Critical Aspects for Improving Reproductive Success

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55th Florida Dairy Production Conference
Gainesville, FL; September 18, 2019

What are common ways to measure reproduction on dairy farms?

Days Open

Calving Interval

Services per Conception

What are common ways to measure reproduction on dairy farms?

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What are common ways to measure and MANAGE reproduction on dairy farms?

21-day pregnancy rate *

Service Rate

Pregnant per AI (Conception rate)

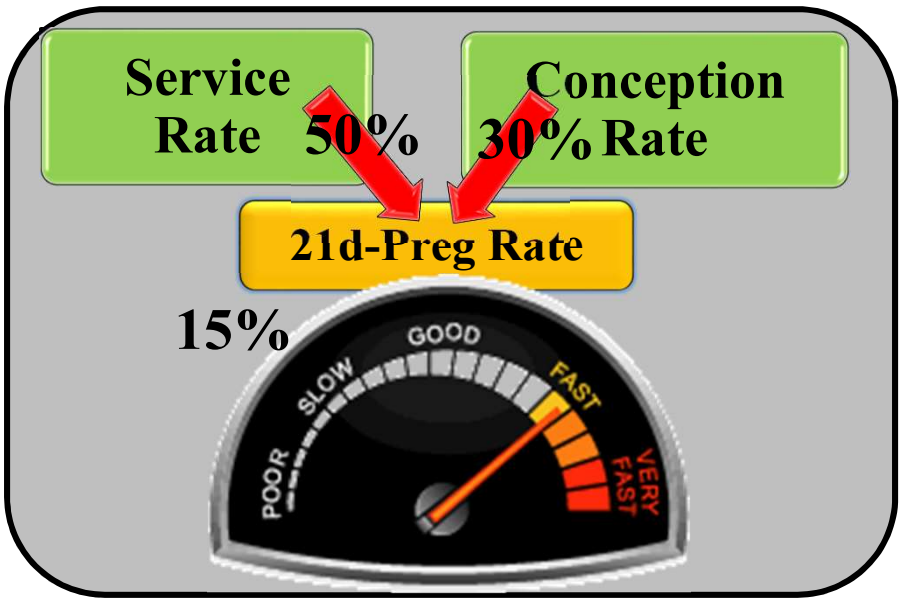
Measuring Reproductive Efficiency on dairy farms

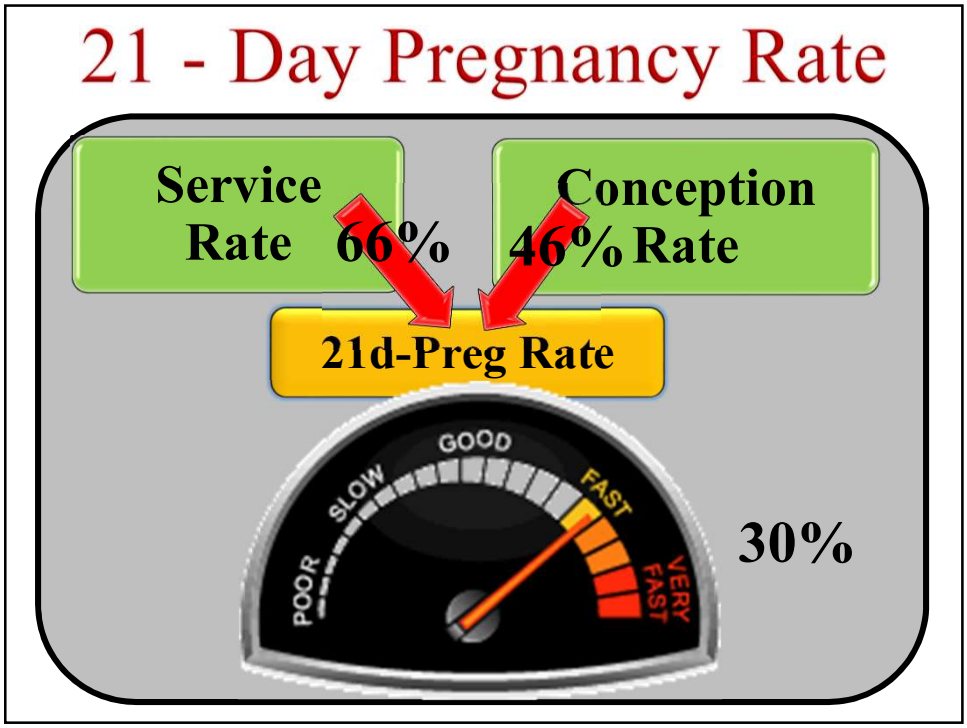
21-day Pregnancy Rate

Percentage of eligible cows that become pregnant during a 21-day period.

Eligible cow = Non-pregnant cow, past the voluntary waiting period, and designated for breeding .

$$\frac{\text{\# of Cows that become pregnant in a 21-day Period}}{\text{\# of Cows Eligible for AI}}$$





Farm 1; VWP= 40 DIM				Farm 2; VWP= 76 DIM		
Pregnancy Eligible	Pregnant	21-day Preg Rate	Date	Pregnancy Eligible	Pregnant	21-dPreg Rate
192	24	12%	5/1/2014	131	46	35%
199	30	15%	5/22/2014	114	27	24%
230	32	14%	6/12/2014	126	41	33%
237	35	15%	7/03/2014	111	32	29%
263	56	21%	7/24/2014	101	30	30%
261	35	13%	8/14/2014	94	29	31%
294	55	19%	9/04/2014	93	27	29%
279	64	23%	9/25/2014	101	35	35%
224	21	9%	10/16/2014	114	49	43%
0	0	0	11/6/2014	92	29	32%
2,179	352	16%	TOTAL	1,077	345	32%

21-Day Pregnancy Rate for Farm 1; VWP= 40 DIM

Date	Breeding Eligible	Bred	Service Rate, %	Pregnancy Eligible	Pregnant	21-day Preg Rate
5/1/2014	**195**	**111**	**57%**	**192**	**24**	**12%**
5/22/2014	**204**	**106**	**52%**	**199**	**30**	**15%**
6/12/2014	**233**	**110**	**47%**	**230**	**32**	**14%**
7/03/2014	**241**	**122**	**51%**	**237**	**35**	**15%**
7/24/2014	**269**	**158**	**59%**	**263**	**56**	**21%**
8/14/2014	**266**	**122**	**46%**	**261**	**35**	**13%**
9/04/2014	**305**	**173**	**57%**	**294**	**55**	**19%**
9/25/2014	**283**	**147**	**52%**	**279**	**64**	**23%**
10/16/2014	**265**	**127**	**48%**	**224**	**21**	**9%**
11/6/2014	**262**	**139**	**53%**	**0**	**0**	**0**
TOTAL	**2,261**	**1,176**	**52%**	**2,179**	**352**	**16%**

21-Day Pregnancy Rate for Farm 2; VWP= 76 DIM

Date	Breeding Eligible	Bred	Service Rate, %	Pregnancy Eligible	Pregnant	21-day Preg Rate
5/1/2014	**136**	**92**	**68%**	**131**	**46**	**35%**
5/22/2014	**117**	**76**	**65%**	**114**	**27**	**24%**
6/12/2014	**127**	**84**	**66%**	**126**	**41**	**33%**
7/03/2014	**112**	**73**	**65%**	**111**	**32**	**29%**
7/24/2014	**102**	**65**	**64%**	**101**	**30**	**30%**
8/14/2014	**96**	**68**	**71%**	**94**	**29**	**31%**
9/04/2014	**93**	**56**	**60%**	**93**	**27**	**29%**
9/25/2014	**103**	**73**	**71%**	**101**	**35**	**35%**
10/16/2014	**115**	**83**	**72%**	**114**	**49**	**43%**
11/6/2014	**92**	**62**	**67%**	**92**	**29**	**32%**
TOTAL	**1,093**	**732**	**67%**	**1,077**	**345**	**32%**

For one year




Farm 1 AI number	Pregnant/ AI (P/AI)	Pregnant	Total
First	**32.3%**	**146**	**452**
Overall 2nd+	**33.0%**	**210**	**637**
Total	**32.7%**	**356**	**1089**

Farm 2 AI number	Pregnant/ AI (P/AI)	Pregnant	Total
First	**57.7%**	**205**	**355**
Overall 2nd+	**43.7%**	**164**	**375**
Total	**50.5%**	**369**	**730**




Item	Farm 1	Farm 2	Difference
21-d Preg Rate	16%	32%	32-16= 16 16/16 =100%
Service Rate	52%	67%	15/52=28.8%
Pregnant/AI (P/AI)	32.7% (356/1089)	50.5% (369/730)	17.8/32.7 = 54.4%
First Service P/AI	32.3% (146/452)	57.7% (205/355)	25.4/32.3 = 78.6%
2+ Service P/AI	33.0% (210/637)	43.7% (164/375)	10.7/33 = 32.4%

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21-d Preg Rate	16%	32%	100%
Service Rate	52%	67%	28.8%
Pregnant/AI (P/AI)	32.7% (356/1089)	50.5% (369/730)	54.4%
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2^{+} Service P/AI	33.0% (210/637)	43.7% (164/375)	32.4%
PGF Use	2.79/cow	4.92/cow	2.13 X $2.65 = **$5.64**
GnRH Use			
Straws/cow			

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PGF Use	2.79/cow	4.92/cow	2.13 X $2.65 = **$5.64**
GnRH Use	3.09/cow	5.92/cow	2.83 X $1.55 = **$4.39**
Straws/cow			

Item	Farm 1	Farm 2	Difference
21-d Preg Rate	16%	32%	100%
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GnRH Use	3.09/cow	5.92/cow	2.83 X $1.55 = **$4.39**
Straws/cow	3.06/pregnancy 3.17/cow	1.98/pregnancy 2.46/cow	-0.71 X $20.00 = **-$14.20**

Measuring Reproductive Efficiency on dairy farms

21-day Pregnancy Rate

Percentage of eligible cows that become pregnant during a 21-day period.

1995 reasonable goal >15%

2000 reasonable goal > 18%

2005 reasonable goal > 20%

2010 reasonable goal > 22%

2015 reasonable goal > 25%

2020 > 30%

Progams that improve service rate

Programs that improve fertility

30:30

4 Keys to Achieving a 30% Pregnancy Rate in a 30,000 lb. Dairy Herd

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Paul M. Fricke, Ph.D.

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DAIRY SCIENCE
University of Wisconsin-Madison

4 Keys to a 30% Pregnancy Rate

Key 1: Aggressively inseminate cows at the end of the voluntary waiting period.

Key 2: Increase fertility to First AI.

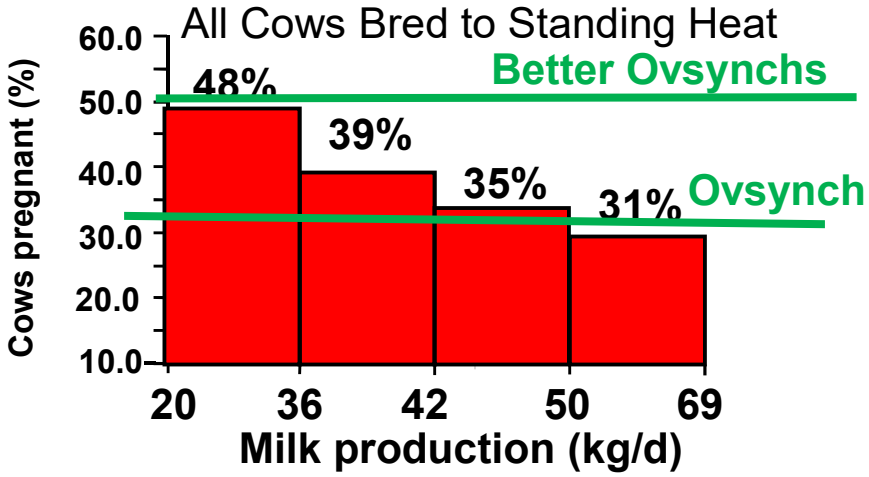
Key 3: Identify non-pregnant cows and aggressively reinseminate them.

Key 4: Increase fertility to second and later AIs.

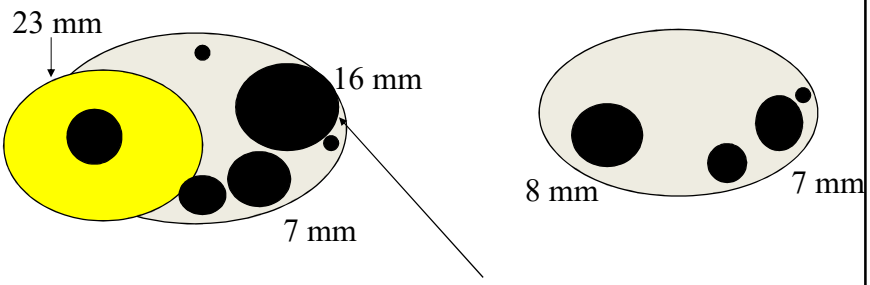
Outline

1. Use fertility program for first AI
2. Get cows in high fertility cycle
3. Use fertility program for Resynchs
4. Consistency, consistency, consistency

Conception Rate in relation to milk production
Santos et al., 2001

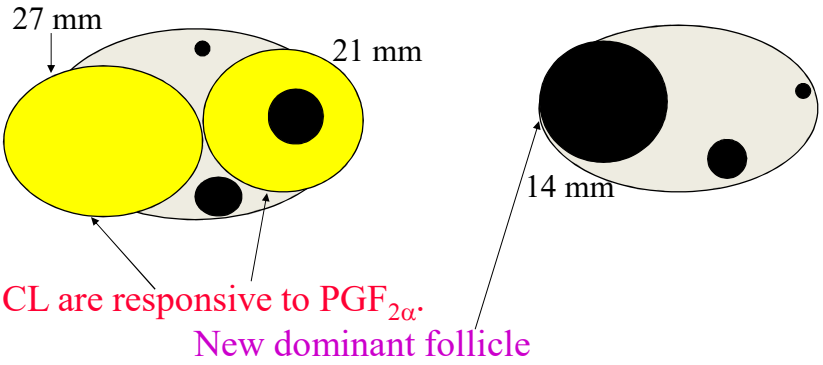


Injecting 1st GnRH
Day 6 or 7 of the cycle



GnRH induced LH surge will ovulate the dominant follicle.

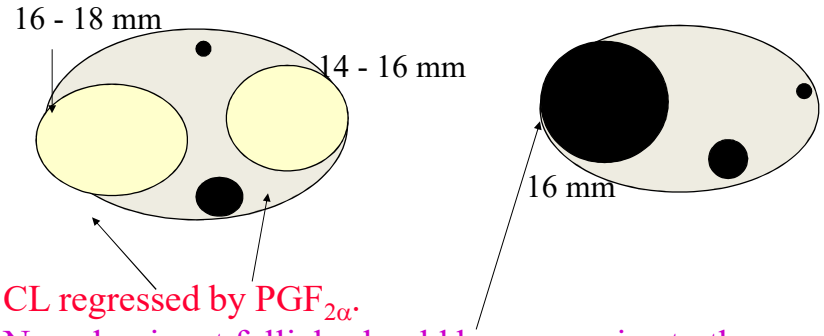
7 Days Later



CL are responsive to $PGF_{2\alpha}$.

New dominant follicle

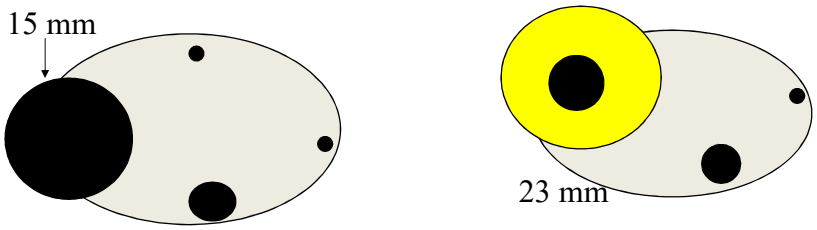
Day of 2nd GnRH



CL regressed by $PGF_{2\alpha}$.

New dominant follicle should be responsive to the GnRH induced LH surge.

One Week after AI

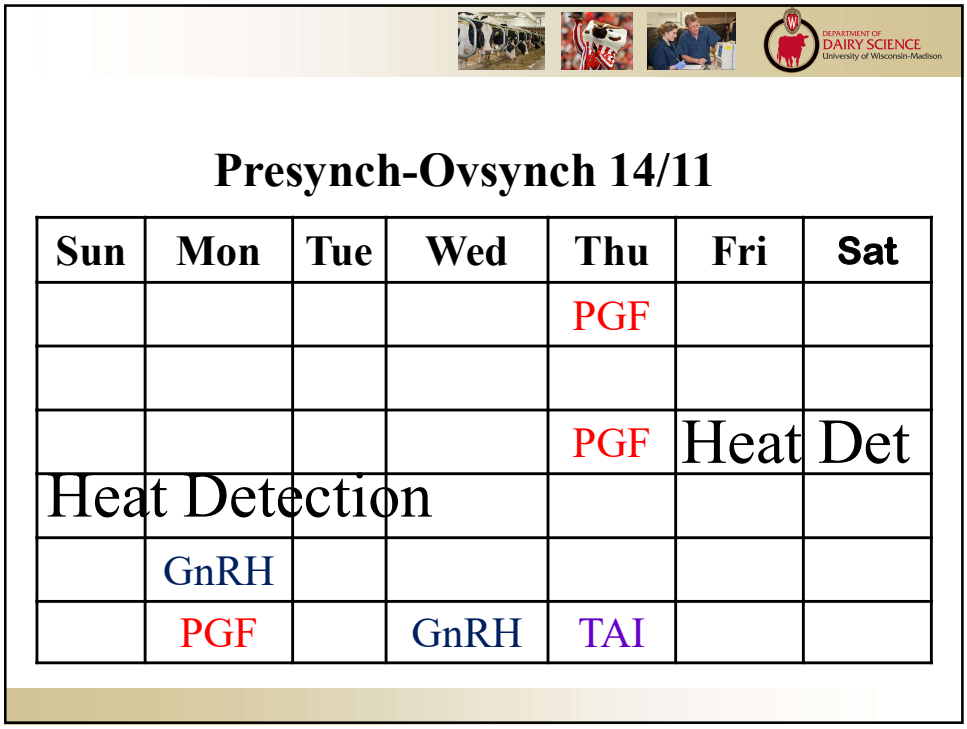




Presynch-Ovsynch 14/12

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

	Ovsynch	Presynch -Ovsynch	
Moreira et al., 1997 Florida (only cycling cows)	29%[a] (76/262)	43%[b] (114/264)	+14% (+48%)
Stevenson et al., 2003 Kansas State (all cows)	36%[a] (98/272)	48%[b] (133/278)	+12% (33%)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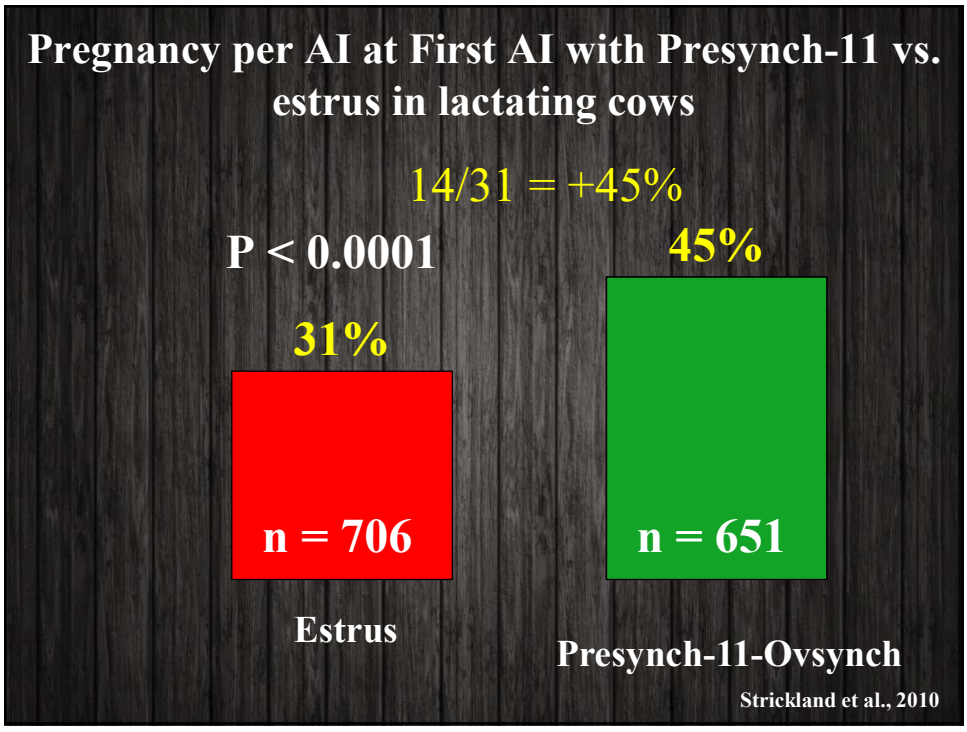
Presynch-Ovsynch 14/11
Sun
Mon
Tue
Wed
Thu
Fri
Sat
PGF
PGF
Heat Det
Heat Detection
GnRH
PGF
GnRH
TAI


Pregnancy per AI at First AI with Presynch-11 vs. estrus in lactating cows
14/31 = +45%
P < 0.0001
45%
31%
n = 706
n = 651
Estrus
Presynch-11-Ovsynch
Strickland et al., 2010

Double Ovsynch for First TAI

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

Double Ovsynch is a Fertility Program

J. Dairy Sci. 100:8507–8517
https://doi.org/10.3168/jds.2017-13210

Fertility of lactating Holstein cows submitted to a Double-Ovsynch protocol and timed artificial insemination versus artificial insemination after synchronization of estrus at a similar day in milk range

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*Department of Dairy Science, University of Wisconsin, Madison 53706
†Diessen Serviços Veterinários Lda, 7001 Évora, Portugal
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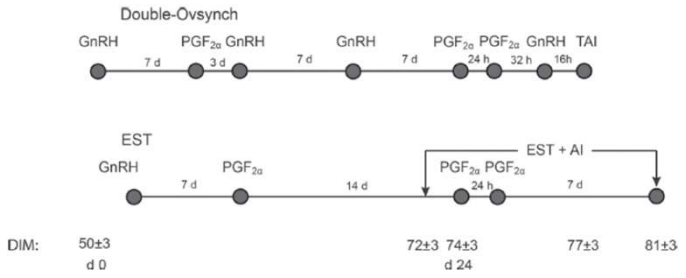

Double Ovsynch is a Fertility Program

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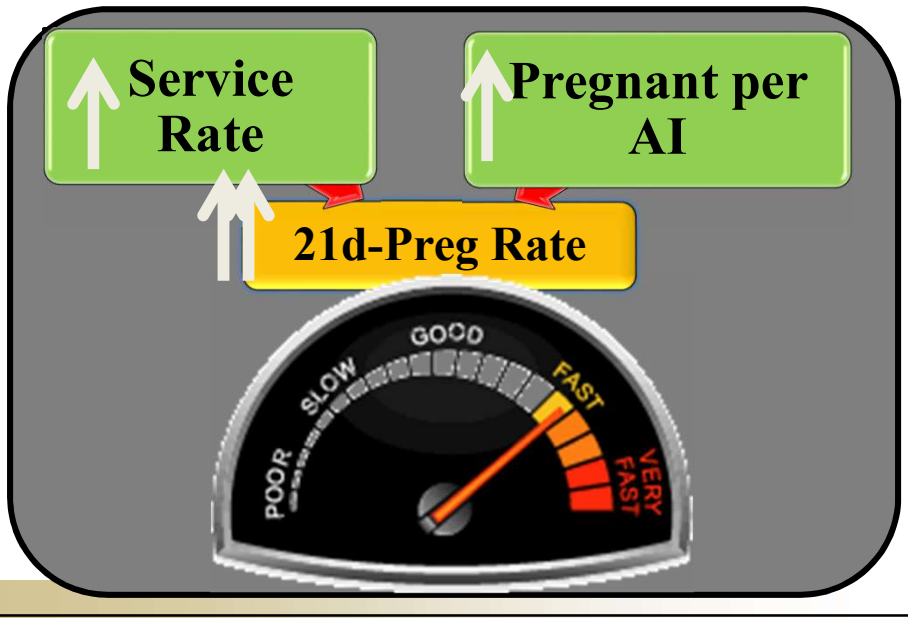
	Double Ovsynch	AI to Estrus	Difference % (P Value)
n	294	284	
Submission Rate %	100% (294/294)	77.5% (220/284)	+ 29% (P < 0.01)
P/AI % at 33 d	49.0% (144/294)	38.6% (85/220)	+ 27% (P = 0.02)
P/AI, % at 66 d	44.6% (131/294)	36.4% (80/220)	+23% (P = 0.05)
% Pregnant of all cows	**44.6% (131/294)**	**28.2% (80/284)**	**+58% (P < 0.01)**

21 - Day Pregnancy Rate using Fertility Programs



Don’t Worry! Breed Happy!

Outline

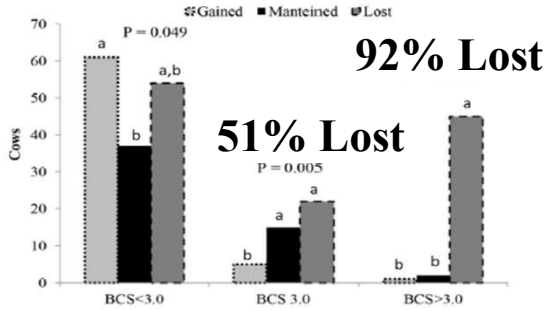
1. Use fertility program for first AI
2. Get cows in high fertility cycle
3. Use fertility program for Resynchs
4. Consistency, consistency, consistency

Association of changes among body condition score during the transition period with NEFA and BHBA concentrations, milk production, fertility, and health of Holstein cows

R.V. Barletta [a,*], M. Maturana Filho [b], P.D. Carvalho [a], T.A. Del Valle [b], A.S. Netto [b], F.P. Rennó [b], R.D. Mingoti [b], J.R. Gandra [d], G.B. Mourão [c], P.M. Fricke [a], R. Sartori [c], E.H. Madureira [b], M.C. Wiltbank [a]

Overall 50% of cows lost BCS.

34% Lost



92% Lost

51% Lost

Fig. 1. Distribution of cows that lost (☐; n = 122), maintained (■; n = 54) or gained (▫; n = 69) BCS during the transition period (days −21 to +21 relative to parturition), according to BCS at Day −21 relative to parturition.
[abc] Different superscript letters differ at P < 0.05.

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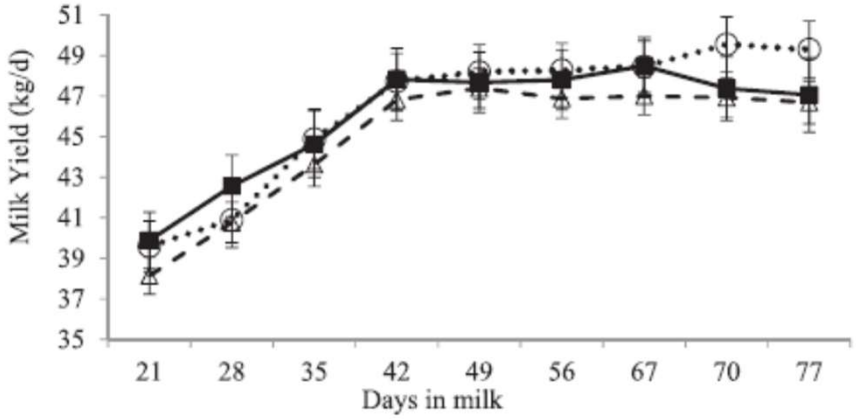
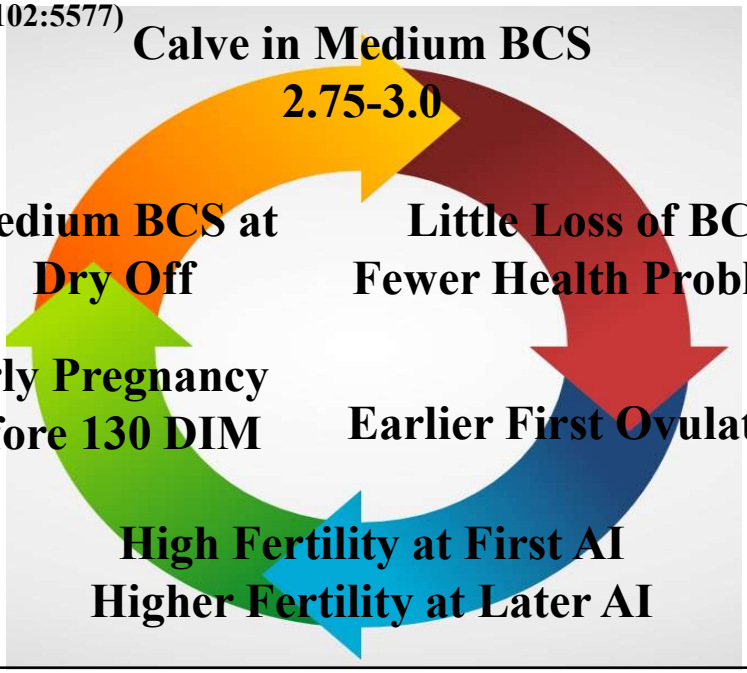
No difference in milk yield.



Diseases in cows with different BCS Changes			
Disease	**Gained BCS**	**Maintained BCS**	**Lost BCS**
Number of cows	**66**	**52**	**116**
Metritis	**19.7%**	**21.2%**	**23.3%**
Mastitis	**16.7%^{b}**	**17.3%^{a,b}**	**29.3%^{a}**
Ketosis	**15.2%**	**19.2%**	**26.7%**
Pneumonia	**9.1%**	**11.5%**	**14.7%**
>1 Health Problem	**39.4%^{b}**	**46.2%^{b}**	**62.9%^{a}**

Reproduction in cows with different BCS Changes			
Disease	**Gained BCS**	**Maintained BCS**	**Lost BCS**
Number of cows	**66**	**52**	**116**
Ovulatory Follicle, mm	**18.5 + 0.5**	**19.0 + 0.8**	**18.4 + 0.4**
Pregnant/AI, 30d Preg Diag	**53.0%^{a}**	**26.9%^{b}**	**18.3%^{b}**
Pregnant/AI, 60d Preg Diag	**45.5%^{a}**	**25.0%^{b}**	**15.7%^{b}**
Pregnancy Loss	**14.3%**	**7.1%**	**14.3%**
First Ovulation, d post-partum	**33.9 + 0.5^{a}**	**37.9 + 0.7^{b}**	**47.1 + 1.0^{c}**

High Fertility Cycle (Middleton, Minela, Pursley, 2019; J.D.S. 102:5577)



Comparison of Genomics and High Fertility Programs

Julio Giordano Laboratory at Cornell University

Genetic merit for fertility and type of reproductive management strategy affected the reproductive performance of primiparous lactating Holstein cows. ADSA Abstract #109 2019

2,400 First Lactation Dairy Cows:

Three groups by Genomic Merit for Reproduction

Two Groups for Reproductive Management

1) IATF – Double Ovsynch

2) AI to estrus (75%) + IATF (Ovsynch+CIDR)

Genomics and High Fertility Programs

	Double Ovsynch	AI to Estrus + TAI	Difference % (P Value)
n	1155	1245	
All Cows	**58.4% (675/1155)**	**48.9% (609/1245)**	**+19.4% (P < 0.0001)**

Genomics and High Fertility Programs

	Double Ovsynch	AI to Estrus + TAI	Overall Differences
n	1155	1245	
High Fertility Genomics			**59.7%[a] (468/784)**
Medium Fert Genomics			**52.4%[b] (426/812)**
Low Fertility Genomics			**49.5%[b] (398/804)**
All Cows	**58.4% (675/1155)**	**48.9% (609/1245)**	**+19.4% (P < 0.0001)**

Genomics and High Fertility Programs

	Double Ovsynch	AI to Estrus + TAI	Overall Differences
n	1155	1245	
High Fertility Genomics	**65.4%[a]**	**54.4%[a]**	**59.7%[a] (468/784)**
Medium Fert Genomics	**57.6%[b]**	**47.8%[b]**	**52.4%[b] (426/812)**
Low Fertility Genomics	**56.1%[b]**	**43.4%[b]**	**49.5%[b] (398/804)**
All Cows	**58.4% (675/1155)**	**48.9% (609/1245)**	**+19.4% (P < 0.0001)**

Outline

1. Use fertility program for first AI
2. Get cows in high fertility cycle
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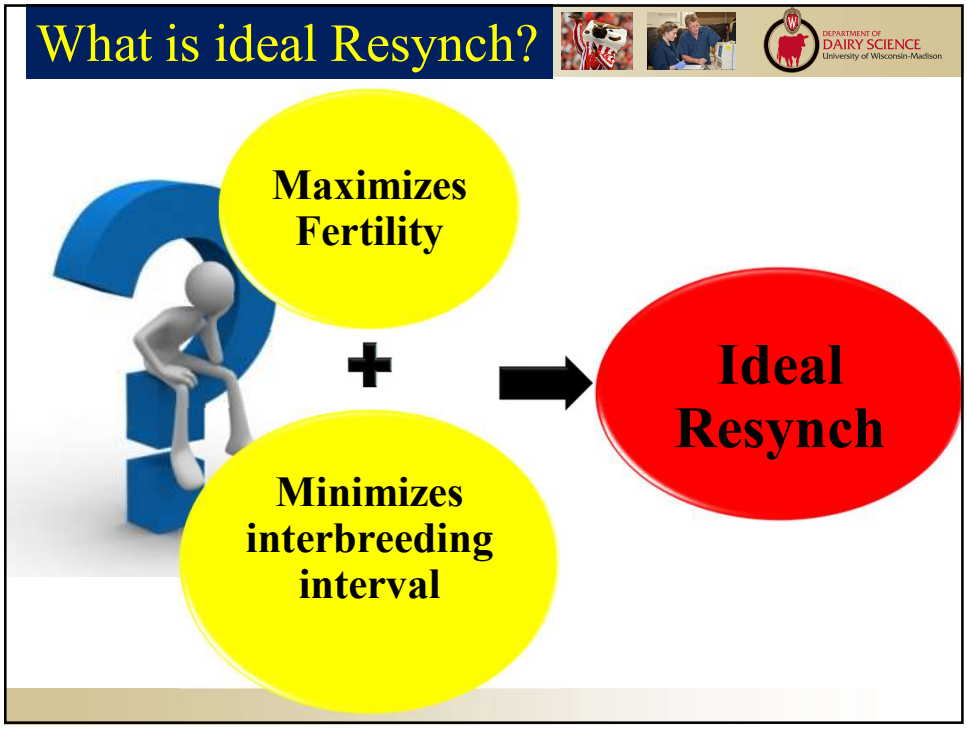
What is ideal Resynch?
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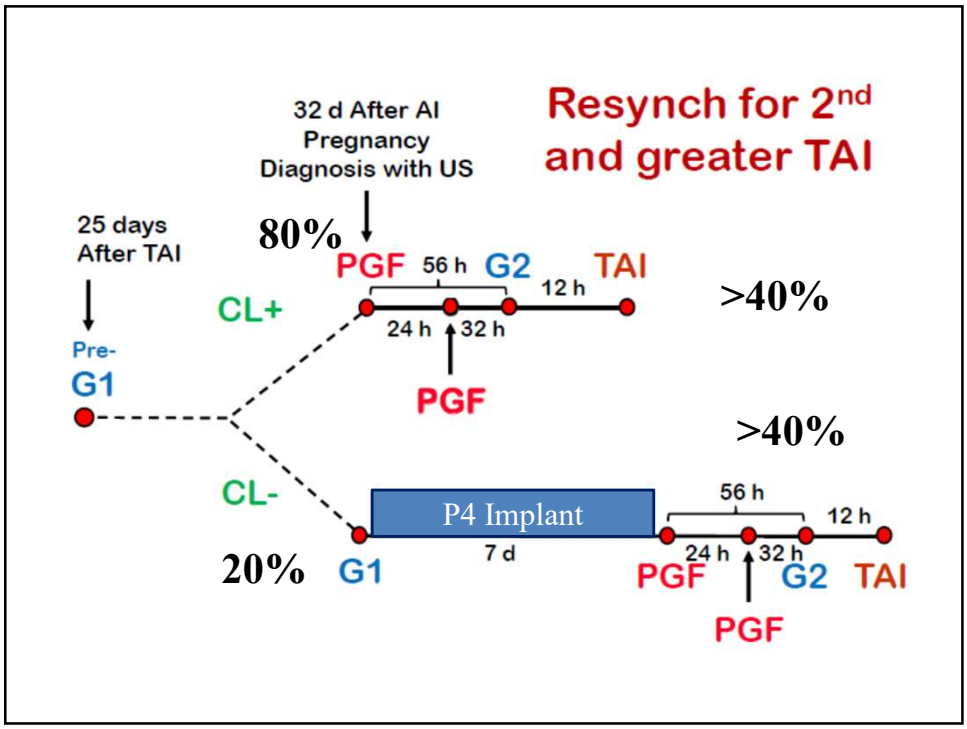
Maximizes Fertility
Minimizes interbreeding interval
Ideal Resynch


Resynch for 2nd and greater TAI
32 d After AI Pregnancy Diagnosis with US
25 days After TAI
80%
Pre-
G1
CL+
PGF
56 h
G2
12 h
TAI
24 h
32 h
PGF
>40%
>40%
CL-
P4 Implant
7 d
20%
G1
56 h
12 h
24 h
32 h
PGF
G2
TAI
PGF

First AI = Double Ovsynch

2nd+ AIs = Resynch-25 + CL verification

Sun	Mon	Tuse	Wed	Thur	Fri	Sat
					GnRH	
					PGF	
	GnRH					
	GnRH					
	PGF	PGF	GnRH	TAI		
Day 3						
Day 10						
Day 17						
Day 24	GnRH					
Day 31	Preg Check PGF	+PGF	GnRH	TAI		

35 days Between AIs

Outline

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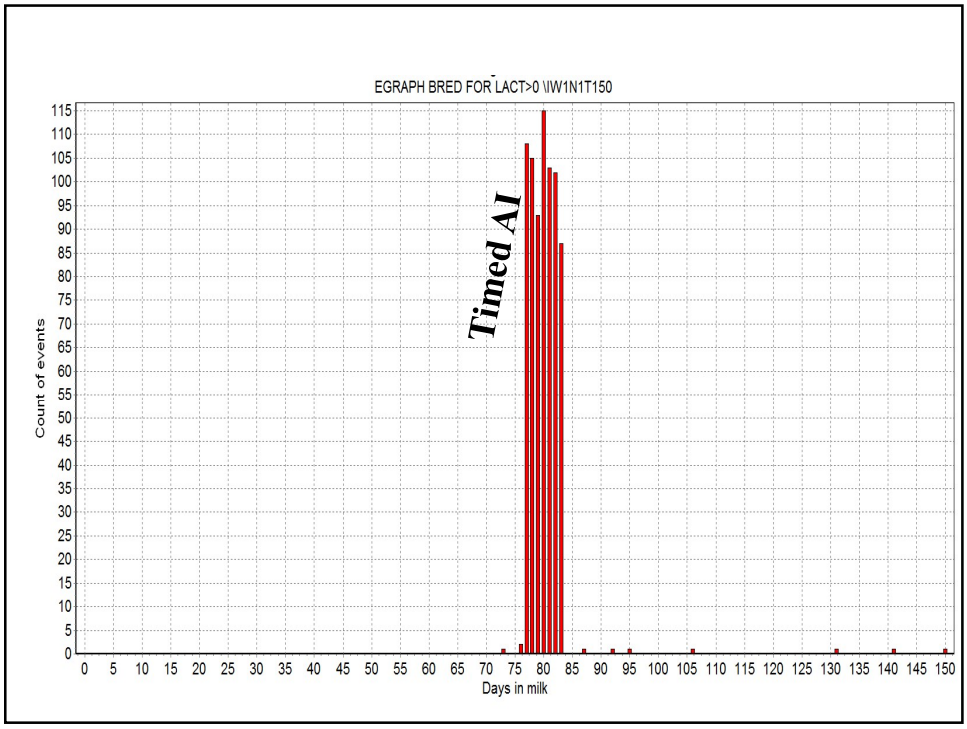
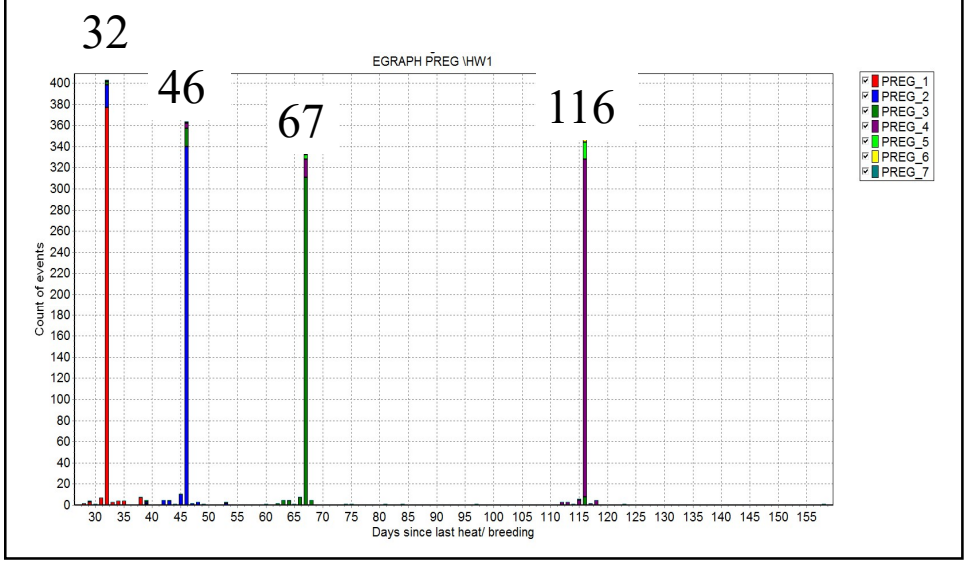
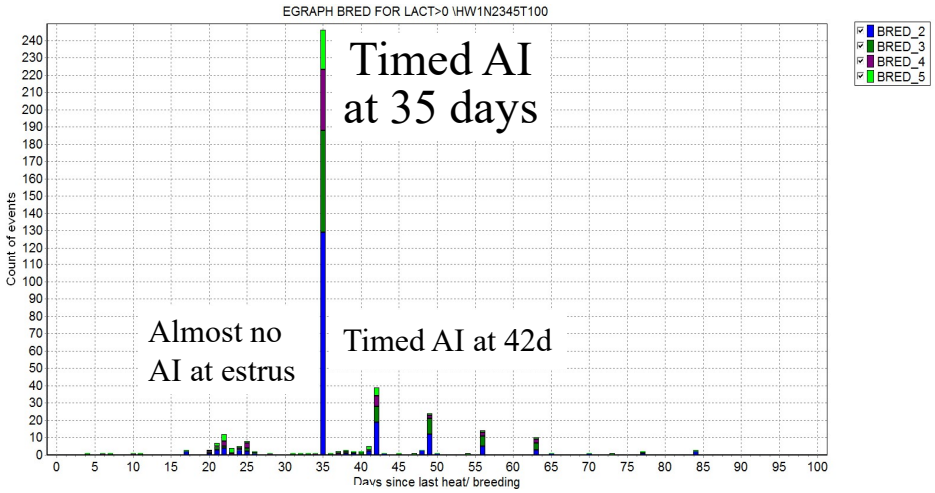


Pregnancy Diagnosis Calendar



Calendar for timing of 2nd and later AIs



IA anterior 35

On-farm Application

(Video)

Outline

1. Use fertility program for first AI
2. Get cows in high fertility cycle
3. Use fertility program for Resynchs
4. Consistency, consistency, consistency

NOTES