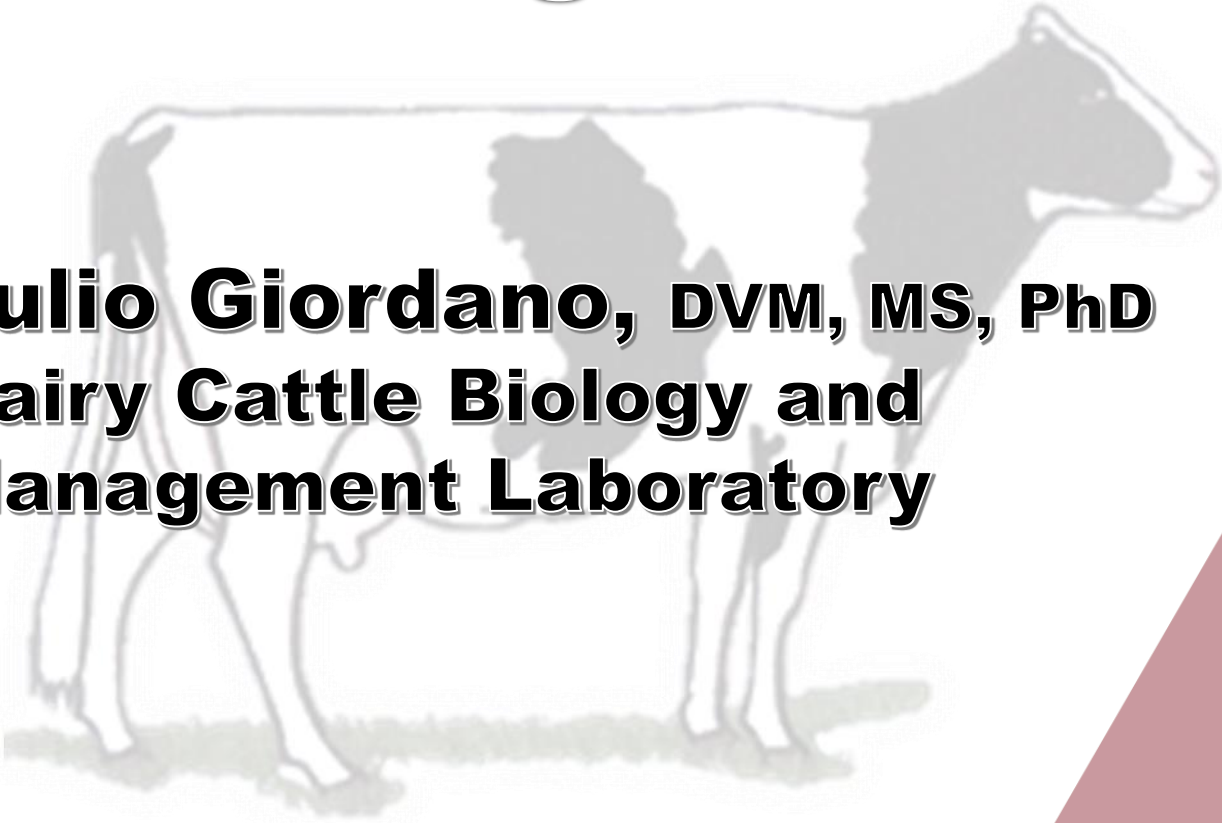


Strategies to Get Older Cows Pregnant

Julio Giordano, DVM, MS, PhD
**Dairy Cattle Biology and
Management Laboratory**



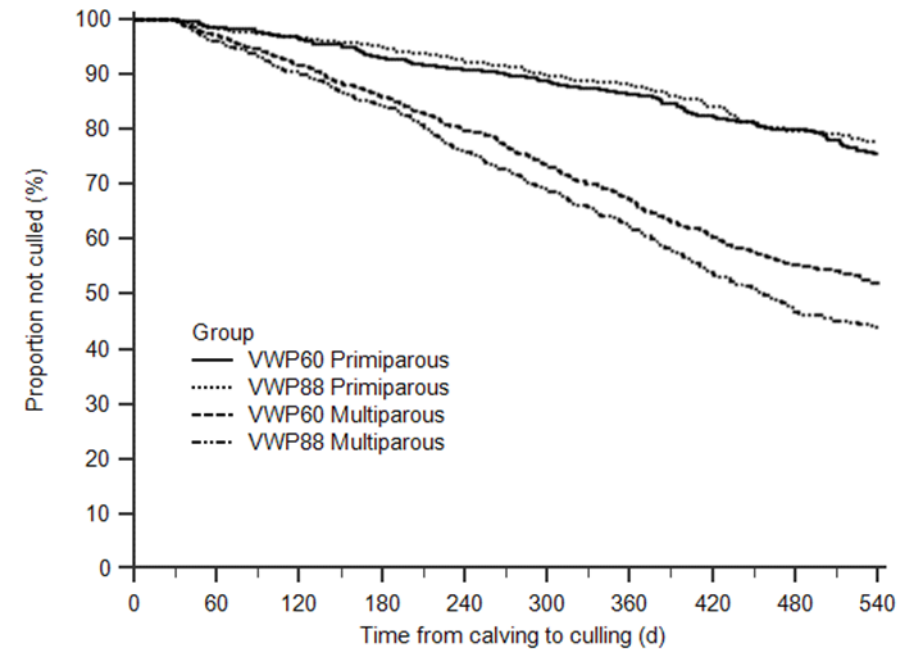
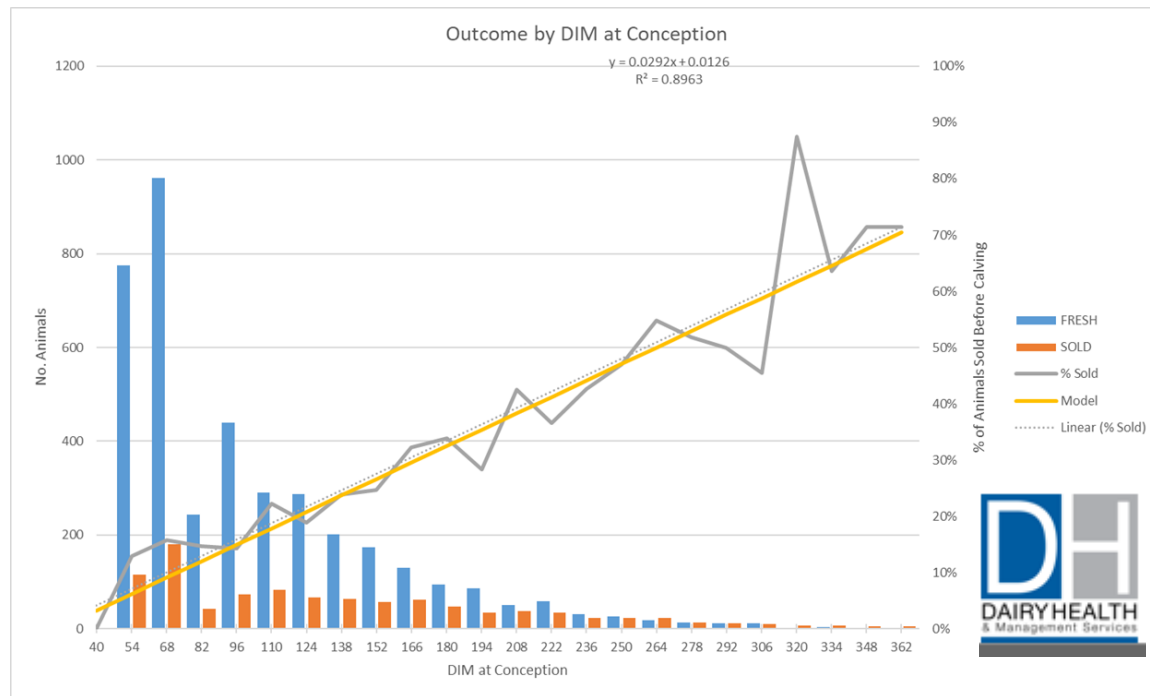
Cornell CALS
College of Agriculture and Life Sciences

Timely pregnancy is equal to insurance for cows to stay in the herd

Multiple associations between reproductive performance and herd survivability



Older cows (i.e., multiparous = lact>1) that get pregnant later in lactation are more likely to leave the herd

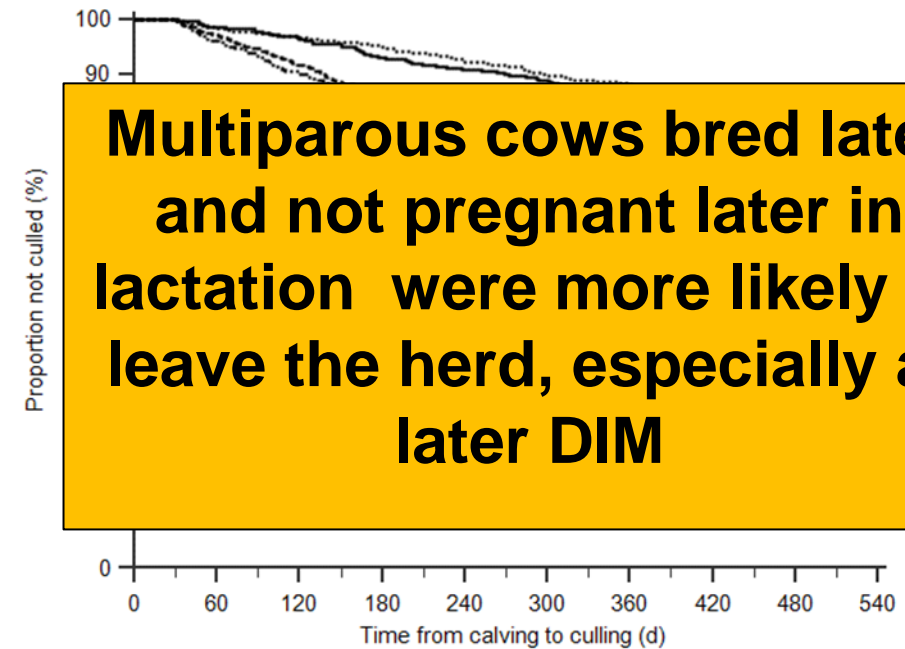
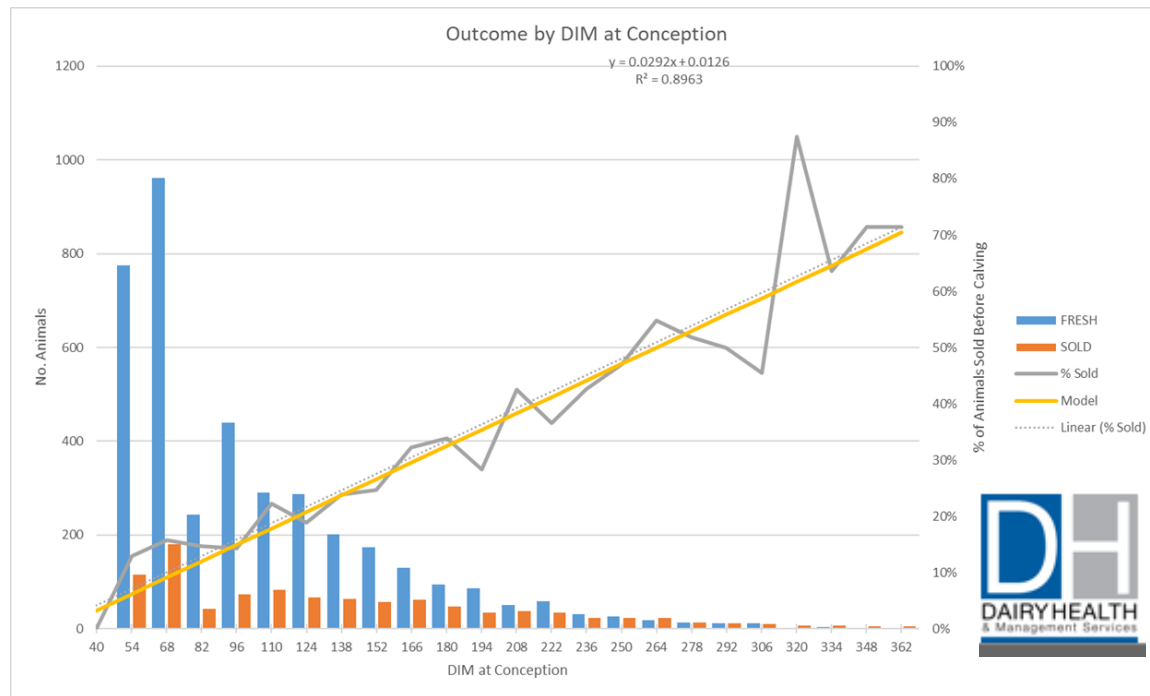


Timely pregnancy is equal to insurance for cows to stay in the herd

Multiple associations between reproductive performance and herd survivability



Older cows (i.e., multiparous = lact>1) that get pregnant later in lactation are more likely to leave the herd



Multiparous cows bred later and not pregnant later in lactation were more likely to leave the herd, especially at later DIM

Reproductive performance decline in dairy cattle manifested in multiple ways



Age is negatively associated with reproductive performance



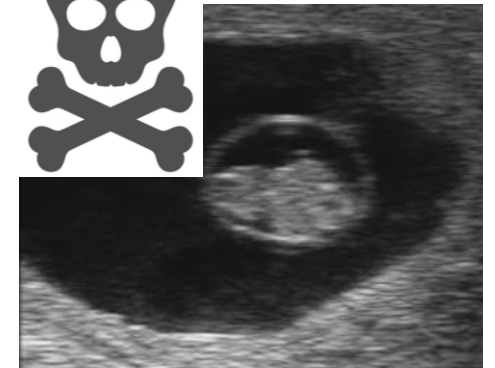
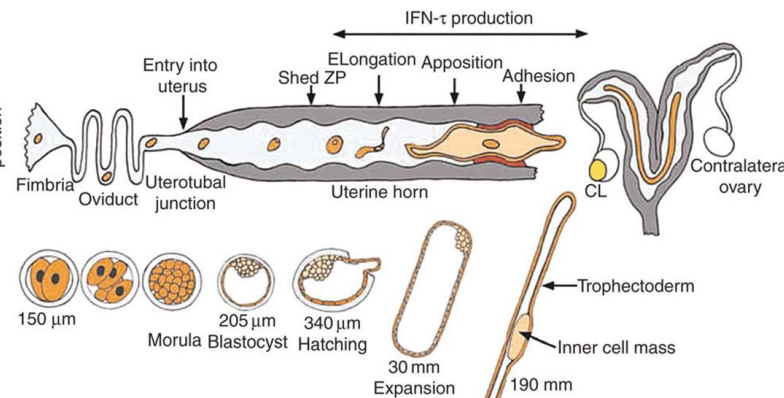
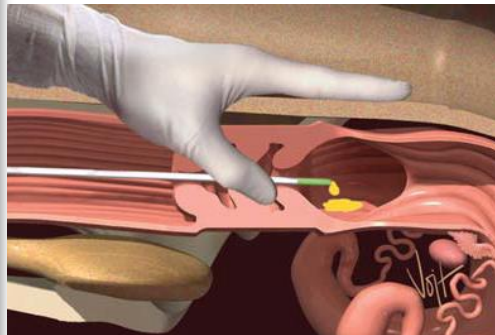
Reduced expression of estrus



Reduced fertility to AI









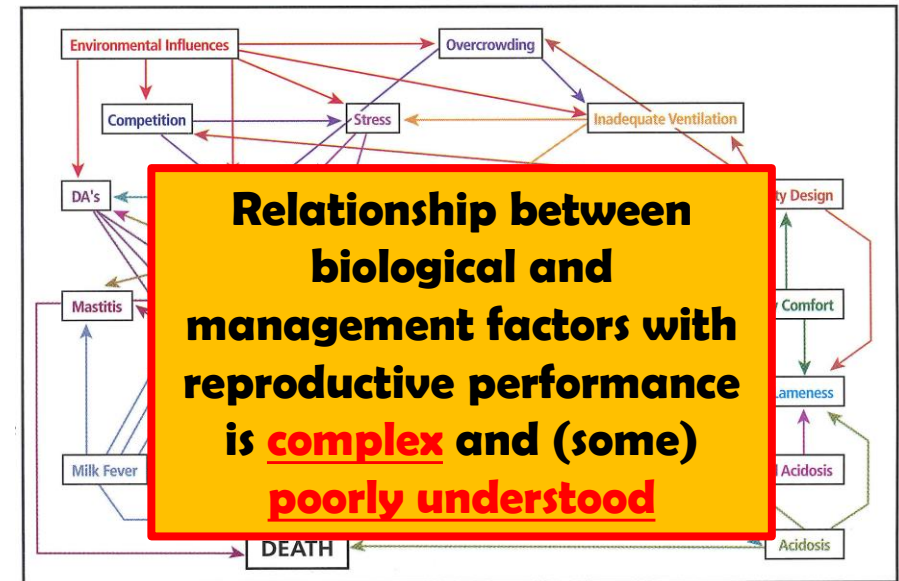
Increased rate of pregnancy loss



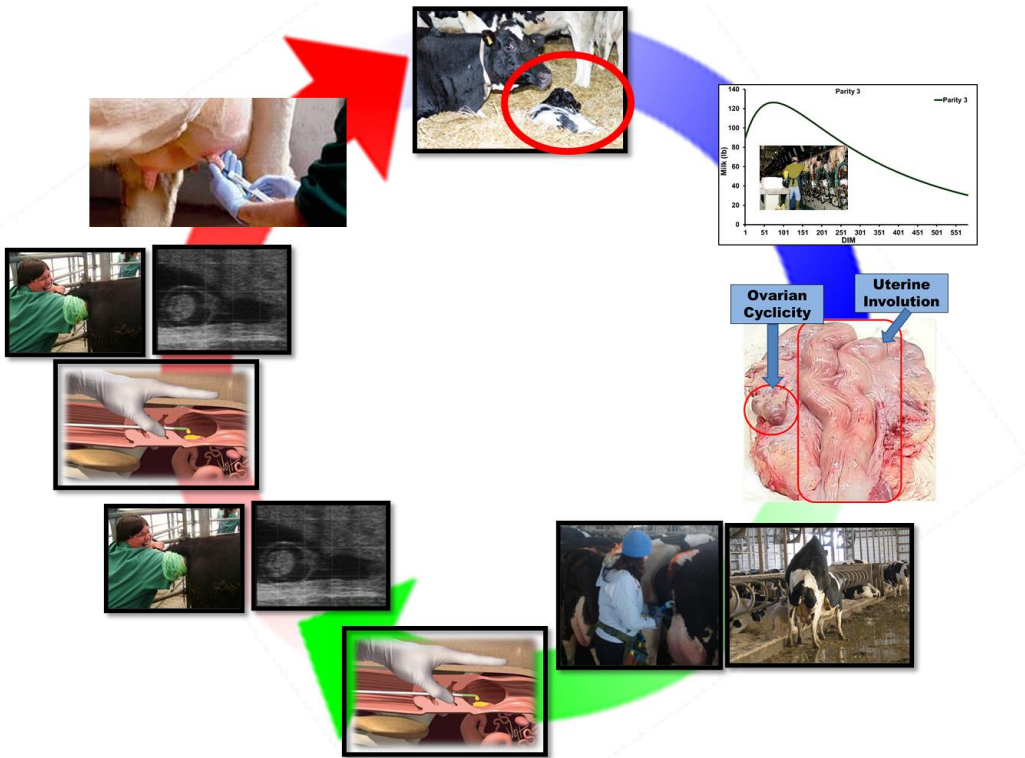
Reproductive performance decline driven by multiple factors

Factors driving decline in performance

-  **Longer and more frequent exposure to factors that reduce fertility**
-  **Calvings**
-  **Health issues – direct and indirect effects on reproduction**
-  **Oxidative stress due to high metabolic rate**
-  **Greater milk production – hormone metabolism**
-  **Larger uterus**



Longer and more frequent exposure to factors that reduce fertility



Health Problems in the First 60 DIM and Pregnancy in Dairy Cows

Category	Pregnant, %	Adjusted OR (95% CI)	P
Healthy	51.4	1.00	
1 case of disease	43.3	0.79 (0.69 – 0.91)	0.001
> 1 case of disease	34.7	0.57 (0.48 – 0.69)	< 0.001

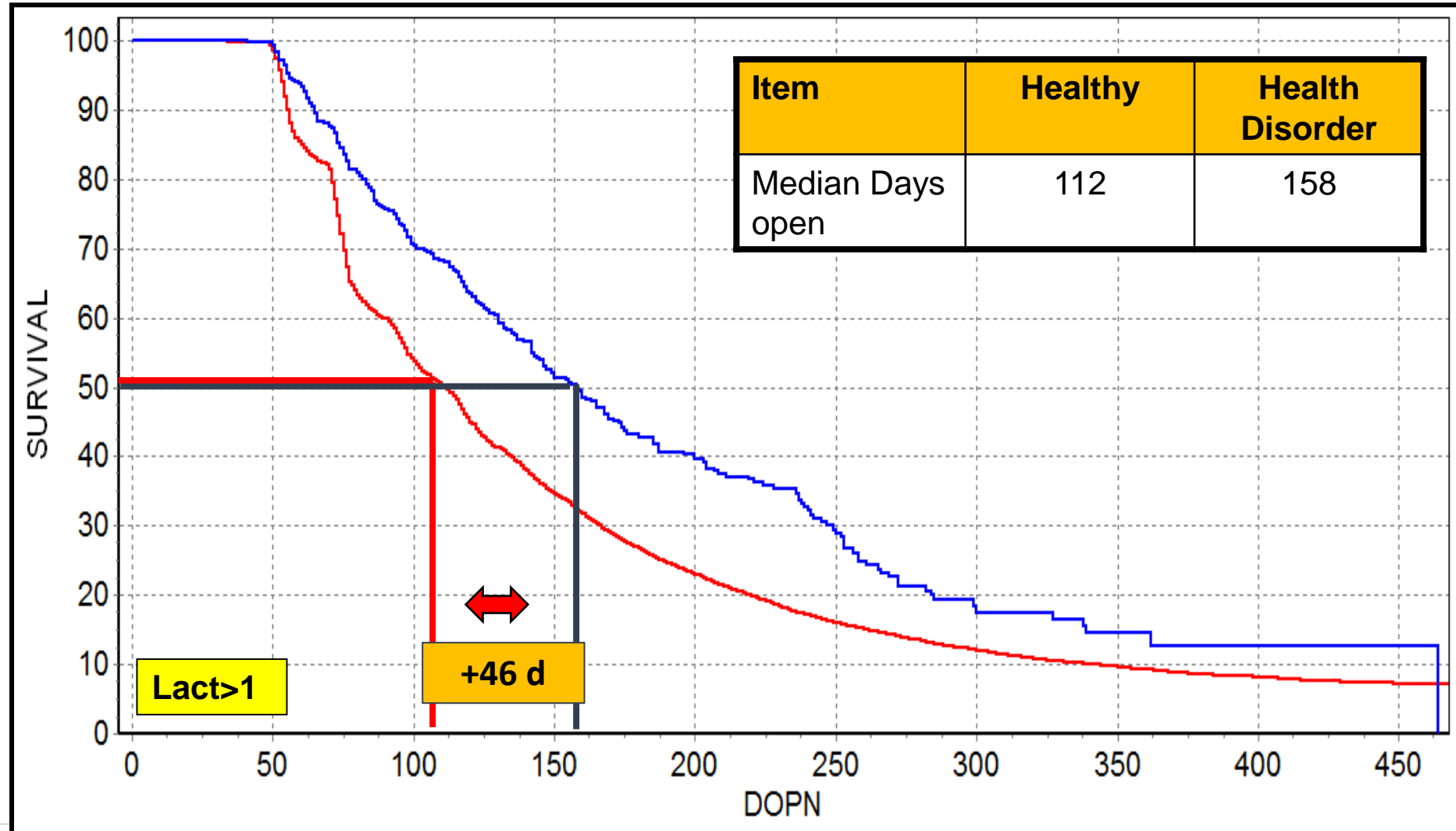
Type of health problem

Calving problem	40.3	0.75 (0.63 – 0.88)	< 0.001
Metritis	37.8	0.66 (0.56 – 0.78)	< 0.001
Clinical endometritis	38.7	0.62 (0.52 – 0.74)	< 0.001
Fever postpartum	39.8	0.60 (0.48 – 0.65)	< 0.001
Mastitis	39.4	0.84 (0.64 – 1.10)	0.20
Clinical ketosis	28.8	0.50 (0.36 – 0.68)	< 0.001
Lameness	33.3	0.57 (0.41 – 0.78)	< 0.001
Pneumonia	32.4	0.63 (0.32 – 1.27)	0.20
Digestive problem	36.7	0.78 (0.46 – 1.34)	0.38

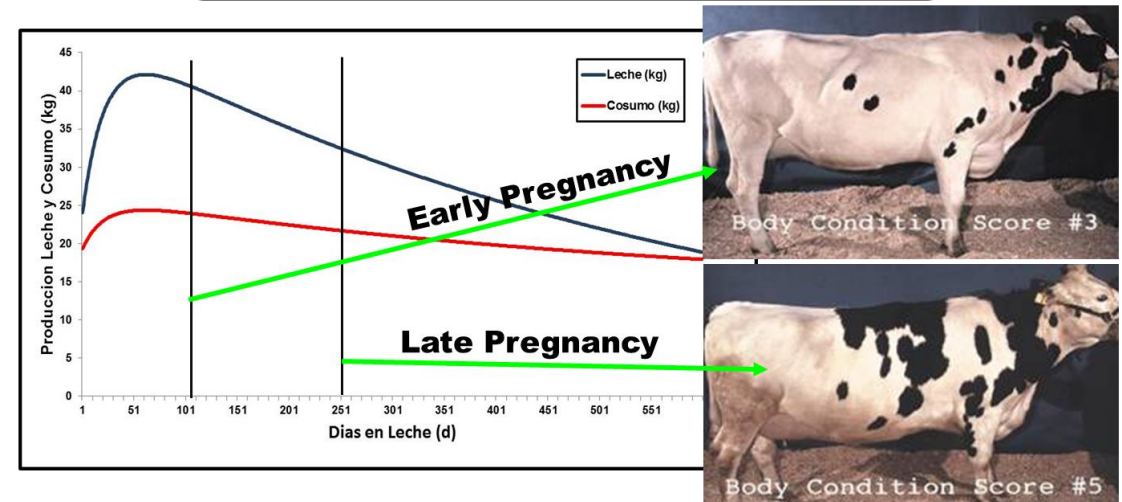
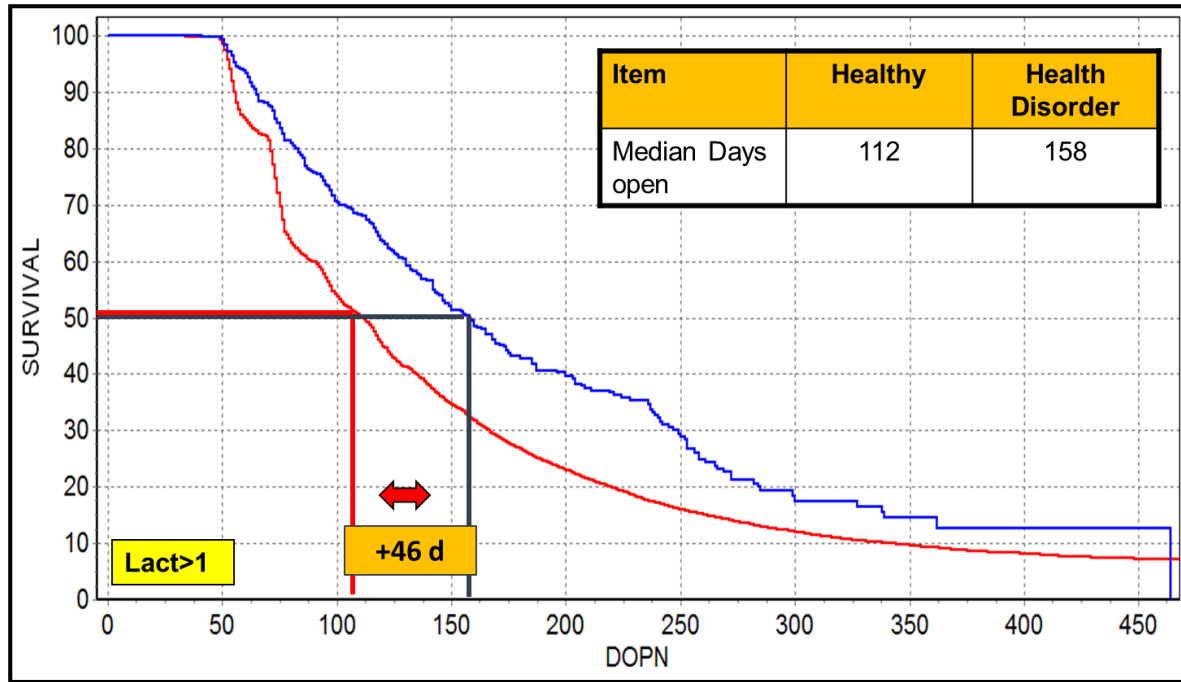
5,719 postpartum dairy cows evaluated daily for health disorders in seven dairy farms in the US

Santos *et al.* (2010) Soc. Reprod. Fertil. 67:387-403

Early lactation health issues carry on through whole breeding period



Early lactation health issues carry on through whole breeding period and subsequent lactations



Older cows have a larger uterus and a larger uterus is associated with reduced fertility

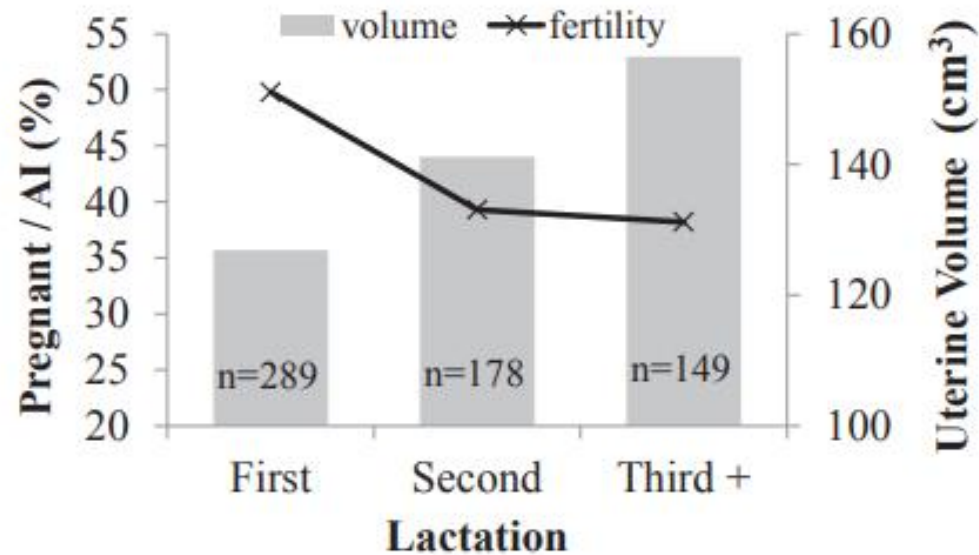


Fig. 1. Comparison of uterine volume (cm³) and percentage of cows pregnant per artificial insemination (P/AI, %) presented by cows in the first, second, or third and greater lactations.

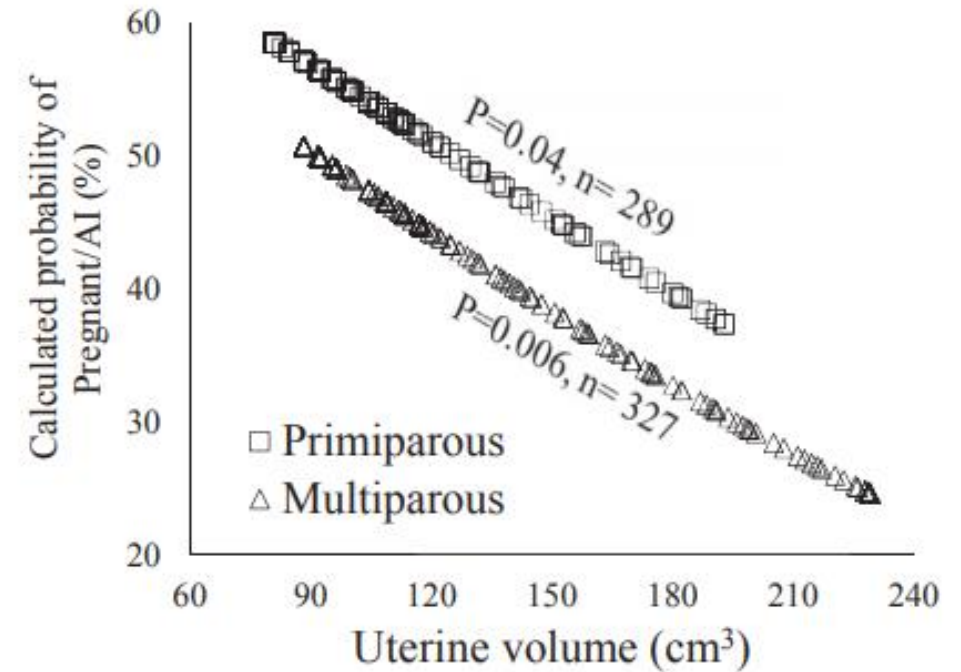
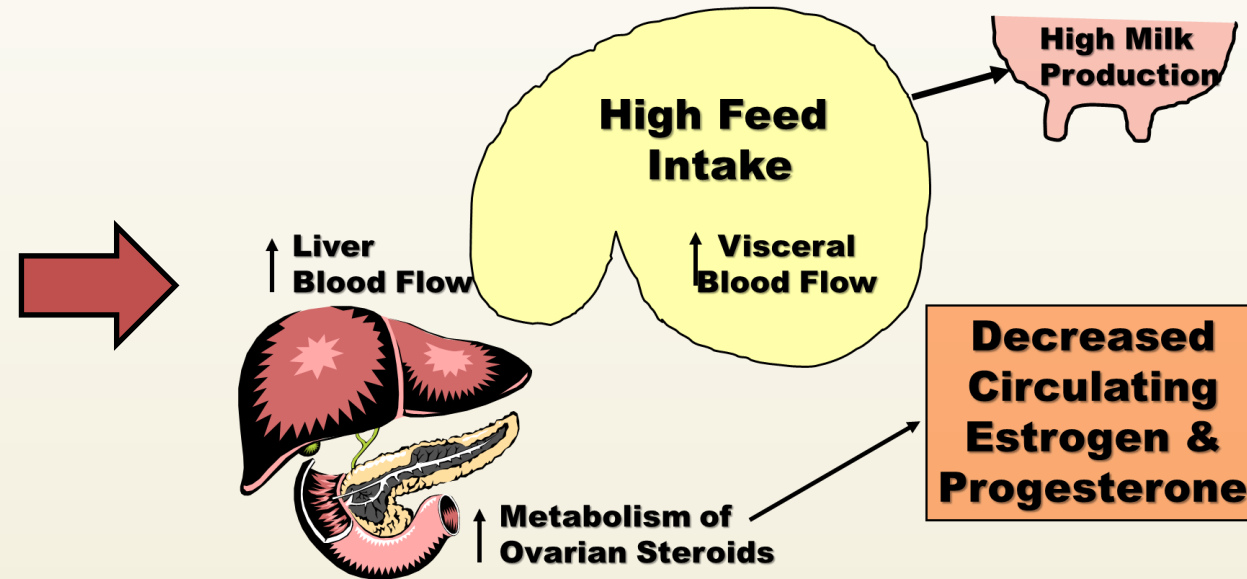
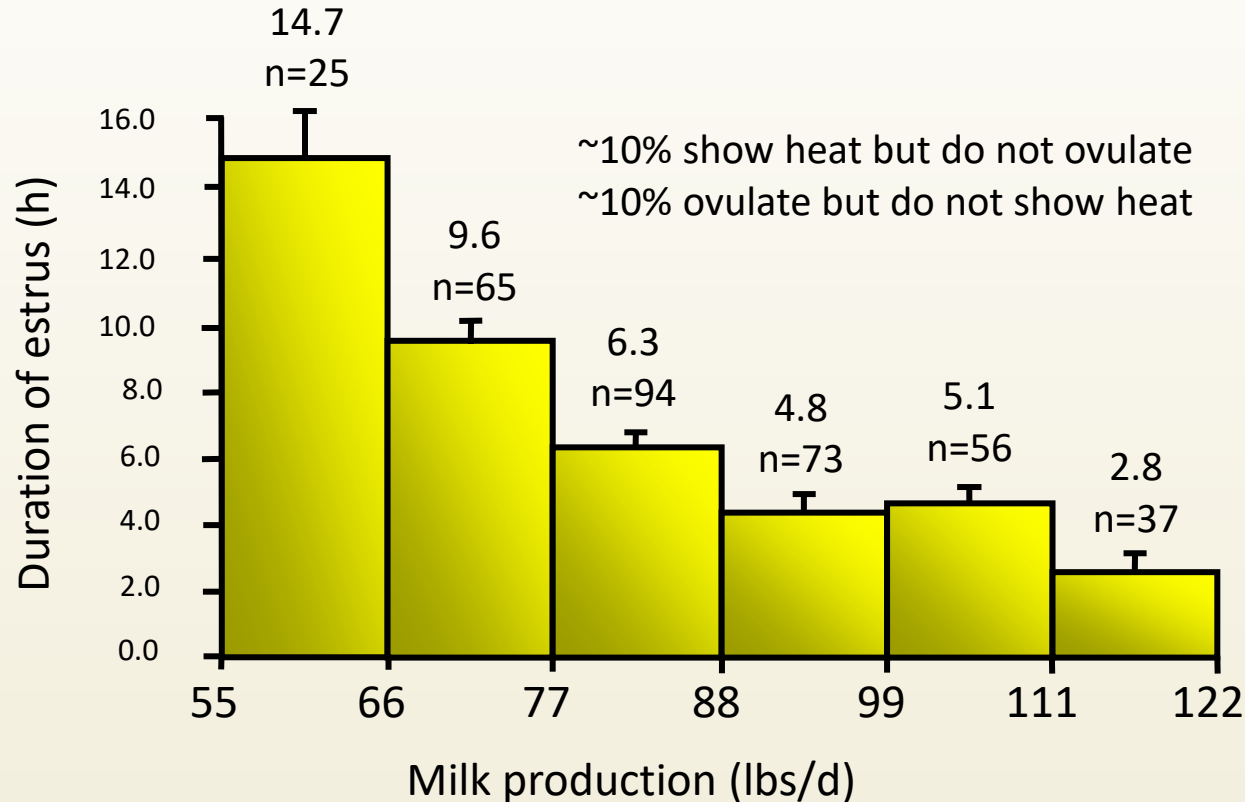


Fig. 2. Logistic regressions for association of probability of pregnancy with uterine volume in primiparous and multiparous lactating dairy cows. AI, artificial insemination.

Older cows produce more milk and increased production is associated with reduced expression of estrus and reduced fertility



- Analysis included all single ovulations (n=350) except first postpartum ovulations
- Average milk production during the 10 days before estrus

No single strategy to improve performance of older cows

- 🐄 Improving reproductive performance of older cows may require adjustments to several aspects of reproductive management – “holistic approach”
- 🐄 Minimize occurrence and impact of risk factors for poor reproductive performance – win-win!
- 🐄 Consider prioritizing reproductive management of multiparous cow groups



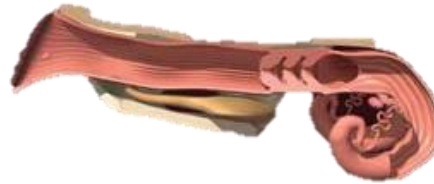
Reproductive performance of older cows can be improved

General concepts to consider for improved repro performance

 **Promote expression of estrus**



 **Promote a healthy uterus**



 **Promote ovulation of a healthy oocyte and formation of a good CL**



 **Promote maintenance of pregnancy**



Individual cow solutions versus herd solutions



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Reduce negative impact of diseases on reproductive performance

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5,719 postpartum dairy cows evaluated daily for health disorders in seven dairy farms in the US

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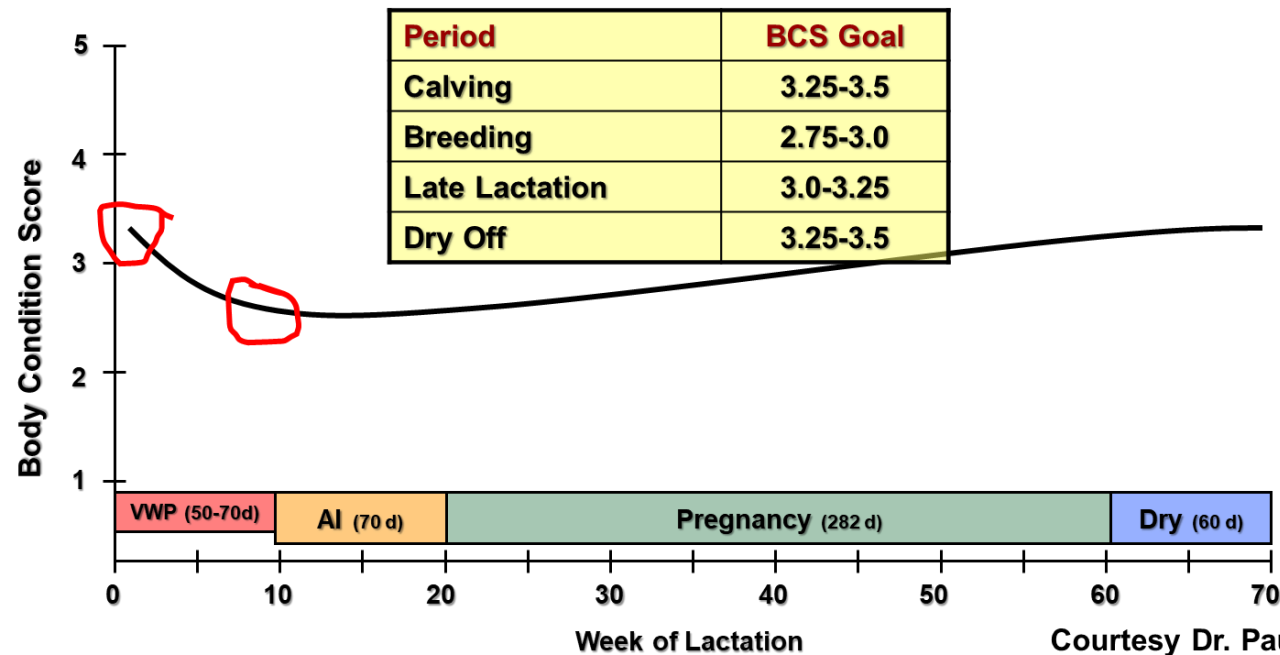
1-Prevention

2-Prevention

3-Prevention

- Decreasing the incidence of postpartum diseases will likely result in improved repro performance

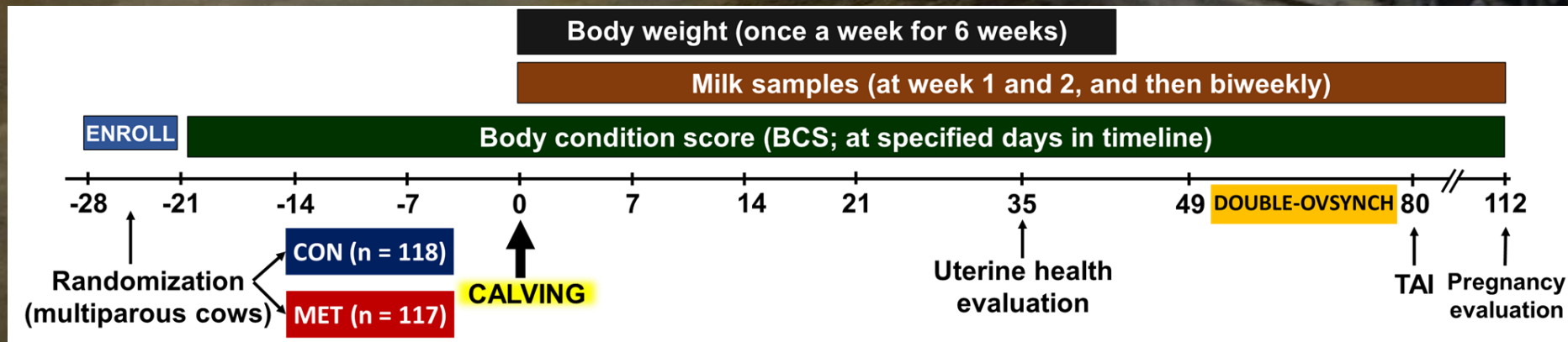
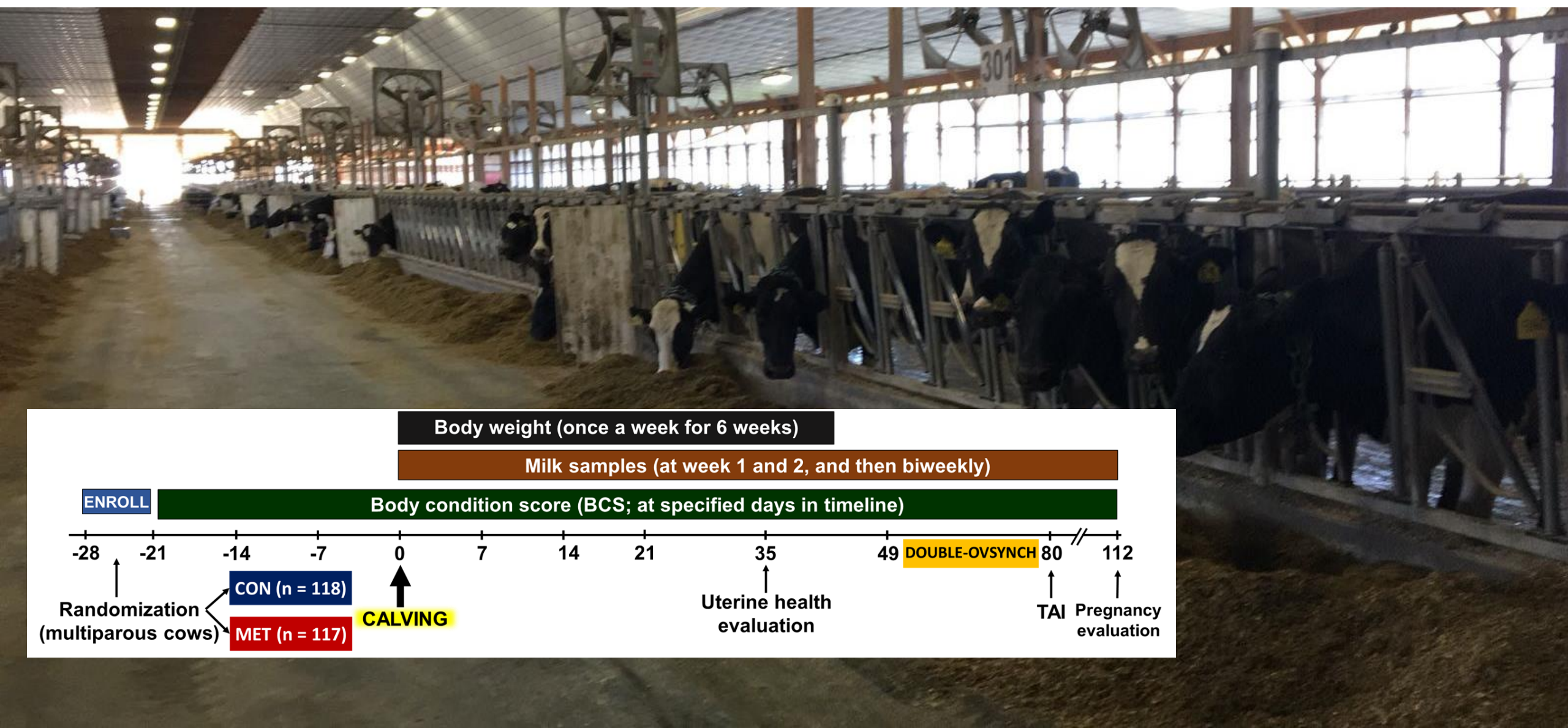
Minimize BCS losses postcalving to optimize repro performance



Courtesy Dr. Paul Fricke

Item	BCS		<i>P</i> -value
	≤ 2.5	> 2.5	
PG 33 (%)	39 (64/164)	55 (334/605)	0.001
PG 61 (%)	36 (59/162)	50 (303/601)	0.003
Loss (%) d 33 to 61	5 (3/62)	8 (27/330)	0.117

Precision feeding strategies have been evaluated but have not been as effective as expected



Fertility and preg. loss after first service TAI did not improve with rumen protected Met feeding

	All cows inseminated ¹				Synchronized cows only ²			
	CON	RPM	Trt ³	Farm ³	CON	RPM	Trt ³	Farm ³
	% (n/n)				% (n/n)			
Pregnancy per TAI								
25 d after TAI	58.0 (123/212)	58.9 (126/214)	0.43	0.34	63.9 (115/180)	64.4 (112/174)	0.45	0.34
29 d after TAI	54.7 (116/212)	56.5 (121/214)	0.36	0.12	60.6 (109/180)	62.6 (109/174)	0.34	0.12
32 d after TAI	48.6 (103/212)	49.1 (105/214)	0.46	0.51	53.9 (97/180)	55.2 (96/174)	0.41	0.49
39 d after TAI	46.7 (99/212)	48.6 (104/214)	0.35	0.35	51.7 (93/180)	54.6 (95/174)	0.30	0.32
67 d after TAI	43.1 (91/211)	45.8 (98/214)	0.28	0.29	48.0 (86/179)	51.2 (89/174)	0.29	0.28
Pregnancy loss								
25 to 29 d after TAI	5.7 (7/123)	4.0 (5/126)	0.26	0.18	5.2 (6/115)	2.7 (3/112)	0.17	0.50
29 to 32 d after TAI	11.2 (13/116)	13.2 (16/121)	0.33	0.12	11.0 (12/109)	11.9 (13/109)	0.43	0.10
32 to 39 d after TAI	3.9 (4/103)	1.0 (1/105)	0.11	0.50	4.1 (4/97)	1.0 (1/98)	0.11	0.21
39 to 67 d after TAI	7.1 (7/98)	5.8 (6/104)	0.35	0.62	6.5 (6/92)	6.3 (6/95)	0.47	0.67
Total 25 to 67 d after TAI	25.4 (31/122)	22.2 (28/126)	0.28	0.53	24.6 (28/114)	20.5 (23/112)	0.24	0.83


Fertility and preg. loss after first service TAI did not improve with rumen protected Met feeding

All cows inseminated¹

Synchronized cows only²

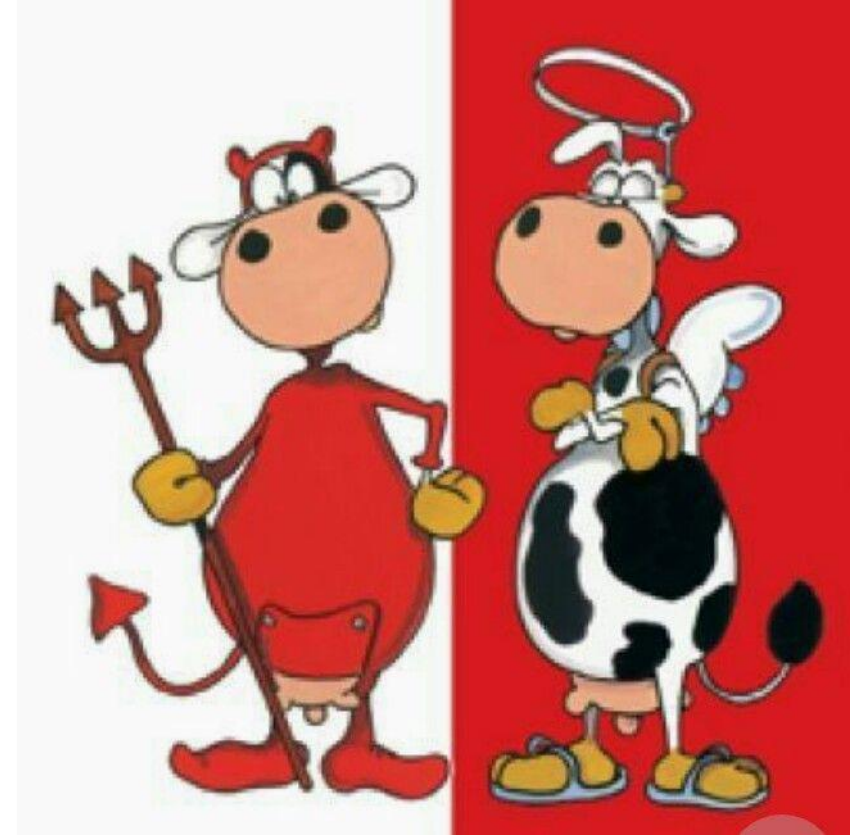
 **Methionine supplementation from -21 to 150 DIM to multiparous cows did not have a significant effect on P/AI (fertility) or pregnancy loss**

 **Observed a milk protein and fat response**

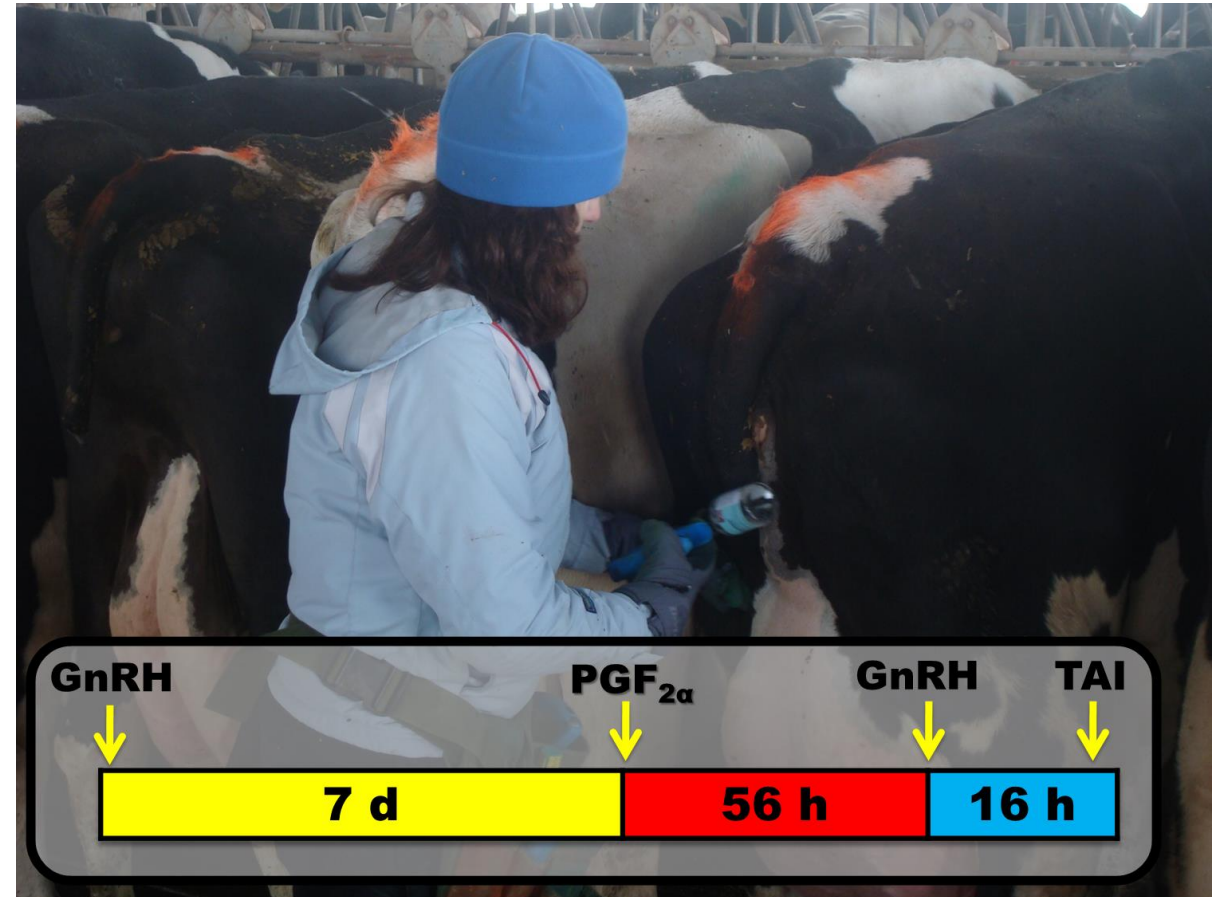
 **Amount needed to optimize yield and component outcomes may be different than needed to improve reproduction or feeding extra Met may not have a substantial effect on reproduction**

No single strategy to improve performance of older cows

- 🐄 Improving reproductive performance of older cows may require adjustments to several aspects of reproductive management – “holistic approach”
- 🐄 Minimize occurrence and impact of risk factors for poor reproductive performance – win-win!
- 🐄 Consider prioritizing reproductive management of multiparous cow groups







Focus on strategies to improve insemination at detected estrus (AIE) and/or timed AI (TAI)






Several Biological and Environmental Factors Known to Affect Expression and Detection of Estrus

Older cows less likely to express estrus, less intense, and of shorter duration

Cow factors

-  **Current and previous health status – health disorders reduce estrus expression**
-  **Poor metabolic/nutritional status reduces estrus expression**
-  **Lameness reduces estrus expression**
-  **Genetic merit for fertility**

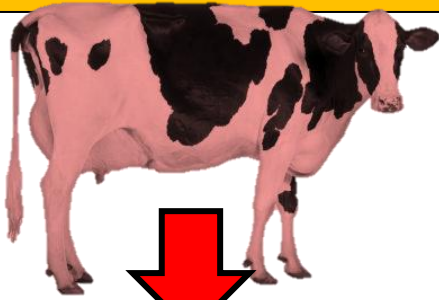
Environmental and management factors

-  **Heat stress reduces estrus expression**
-  **Harder, slippery, abrasive flooring reduces estrus expression**
-  **Excessive overcrowding reduces estrus expression**

Estrus During the VWP Associated with Probability of Estrus Expression after End of VWP

ESTRUS before 50 DIM (VWP)

54.5% (336/617)



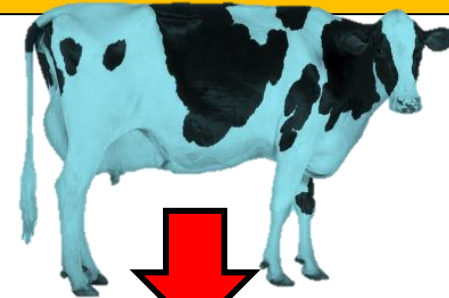
AIE after 50 DIM (VWP)

87% (293/336)

44% (111/254)

NO ESTRUS before 50 DIM (VWP)

45.5% (281/617)



No AIE 50 DIM (VWP)




51% (144/281)

36% (47/130)

Consider prioritizing estrus detection for multiparous cow groups

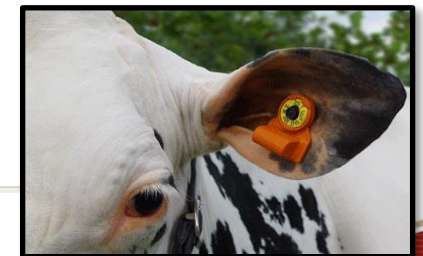
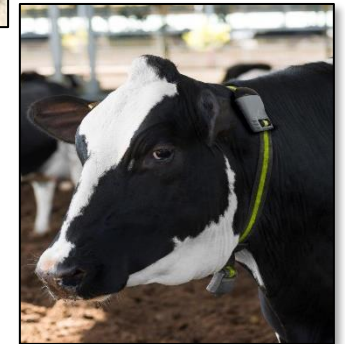


Prioritize older cows

- ➡  Spend more time with older cows
-  Use one or more estrus detection aids
-  Give them better space and conditions to express estrus

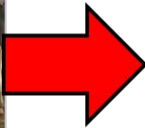
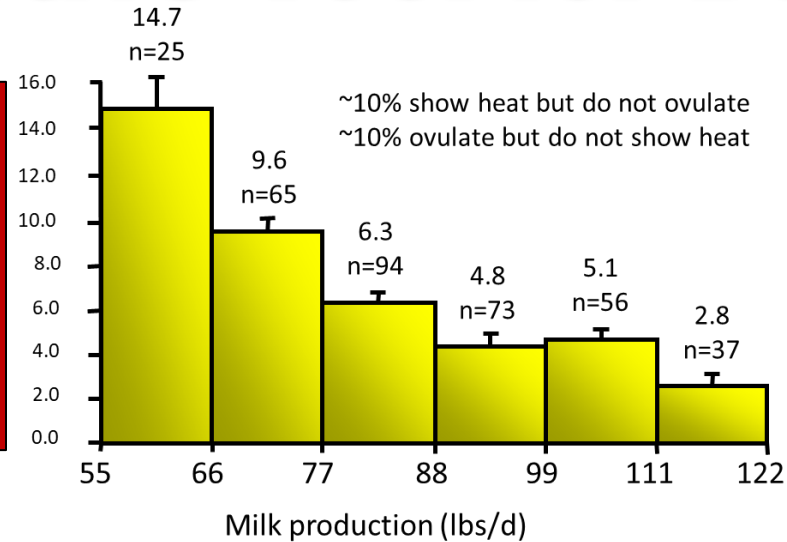
Several Stand-Alone Methods and Aids Available for Detection of Estrus

- 🐄 **Visual detection**
- 🐄 **Tail-chalk/paint**
- 🐄 **Estrous alert patches**
- 🐄 **Flashmate/Kamar**
- 🐄 **Automated estrus detection (AED) systems**



Automated Estrus Detection (AED) Systems Are an Effective Tool for Detection of Estrus

Older cows less likely to express estrus, less intense, and of shorter duration



Potential benefits of AED systems

- Continuous monitoring
- Objective evaluation of behavior or physiological status
- Elimination or substantial labor reduction










Focus on strategies to improve insemination at detected estrus (AIE) and/or timed AI (TAI)

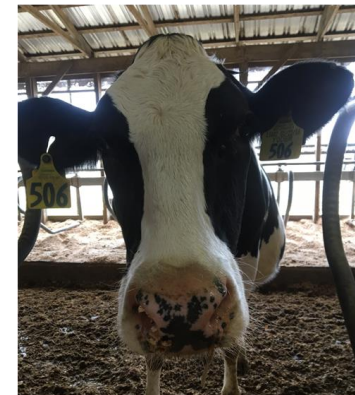


Reproductive performance of older cows can be improved through TAI

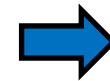
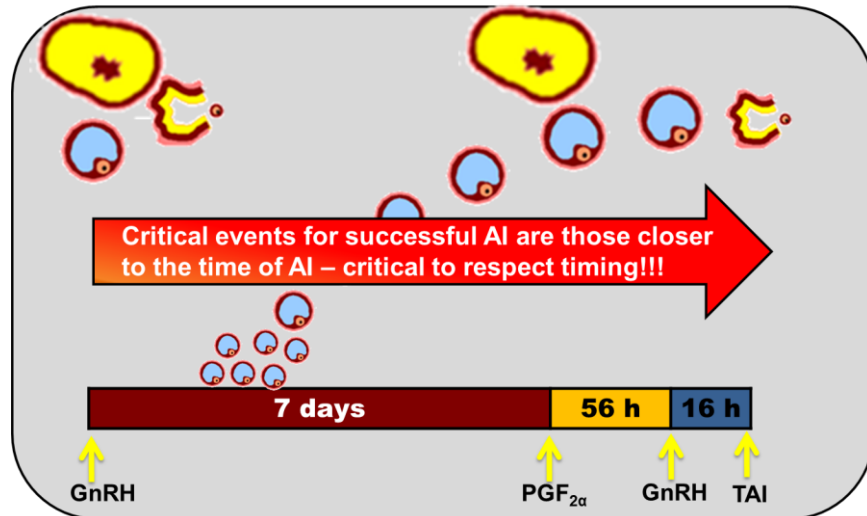
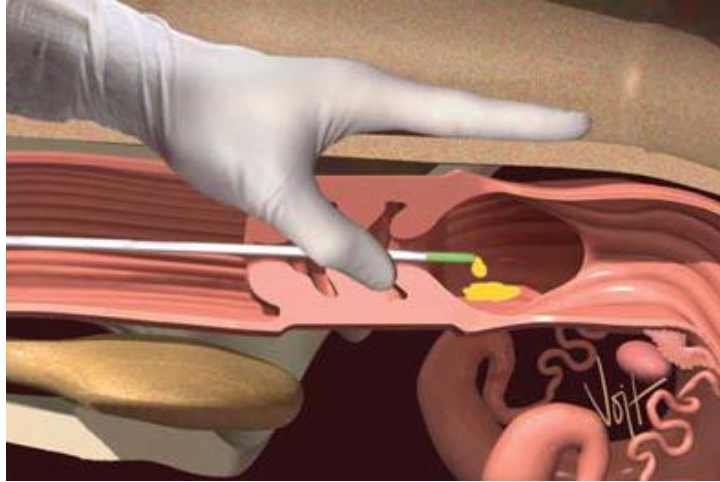
Use programs that optimize performance through TAI

-  Inclusion of more TAI for 1st and 2+ AI
-  Modifications to existing protocols for TAI
 -  Two PGFs before TAI
 -  Larger doses for key hormonal treatments
 -  GnRH – at time of first GnRH of Ovsynch
 -  Progesterone supplementation - 2 vs 1 CIDR device
-  Consult with your veterinarian for label use and supervision






Individual cow solutions versus herd solutions



Consider prioritizing reproductive management of multiparous cow groups

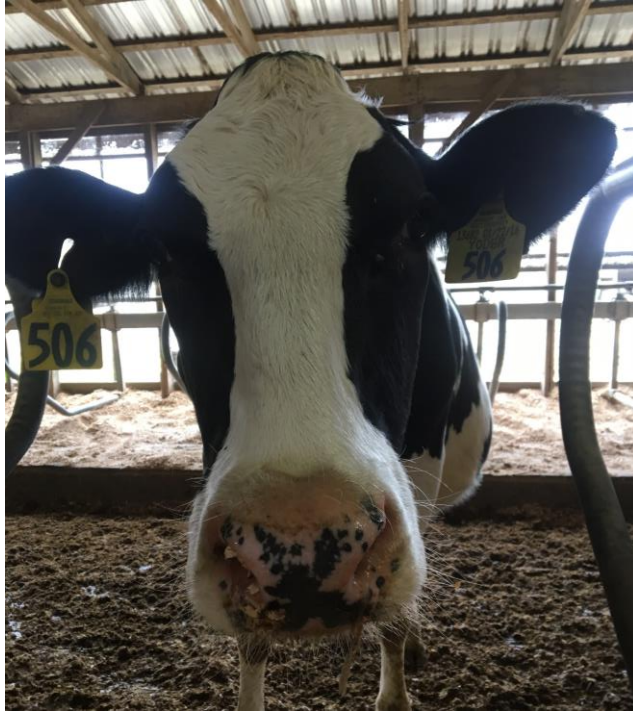


Prioritize older cows to:

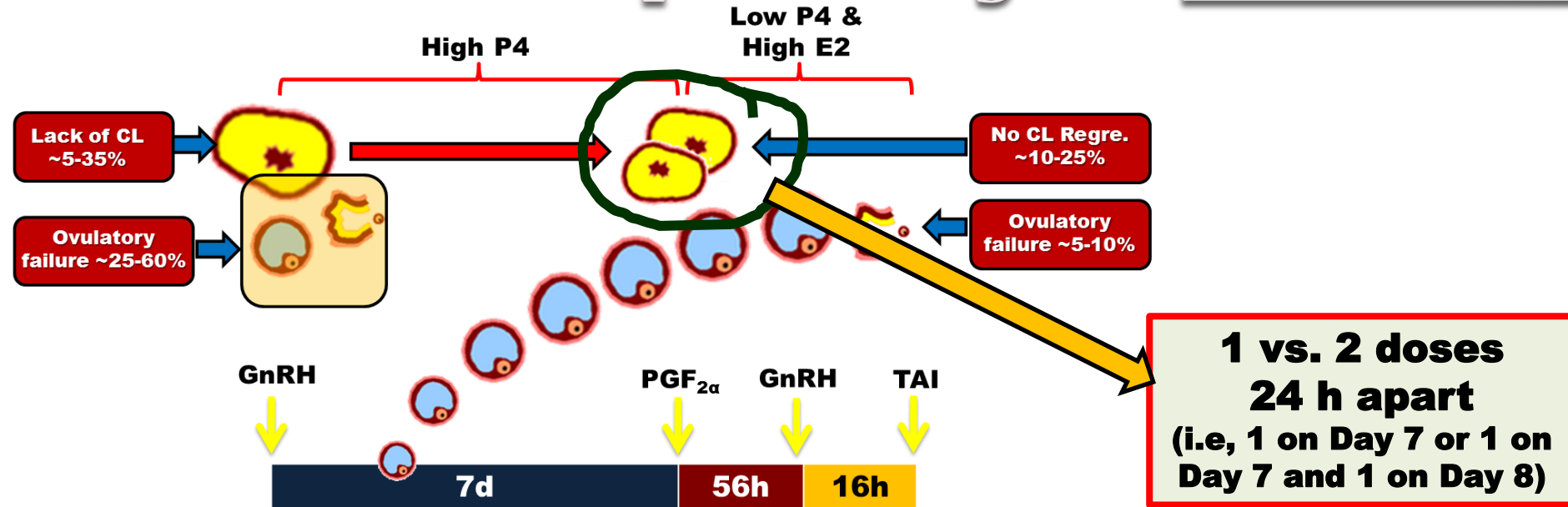
-  **Optimize timing of AI and AI procedures**
-  **Optimize timing and technique for hormonal treatments**
 -  **Ensure cows get the right volume of product in the right place**
 -  **Adjust routines to ensure that older cows get treatments as close as possible to ideal timings**
 -  **Prioritize consistency of treatments closest to TAI**

Pursley et al. 1995

Individual cow solutions versus herd solutions

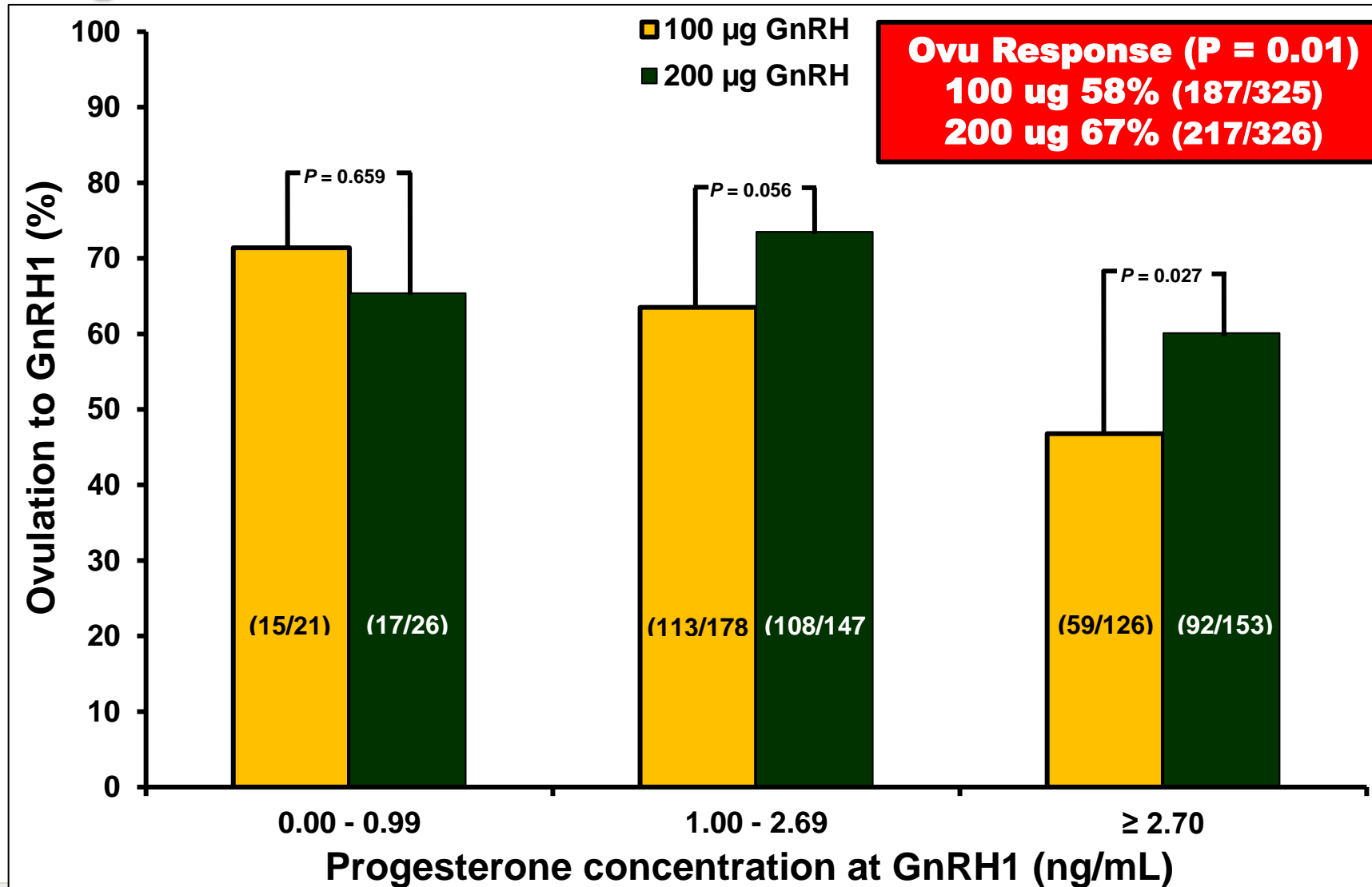


Additional PGF treatment before TAI increases P/AI especially in older cows

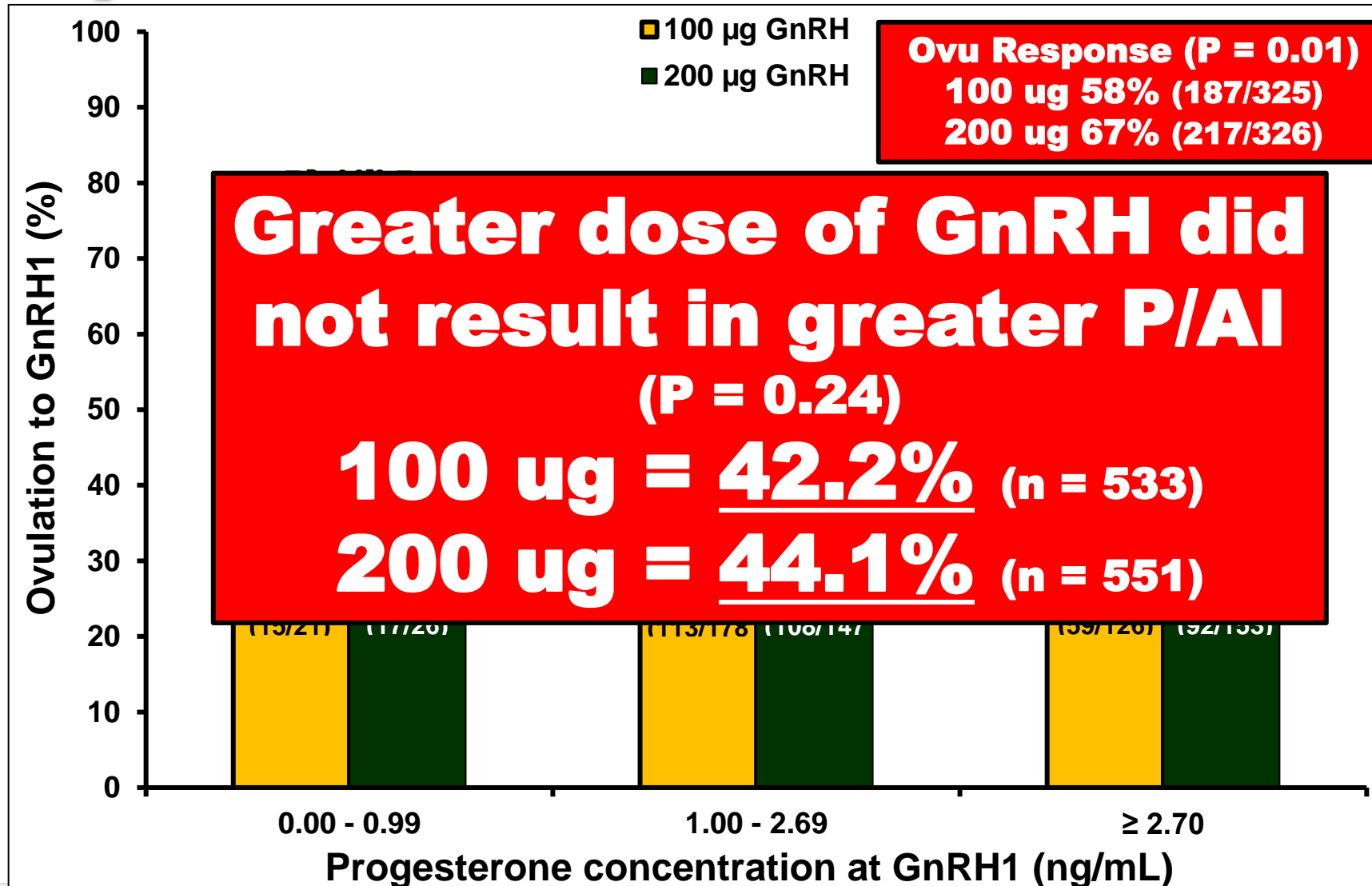


- **Additional PGF treatment (12-24 h after initial PGF) increased luteal regression by ~10-15 percentage points** (Brusveen et al., 2006; Wiltbank et al., 2015)
- **Expected improvement in fertility of 3-5 percentage points** (Brusveen et al., 2006; Wiltbank et al., 2015)
- **Although similar range of gain in P/AI (~4 percentage points) was observed with 50% greater dose (750 ug) of Cloprostenol** (Giordano et al., 2013), **two separate doses may be more effective**

A greater Dose of GnRH increases ovulatory response but fertility response has not been consistent

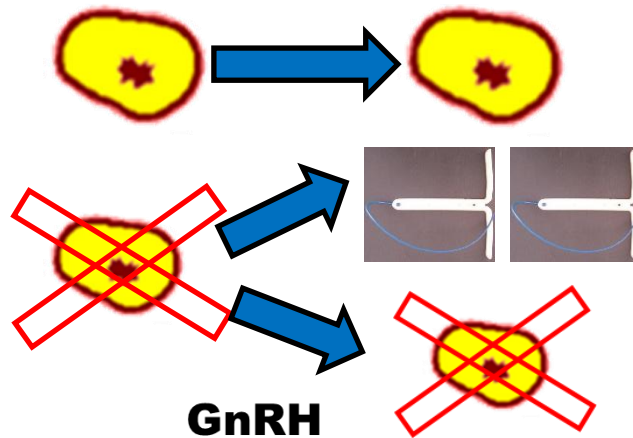


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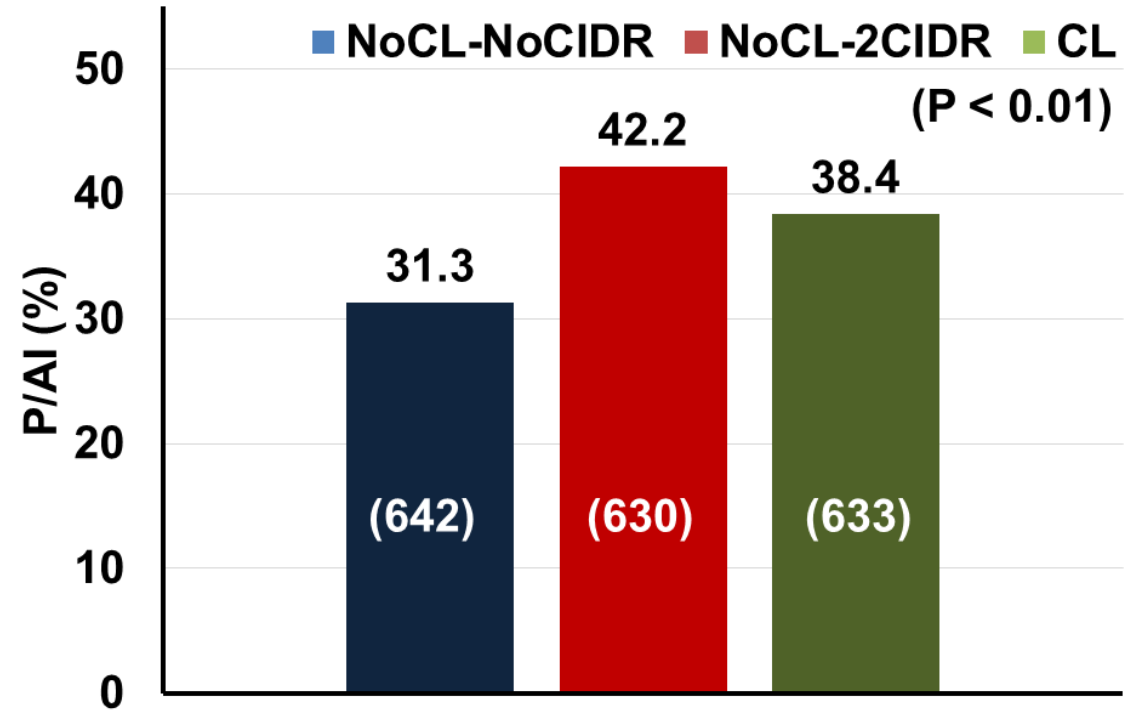


Supplemental P4 pre-AI could help cows that are not cyclic

2 CIDRs for cows with no CL



GnRH



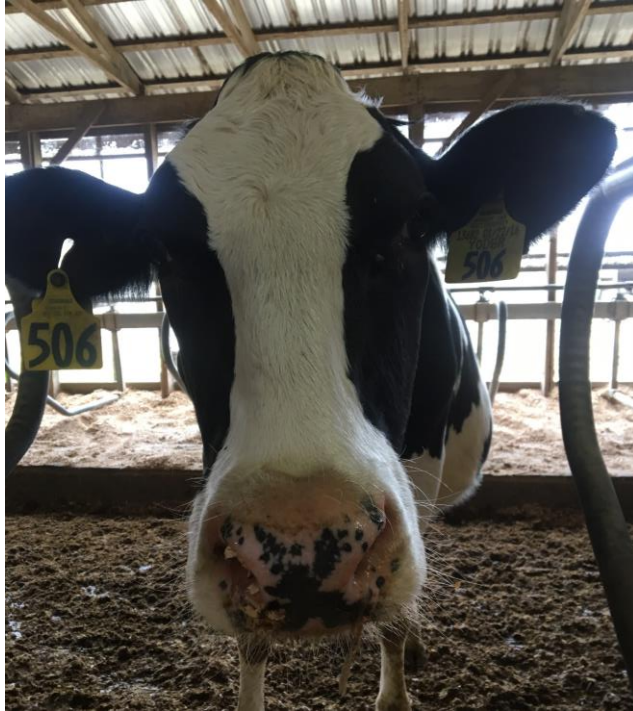
PGF_{2α}

GnRH

TAI

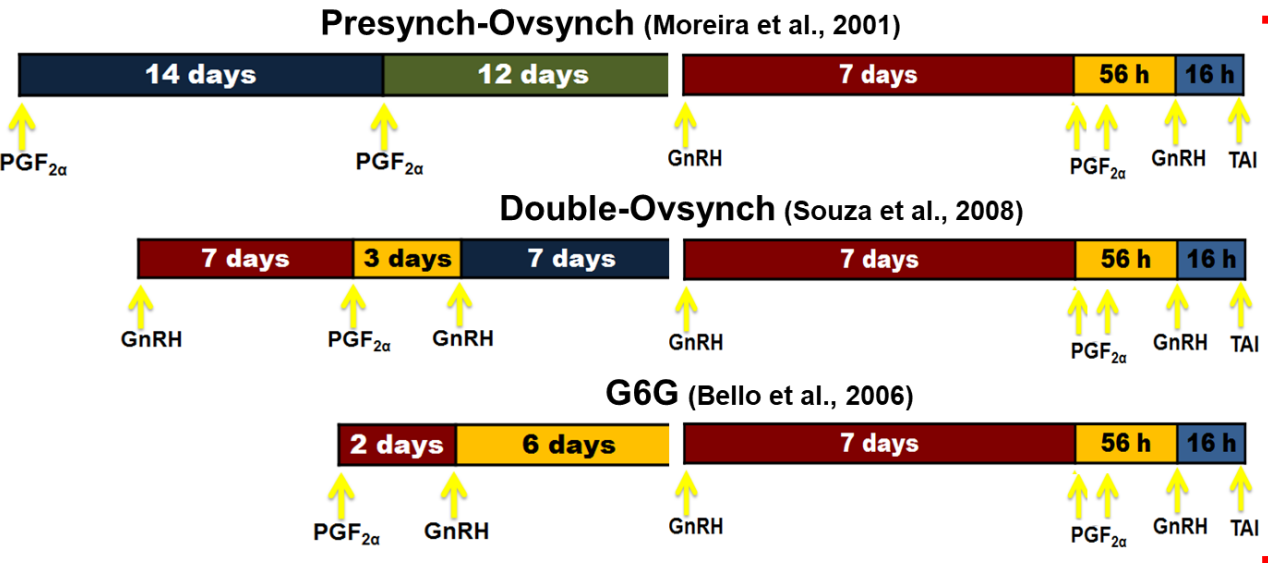


Individual cow solutions versus herd solutions

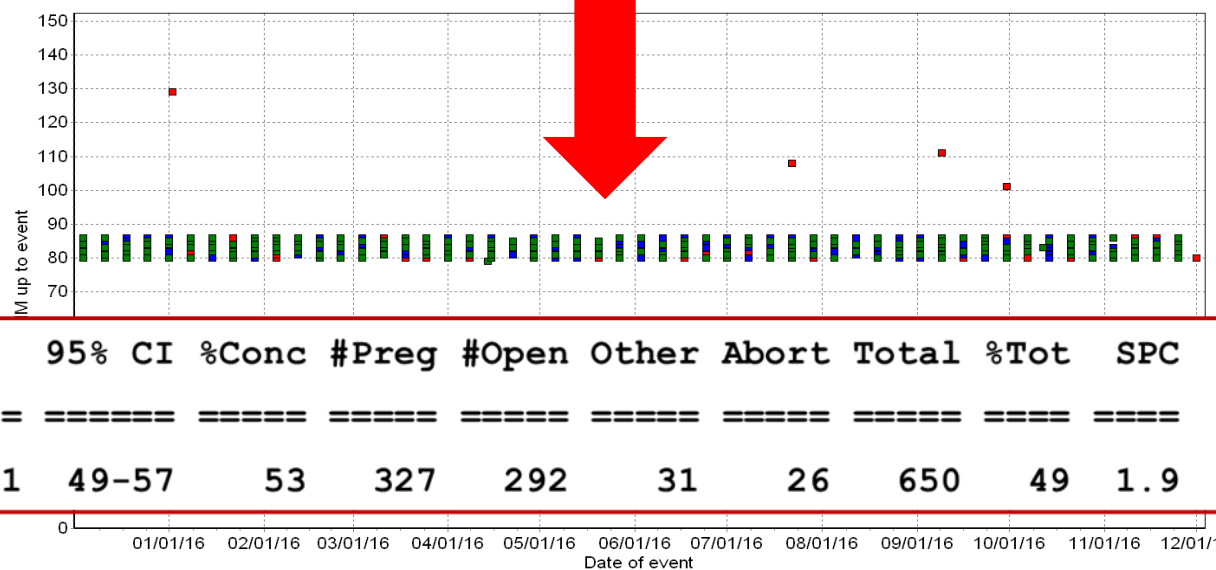


All-TAI with Fertility Programs Provides Total Control of Days to First AI and Increase Fertility

Example Proven Fertility Programs for First Service

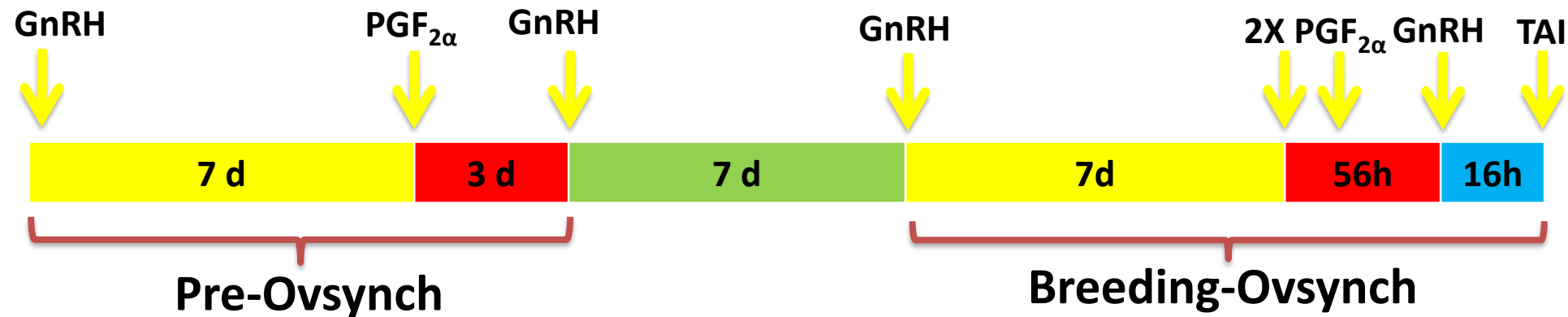


Tight control of days in milk at first service + fertility



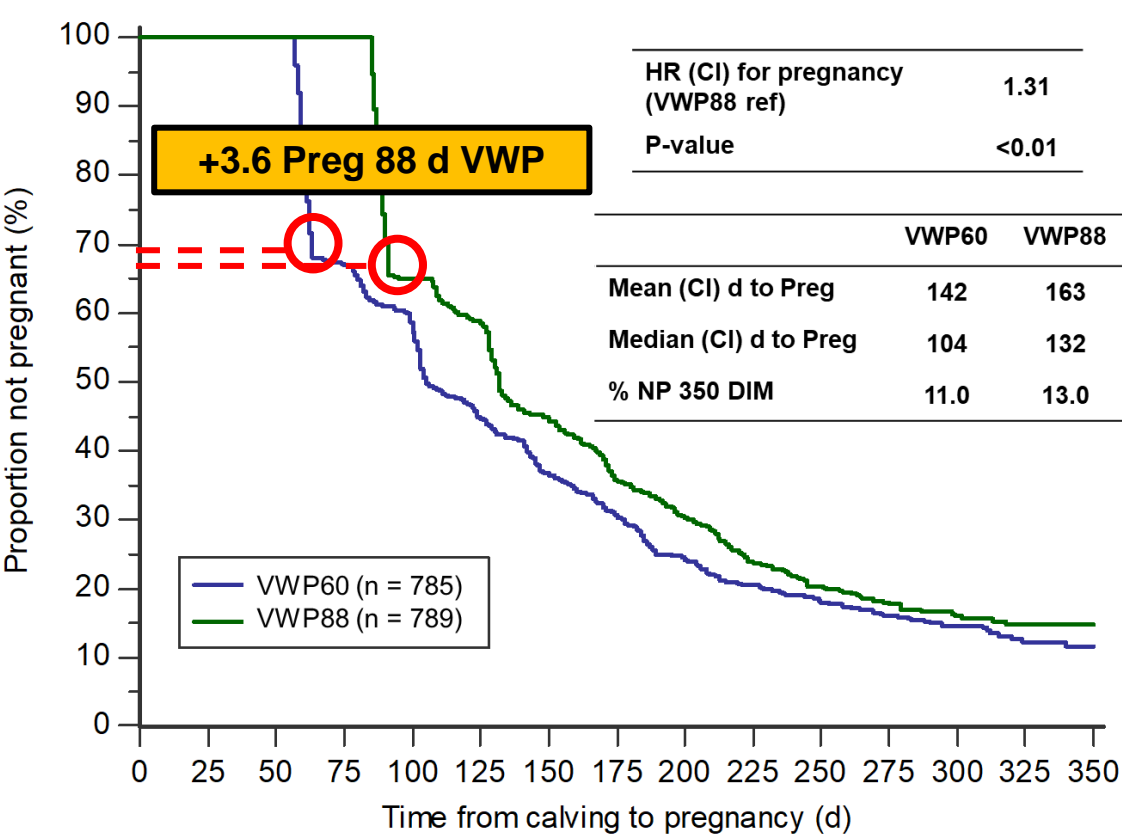
Bred Number	95% CI	%Conc	#Preg	#Open	Other	Abort	Total	%Tot	SPC
=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
1	49-57	53	327	292	31	26	650	49	1.9

Double-Ovsynch is a great fertility program which can maximize the chances of pregnancy at first service



Minimizing days to first service and maximizing fertility through a fertility program may be ideal for older cows – even if earlier breeding does not result in the greatest fertility

Consider earlier DIM for TAI with fertility program to minimize days to pregnancy



	Primiparous			
	VWP60	VWP88	Diff	P-val
Number of cows	785	789	-	-
	\$ /slot per 18 mo			
Cash flow (\$/slot)	2,006 ± 124	1,921 ± 124	-85	0.19

-\$85 X Long VWP

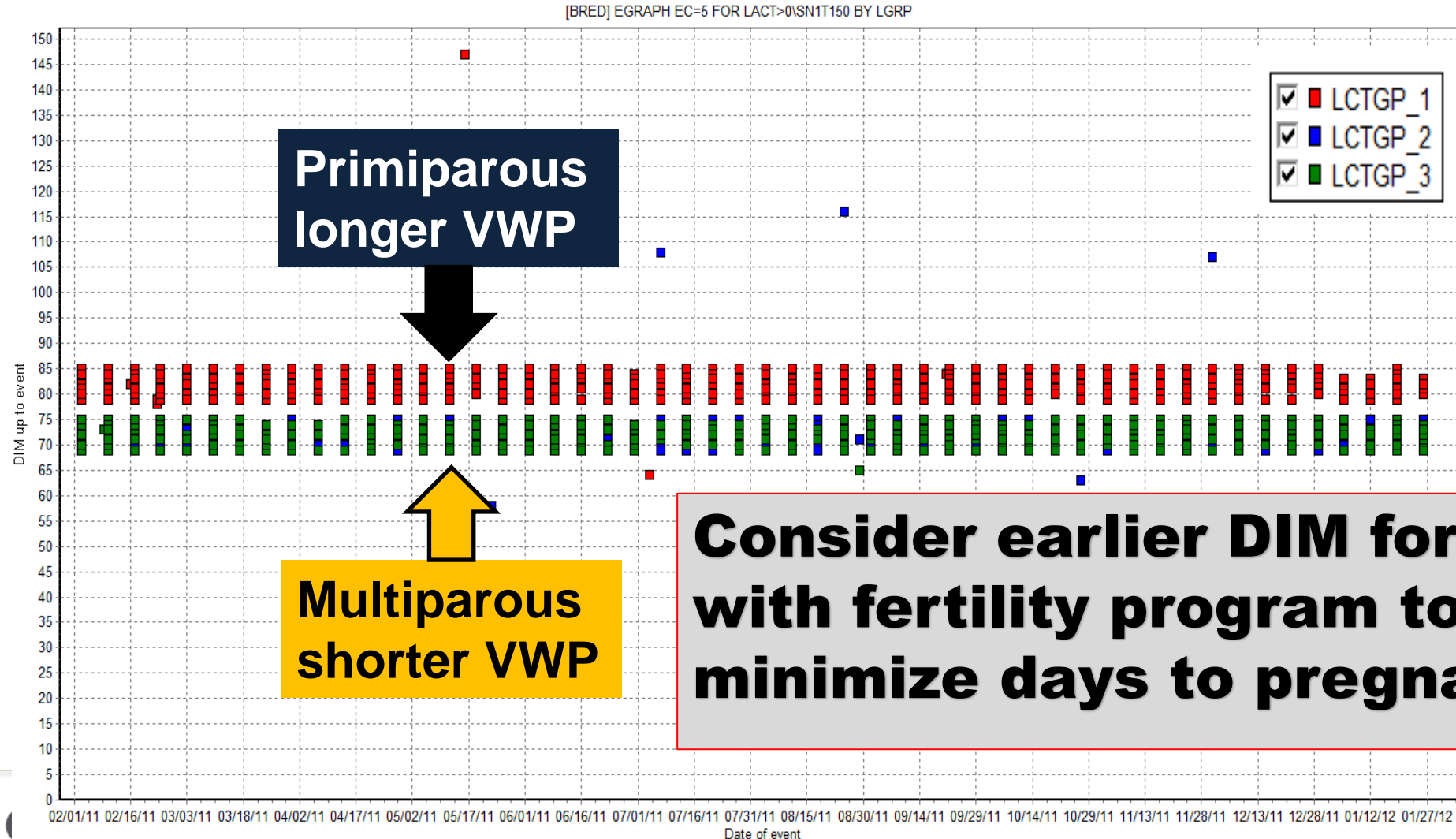


Multi

- +\$114 for VWP60
- IOFC greatest difference

COWS pregnant at first service and did not leave for 18 mo after calving

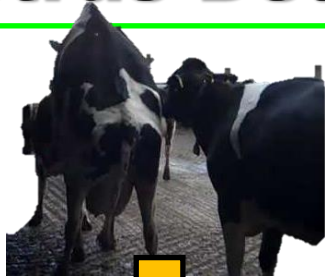
Voluntary Waiting Period based on Parity



Programs that combine AI at detected estrus with TAI can also be effective

**Presynch-Ovsynch
VWP = 50 DIM**

Estrus Det.+AI



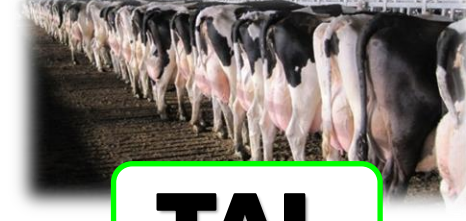
TAI

**Double-Ovsynch
VWP = 60 DIM**

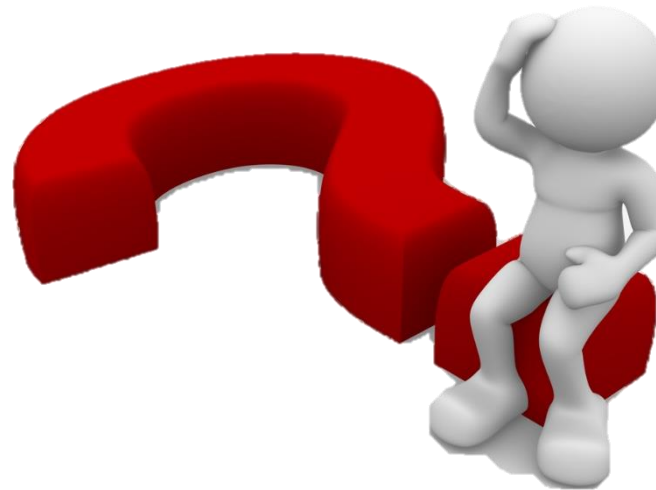


TAI

**Double-Ovsynch
VWP = 88 DIM**

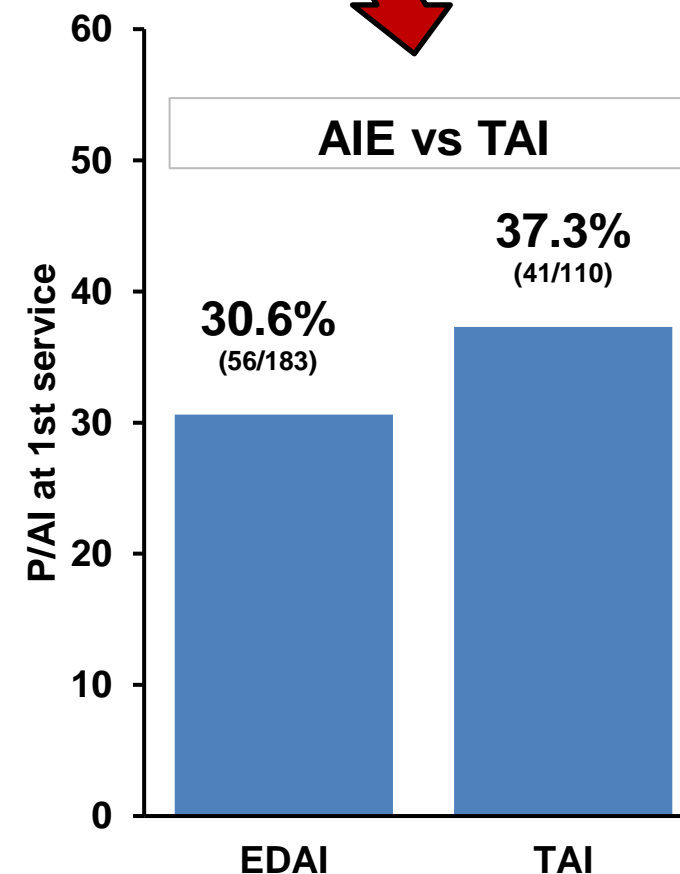


TAI

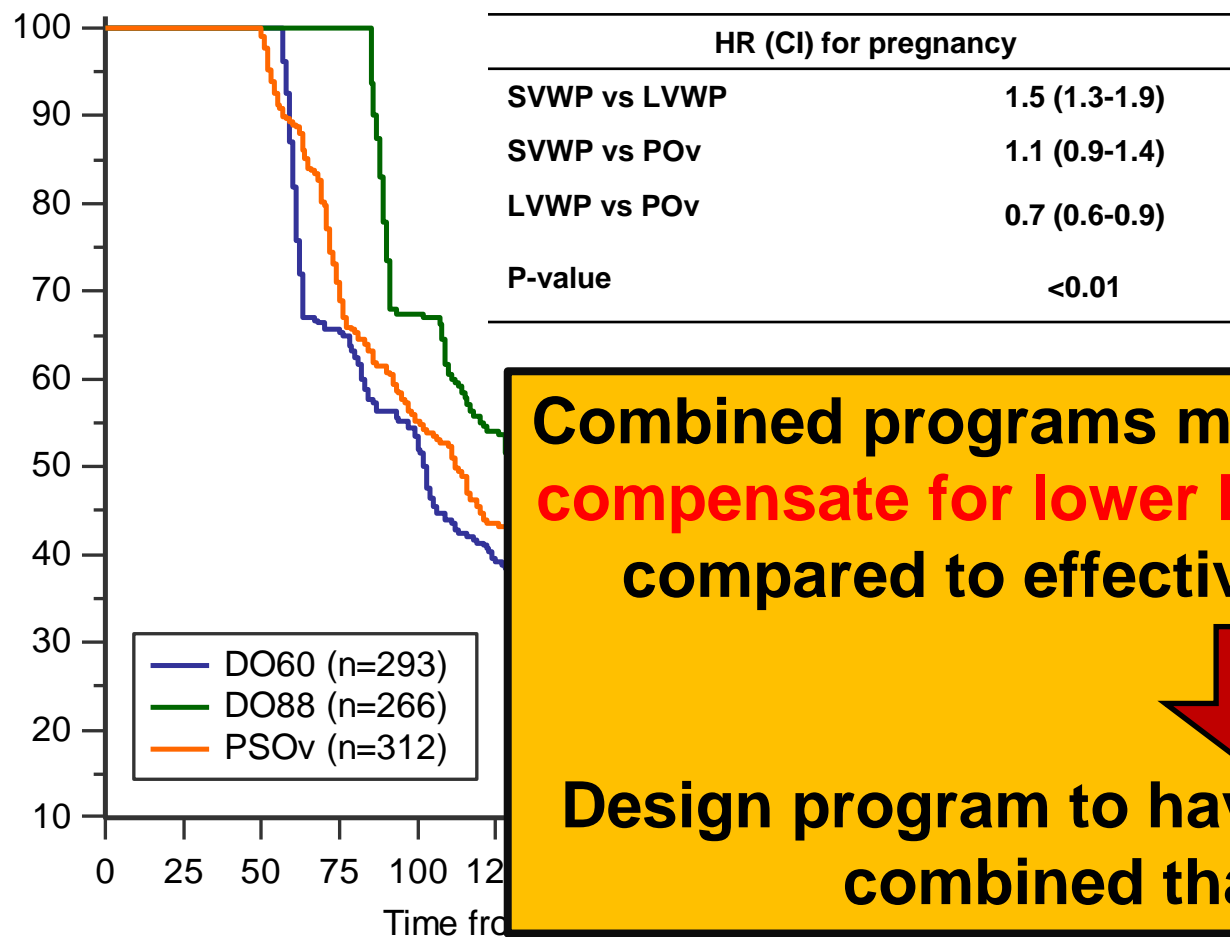


Programs that combine AI at detected estrus with TAI do not optimize first service fertility

Variable	Multi			P-value
	SVWP	LVWP	POv	Group
DIM 1 st TAI	60 ^a	88 ^b	62 ^a	<0.01
P/AI 1st AI, % (n/n)	37.1 (103/278)	37.3 (90/241)	33.1 (97/293)	0.24
Preg. Loss, % (n/n)	6.8 (7/103)	10.0 (9/90)	7.2 (7/97)	0.80
Preg. 91 DIM, % (n/n)	49.1 ^b (137/279)	37.3 ^a (90/241)	44.9 ^{ab} (132/294)	<0.01



Programs that combine AI at detected estrus with TAI can result in acceptable pregnancy rates



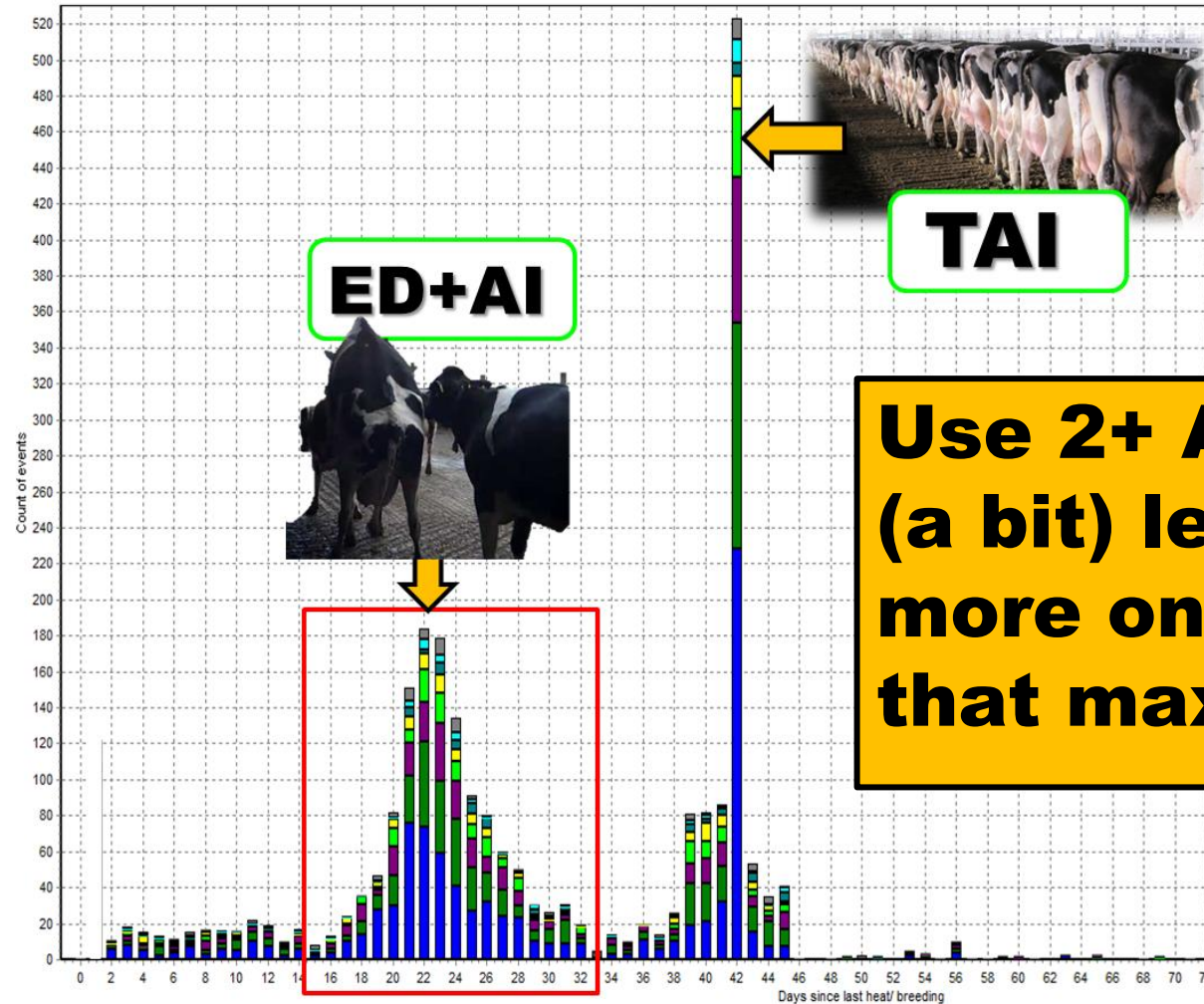
Estrus detection efficiency and fertility of estrus breeding is critical to the success of combined programs

Combined programs may need a shorter VWP to compensate for lower P/AI to detected estrus as compared to effective 100% TAI programs.



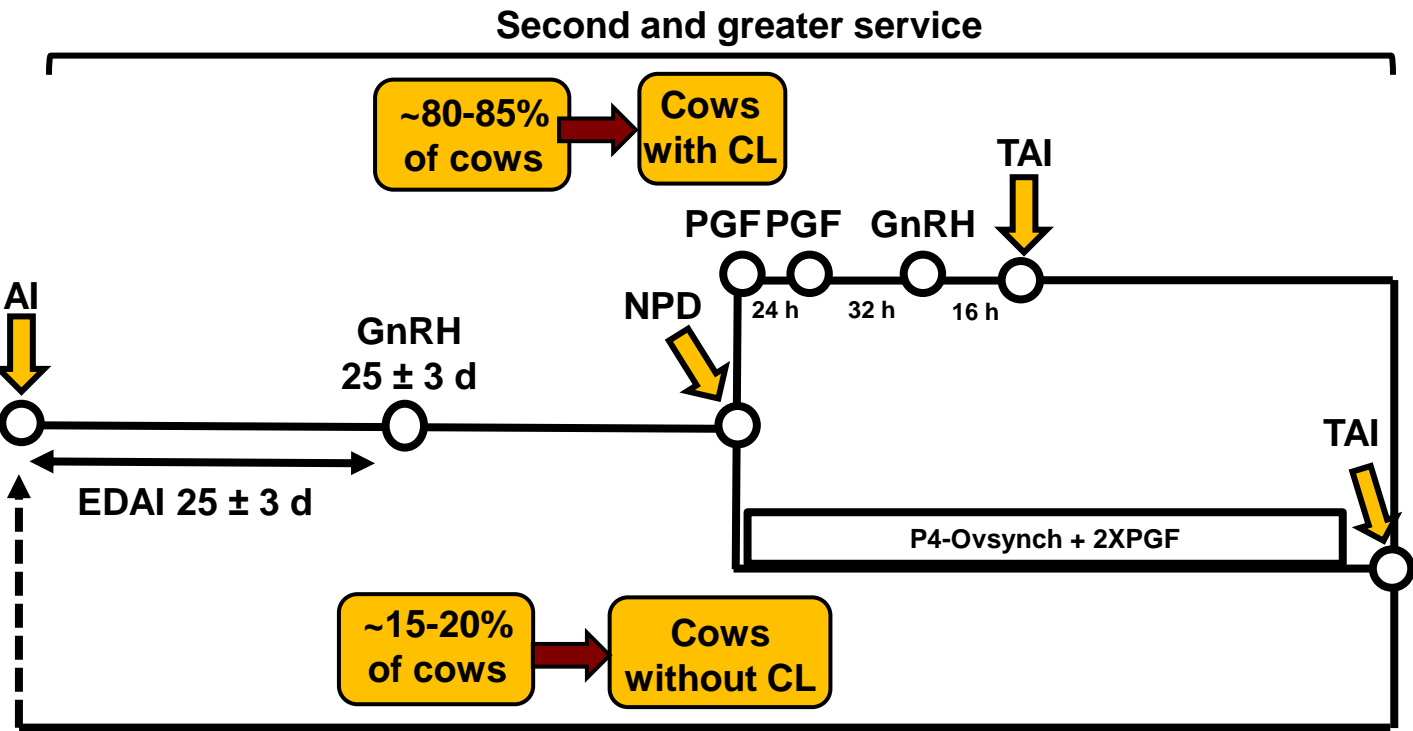
Design program to have same average DIM for combined than TAI program

As older cows maybe less likely to show estrus after previous AI consider more aggressive use of TAI



Use 2+ AI program that depends (a bit) less on heat detection and more on effective TAI protocols that maximize fertility

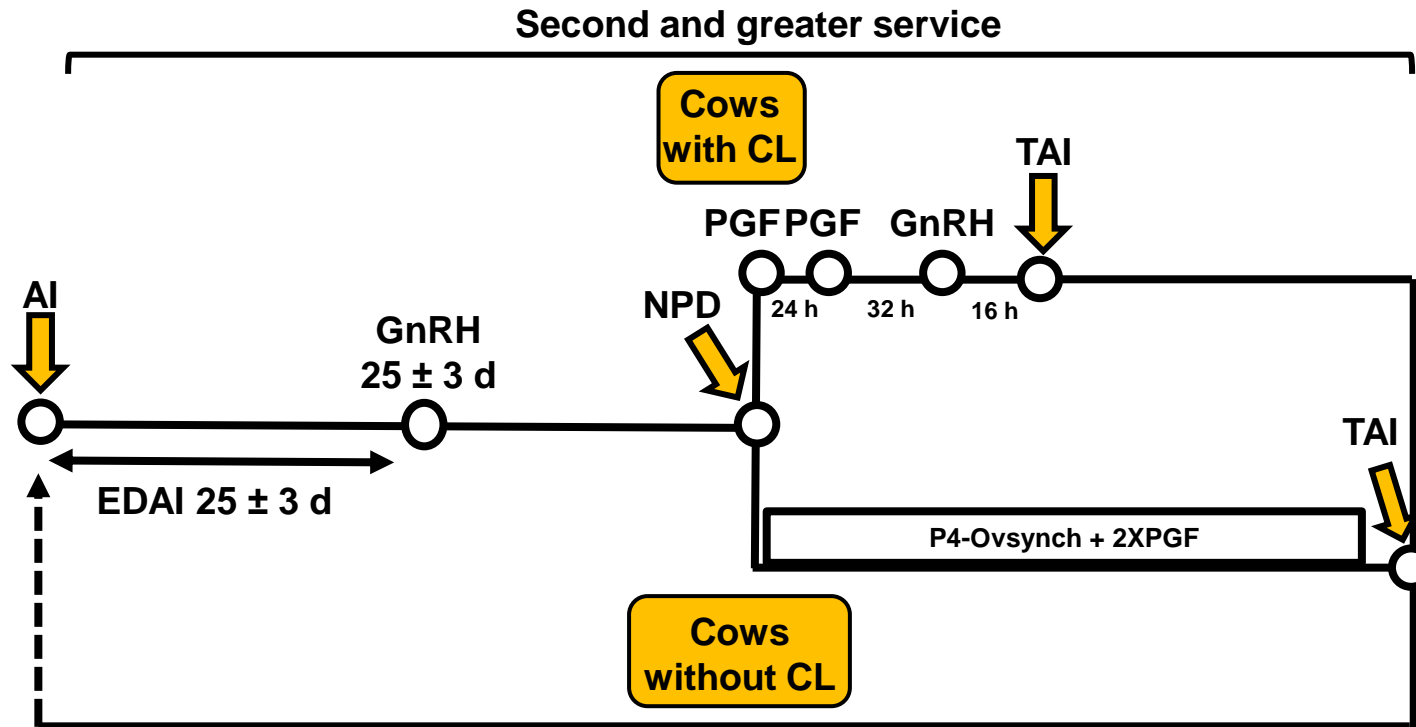
D25-Resynch + P4-Ovsynch is an Effective Program for 2+ AI Service



Perez et al. (2020) JDS 103:10769-10783

	Treatment
Item	D25-Resynch+ P4-Ovsynch
Cows with CL (%)	84 (990/1,178)
P/AI CL at NPD (%) (D25-Resynch or Short Resynch)	41 (410/990)
P/AI NO CL at NPD (%) (CIDR-Synch)	39 (73/188)
Overall cows pregnant through TAI	43 (483/1,178)

D25-Resynch + P4-Ovsynch may be an effective program to maximize performance of older cows



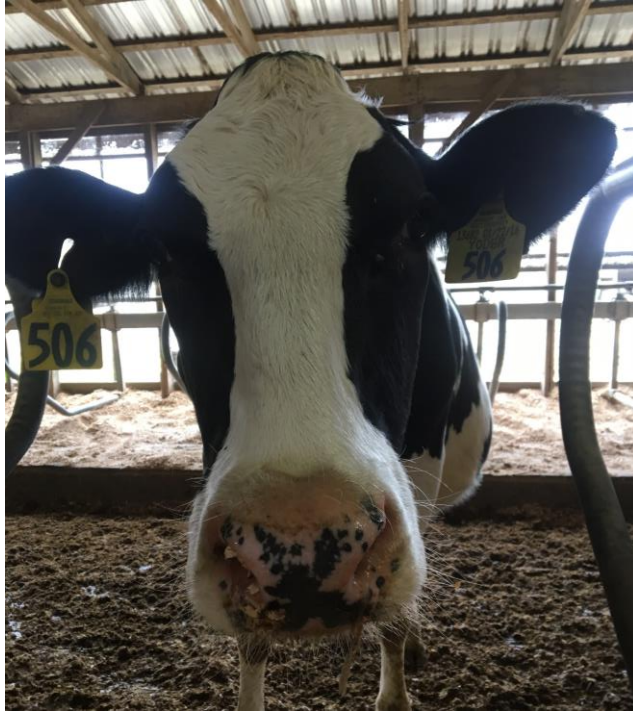
Perez et al. (2020) JDS 103:10769-10783

Expected benefits:

- Reduces interbreeding interval for TAI services in cows with CL at NPD and maximizes P/AI
- Increases fertility for cows without a CL at NPD

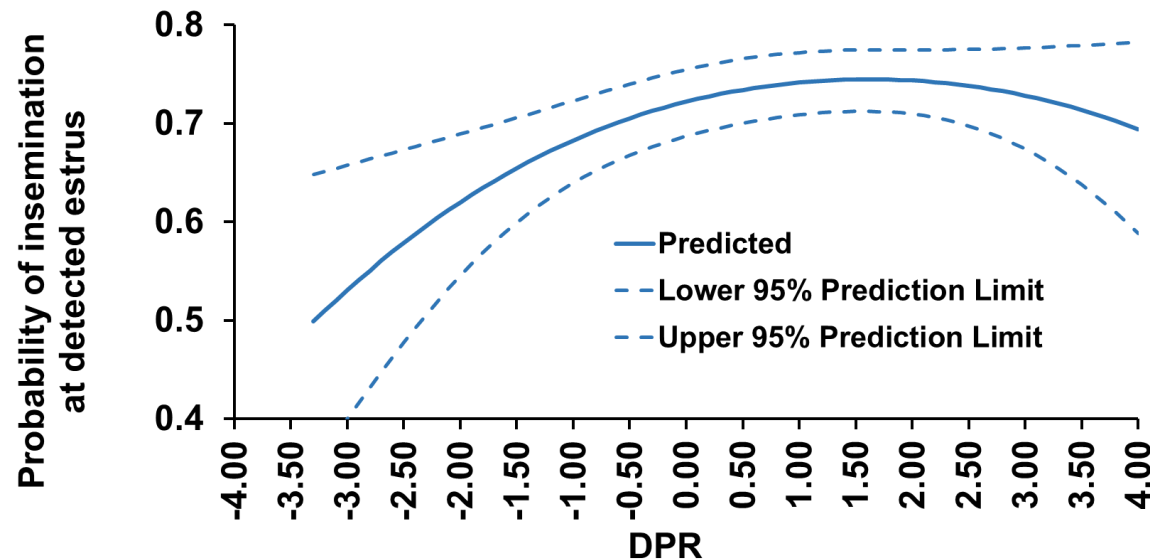
Perez et al. (2020) JDS 103:10769-10783

Individual cow solutions versus herd solutions

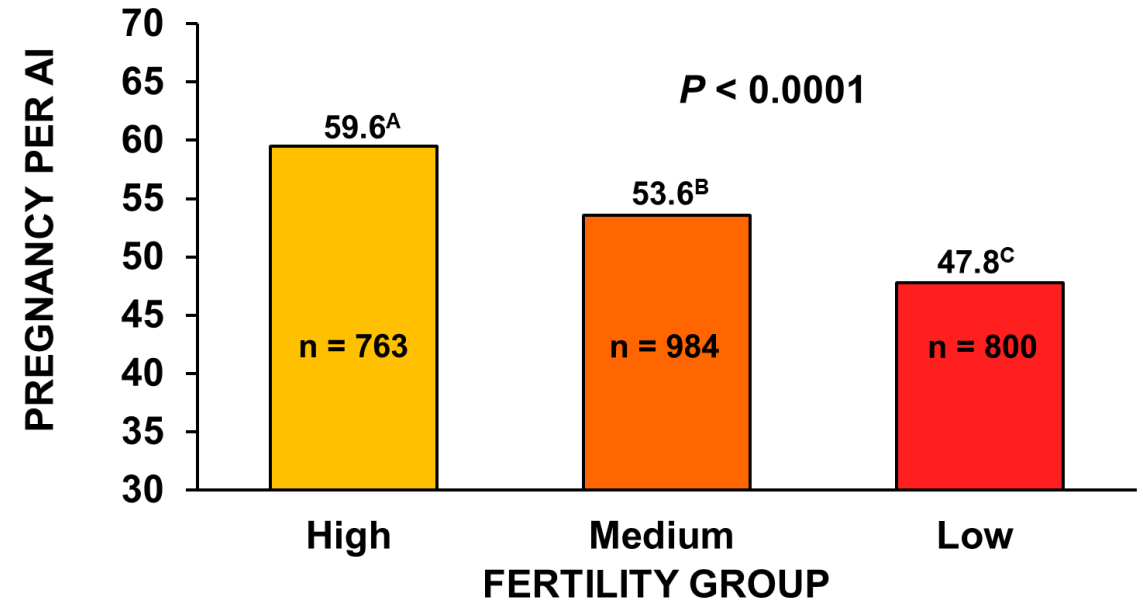


Emphasizing genetic merit for fertility might improve reproductive performance in the long term

Primiparous cows with Higher Genetic Merit for Fertility were more likely to be detected in estrus



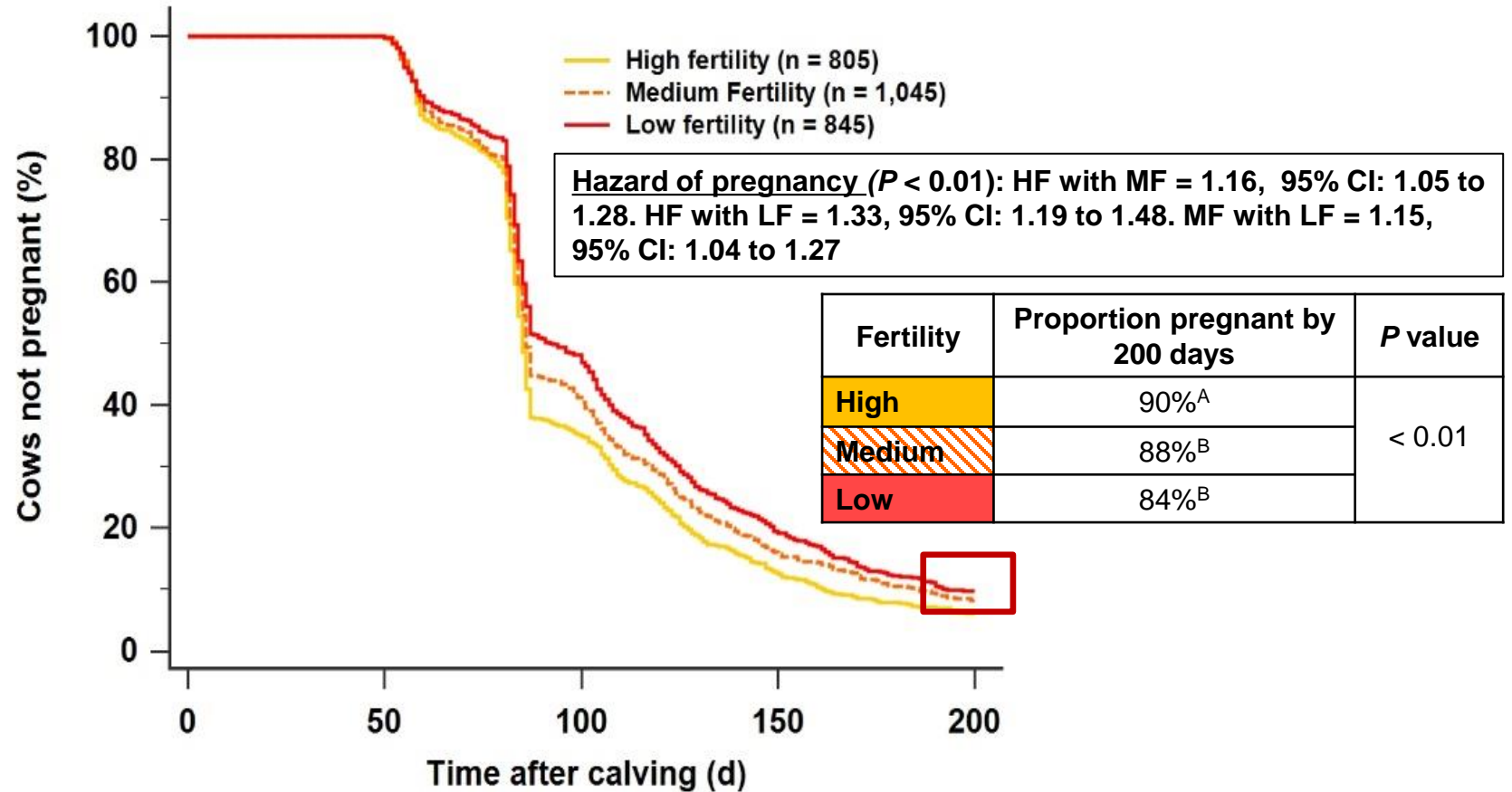
Primiparous cows with Higher Genetic Merit for Fertility had Greater P/AI for First Service



Sitko et al., 2019 (Abstract) JDS 102 E-suppl. 1 109

Emphasizing genetic merit for fertility might improve reproductive performance in the long term

Primiparous
High Fertility
cows became
pregnant earlier
than Low
Fertility cows



Consider evaluation of reproductive performance by lactation group

Date	Br Elig	Bred	Pct	Pg Elig	Preg	Pct	Aborts
=====	=====	=====	=====	=====	=====	=====	=====
10/16/17	527	335	64	519	135	26	8
11/06/17	499	315	63	488	123	25	7
11/27/17	489	323	66	478	110	23	14
12/18/17	497	284	57	490	102	21	7
1/08/18	506	311	61	496	114	23	8
1/29/18	530	326	62	526	108	21	9
2/19/18	569	363	64	564	126	22	9
3/12/18	556	375	67	550	131	24	16
4/02/18	522	334	64	515	113	22	8
4/23/18	539	348	65	534	106	20	3
5/14/18	518	311	60	514	115	22	4
6/04/18	522	340	65	522	106	20	6
6/25/18	575	357	62	571	104	18	6
7/16/18	610	384	63	604	129	21	3
8/06/18	631	418	66	623	135	22	4
8/27/18	614	399	65	607	106	17	0
9/17/18	613	437	71	0	0	0	0
10/08/18	468	379	81	0	0	0	0
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Total	8704	5523	63	8601	1863	22	112

Wait Period 57

lact=1

lact>1

Date	Br Elig	Bred	Pct	Pg Elig	Preg	Pct	Aborts
=====	=====	=====	=====	=====	=====	=====	=====
10/16/17	173	120	69	172	60	35	2
11/06/17	160	107	67	160	55	34	2
11/27/17	152	104	68	151	40	26	6
12/18/17	170	93	55	167	38	23	2
1/08/18	175	95	54	173	37	21	1
1/29/18	186	113	61	185	46	25	2
2/19/18	204	134	66	202	50	25	2
3/12/18	193	139	72	193	58	30	8
4/02/18	173	110	64	172	42	24	3
4/23/18	178	114	64	177	36	20	0
5/14/18	194	103	53	193	42	22	3
6/04/18	194	120	62	194	41	21	3
6/25/18	206	127	62	206	54	26	1
7/16/18	200	120	60	200	60	30	1
8/06/18	199	139	70	198	50	25	1
8/27/18	190	120	63	189	43	23	0
9/17/18	182	126	69	0	0	0	0
10/08/18	131	103	79	0	0	0	0
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Total	2947	1858	63	2932	752	26	37

Wait Period 57

Date	Br Elig	Bred	Pct	Pg Elig	Preg	Pct	Aborts
=====	=====	=====	=====	=====	=====	=====	=====
10/16/17	354	215	61	347	75	22	6
11/06/17	339	208	61	328	68	21	5
11/27/17	337	219	65	327	70	21	8
12/18/17	327	191	58	323	64	20	5
1/08/18	331	216	65	323	77	24	7
1/29/18	344	213	62	341	62	18	7
2/19/18	365	229	63	362	76	21	7
3/12/18	363	236	65	357	73	20	8
4/02/18	349	224	64	343	71	21	5
4/23/18	361	234	65	357	70	20	3
5/14/18	324	208	64	321	73	23	1
6/04/18	328	220	67	328	65	20	3
6/25/18	369	230	62	365	50	14	5
7/16/18	410	264	64	404	69	17	2
8/06/18	432	279	65	425	85	20	3
8/27/18	424	279	66	418	63	15	0
9/17/18	431	311	72	0	0	0	0
10/08/18	337	276	82	0	0	0	0
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Total	5757	3665	64	5669	1111	20	75

Wait Period 57

Consider evaluation of reproductive performance by lactation group

LG	95% CI	%Conc	#Preg	#Open	Other	Abort	Total	%Tot	SPC
1	40-45	42	909	1231	31	47	2171	34	2.4
2	31-36	34	557	1103	60	37	1720	27	3.0
3	29-33	31	756	1670	95	43	2521	39	3.2
TOTALS	35-37	36	2222	4004	186	127	6412	100	2.8

lact=1
weanings were omitted

Bred Number	95% CI	%Conc	#Preg	#Open	Other	Abort	Total	%Tot	SPC
1	43-49	46	442	524	9	19	975	45	2.2
2	39-47	43	229	305	3	15	537	25	2.3
3	34-45	39	120	185	0	4	305	14	2.5
4	34-48	41	73	105	2	5	180	8	2.4
5	26-45	35	33	62	1	2	96	4	2.9
6	10-32	19	9	39	1	2	49	2	5.3
7	-	21	3	11	1	0	15	1	4.7
TOTALS	40-45	42	909	1231	17	47	2157	100	2.4

Bred Number	95% CI	%Conc	#Preg	#Open	Other	Abort	Total	%Tot	SPC
1	30-35	32	516	1084	38	30	1638	39	3.1
2	30-35	32	342	714	33	23	1089	26	3.1
3	28-35	32	209	451	22	11	682	16	3.2
4	30-39	34	143	272	11	7	426	10	2.9
5	25-37	31	69	153	7	7	229	5	3.2
6	19-37	27	25	68	9	2	102	2	3.7
7	11-39	22	7	25	0	0	32	1	4.6
8	-	20	1	4	1	0	6	0	5.0
OTHERS	-	33	1	2	0	0	3	0	3.0
TOTALS	31-34	32	1313	2773	121	80	4207	100	3.1

Highlights



Older cows have reduced reproductive performance

-  Getting them pregnant early in lactation reduces the chances of culling and optimizes their health, reproduction, and profitability

Minimize impact of risk factors for poor reproductive performance



We have management strategies to increase success of reproductive programs for older cows

-  Minimize days to breeding after end of VWP through TAI or aggressive combined AIE+TAI program
-  Maximize chances of pregnancy at first breeding through multiple hormonal and non-hormonal strategies



Long term solutions including genetic selection

Acknowledgement



Commercial dairy farms



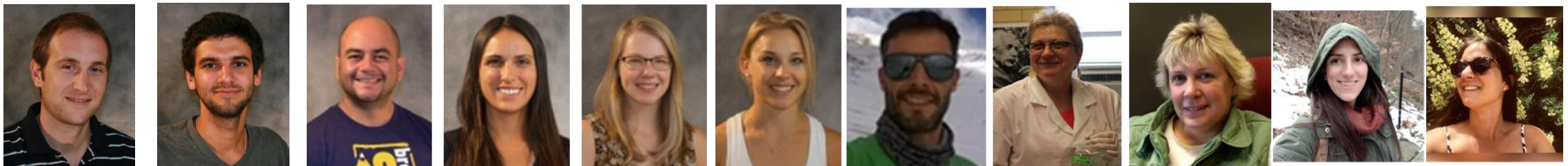
United States Department of Agriculture
National Institute of Food and Agriculture



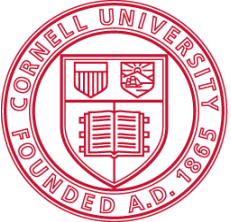
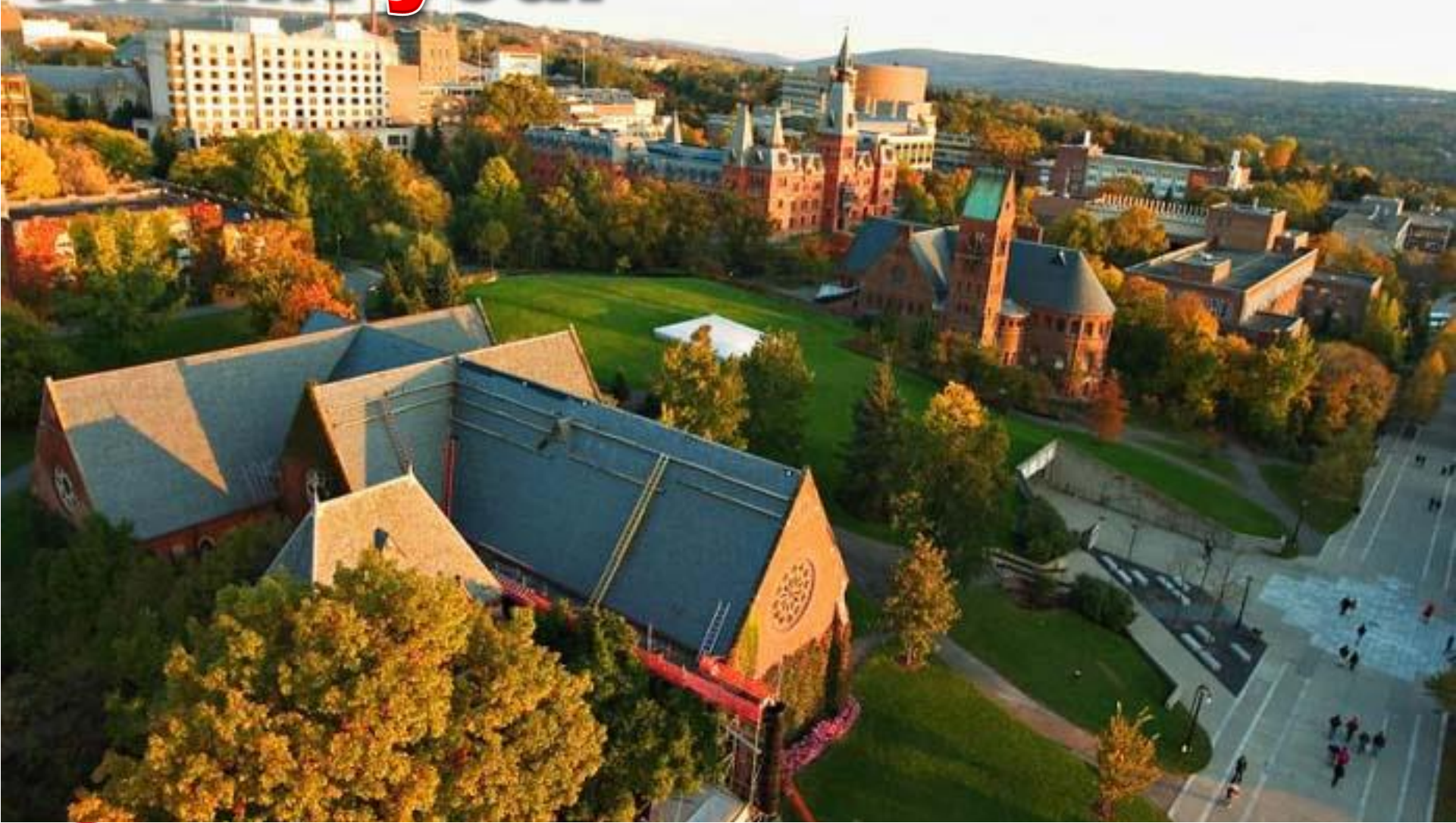
Dairy Cattle Biology & Management Laboratory



Dr. Jim Ehrlich



Thank you!



Cornell University
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jog25@cornell.edu](http://blogs.cornell.edu/giordano/jog25@cornell.edu)