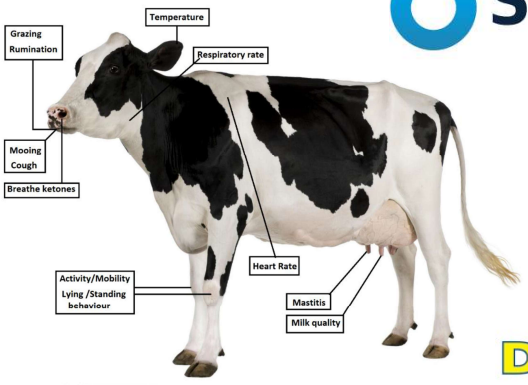
Experiment 3

Observational study assessing variation of timing of AI with an Automated Activity Monitoring System using sex-sorted dairy semen or conventional beef semen.

GEA Farm Technologies

SenseHub™



LELY

nedap technology that matters

DAIRYMASTER

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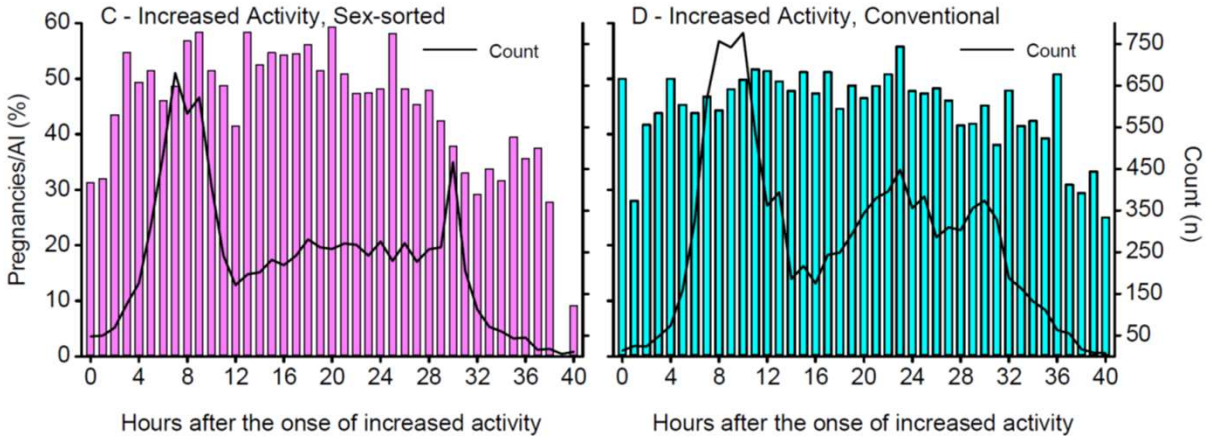
Timing of AI Relative to Onset of Activity

Lactating dairy Holstein (n = 927), Jersey (n = 3,238), and crossbred (n = 6,762) cows from farms in Texas and Arizona were fitted with activity-monitoring tags mounted to a neck collar, and the timing of AI relative to the onset of increased activity was recorded (20,461 inseminations).



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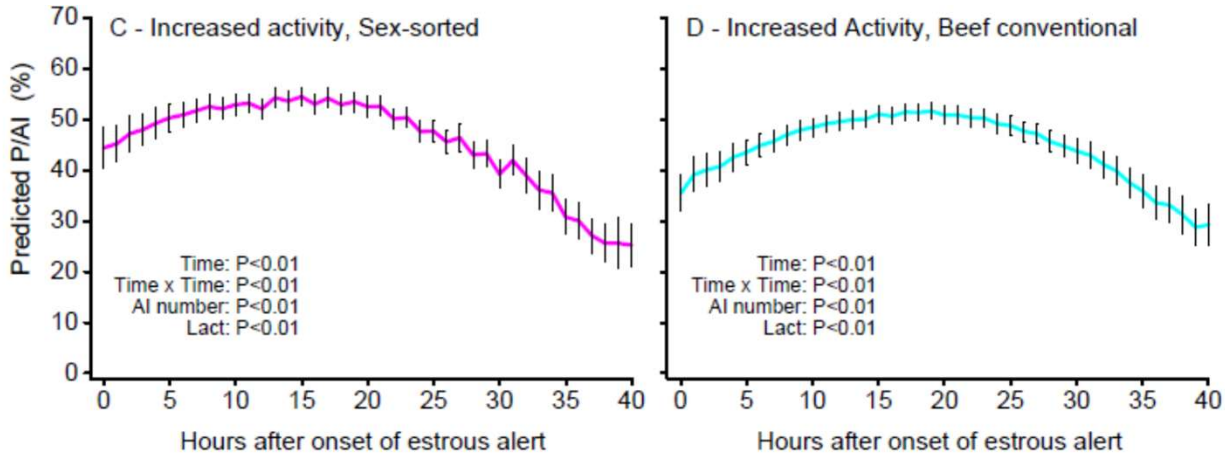
Timing of AI Relative to the Onset of Activity

Timing of AI from 0 to 40 h after onset of activity



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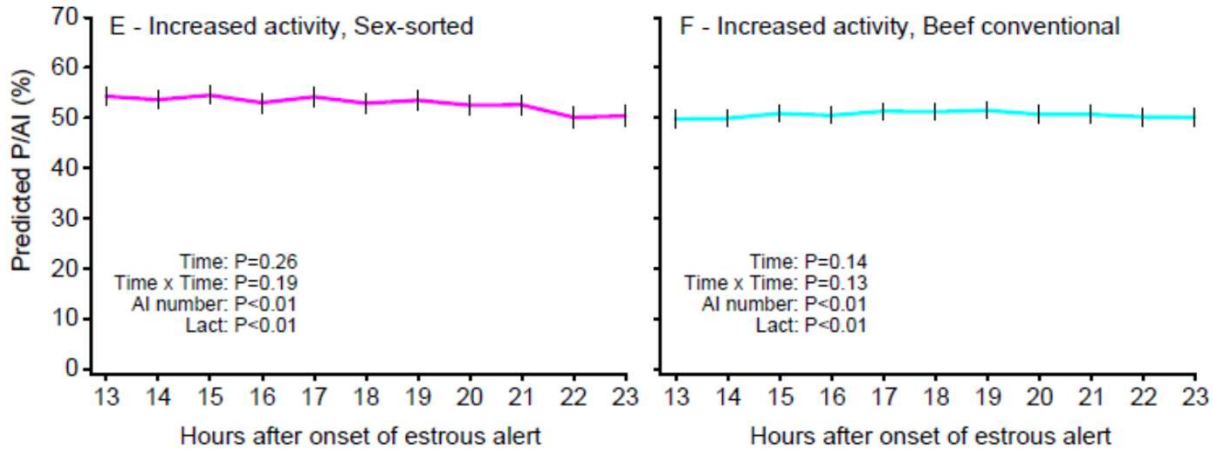
Timing of AI Relative to the Onset of Activity

Data restricted to AI from 13 to 23 h after the onset of activity



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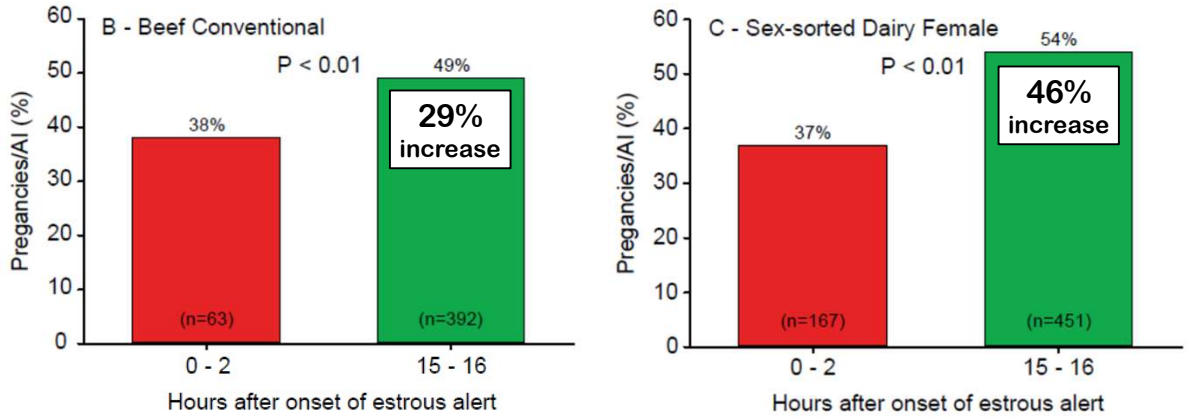
Effect of timing of AI relative to activity on P/AI

Pregnancies/AI for cows inseminated from 0 to 2 h or from 15 to 16 h after onset of activity using an automated activity monitoring system.



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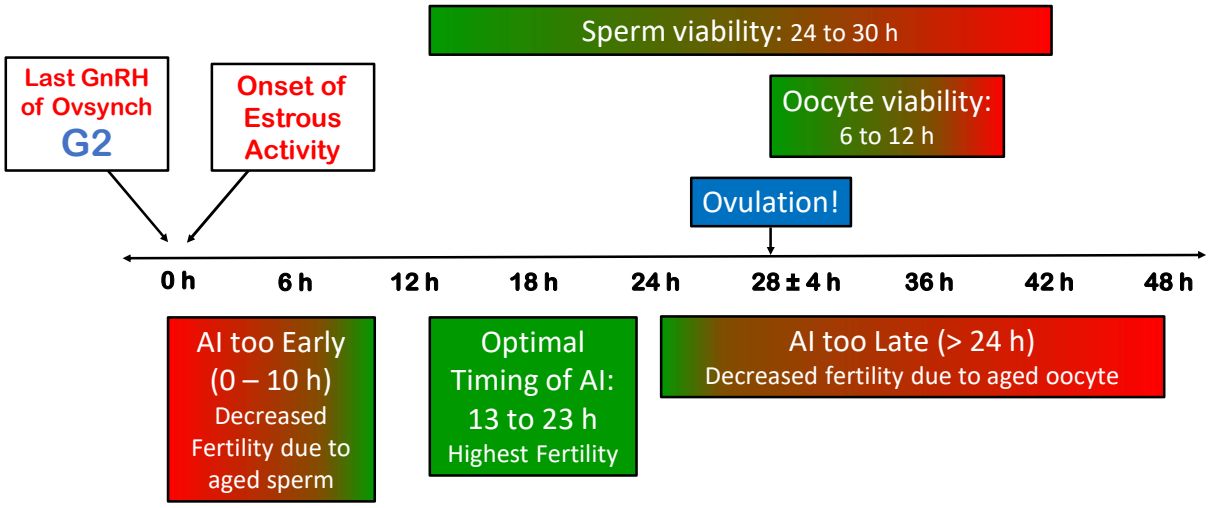
Summary of Timing of Insemination



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Take-Home Messages

- Correct timing of insemination is critical for good fertility.
- Cosynch protocols result in poor fertility because insemination occurs too early relative to ovulation.
  - **STOP doing Cosynch!**
- The insemination window for optimal fertility is:
  - Approximately 13 to 23 hours after G2 of a Double-Ovsynch protocol or after an estrus alert based on an activity monitoring system.
  - This requires generating lists of cows twice daily when using an activity monitoring system.
- There was no difference in optimal timing of AI between conventional and sex-sorted semen.

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Thank you!
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