Risks and Rewards of Synchronization

Matt Lucy

Animal Reproductive Biology Group

Division of Animal Sciences

University of Missouri-Columbia, USA

UNIVERSITY OF MISSOURI
COLLEGE OF AGRICULTURE,
FOOD AND NATURAL RESOURCES

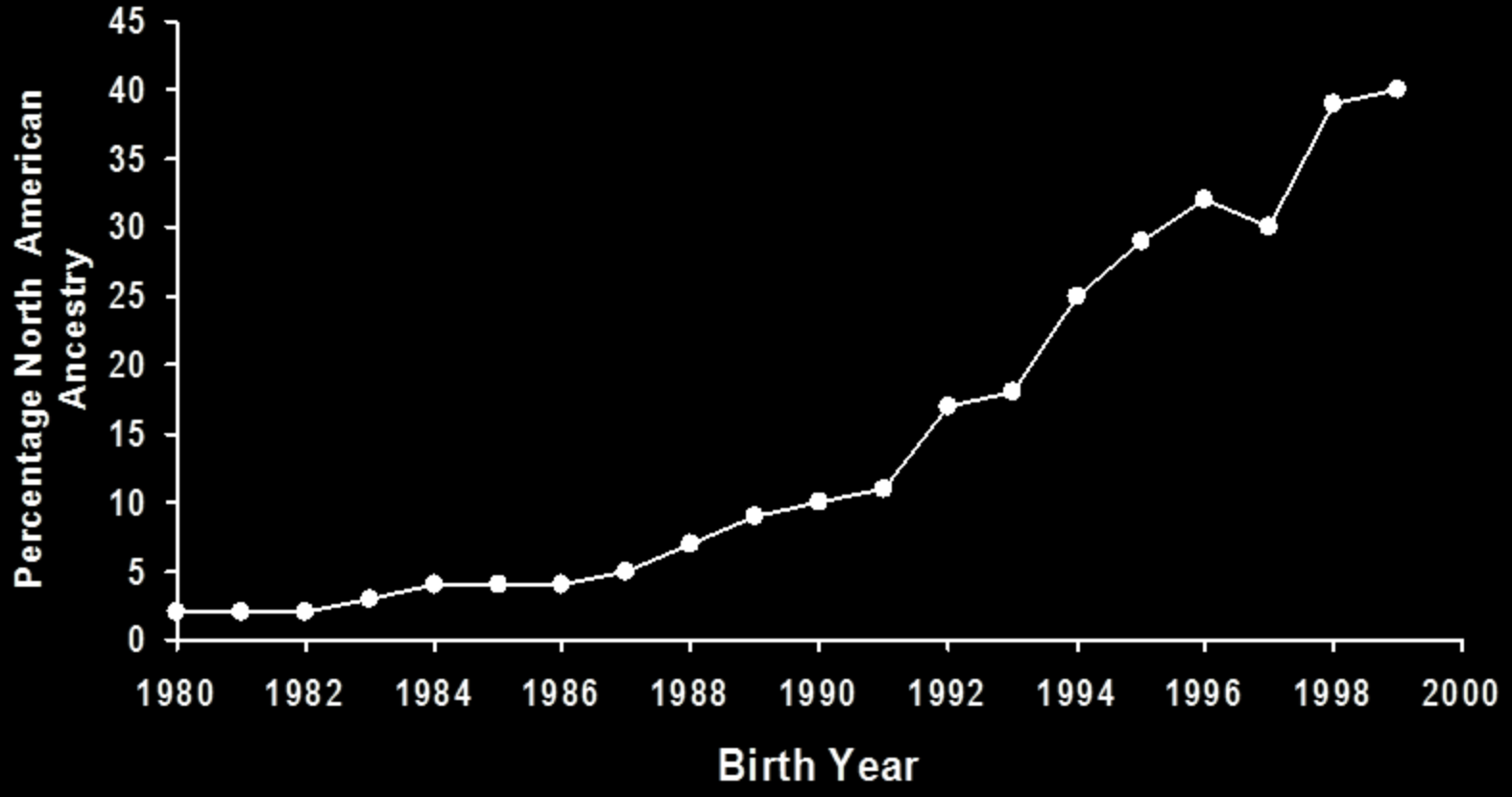
Teagasc Moorepark - Animal & Grassland Research and Innovation Centre, Fermoy, Ireland

2015 Open Day - Teagasc Moorepark

Dexcel (DairyNZ) New Zealand

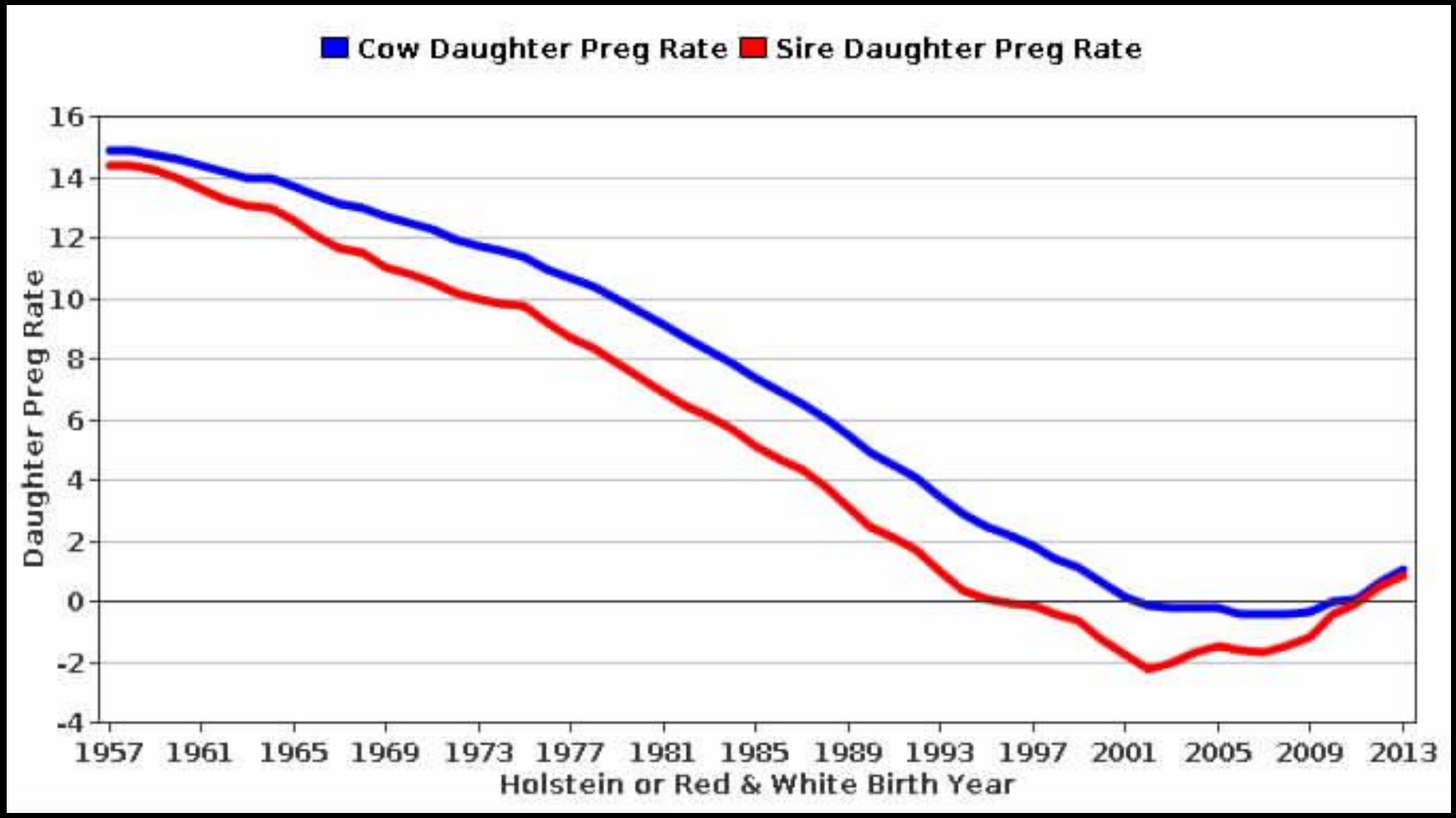
2003-2004

Holsteinization of New Zealand Friesian Cows



Harris and Kolver, Journal of Dairy Science 84(E Suppl):E56-E61.

Cow and sire daughter pregnancy rate (1957 to today)



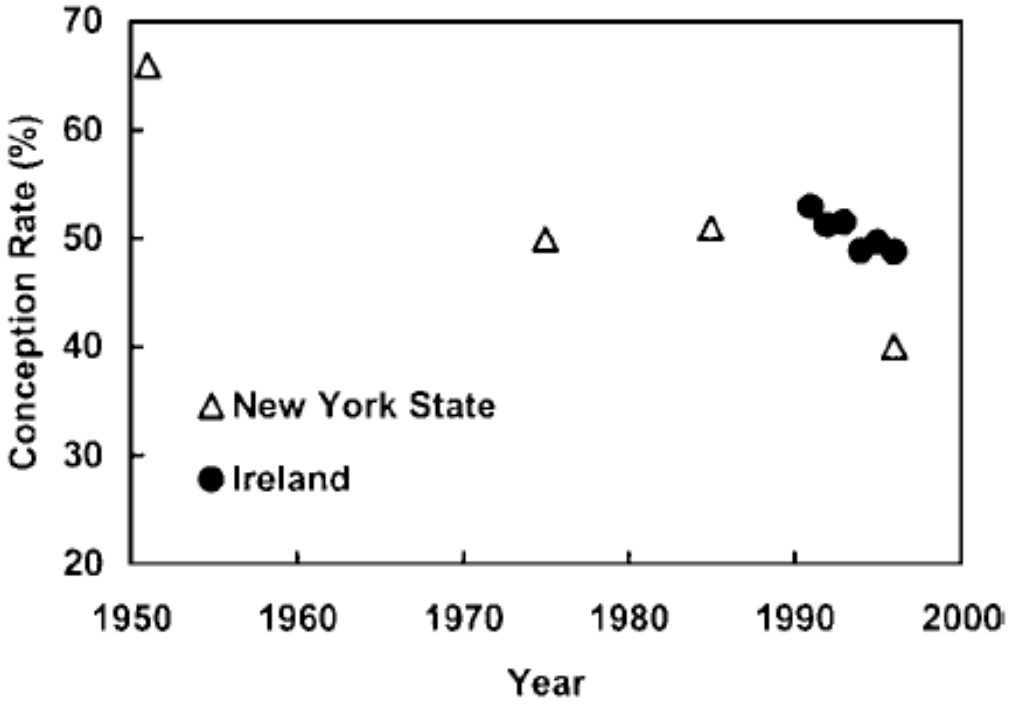
USDA AIPL 2015

J. Dairy Sci. 84:1277–1293

ADSA Foundation Scholar Award

Reproductive Loss in High-Producing Dairy Cattle: Where Will It End?[1]

M. C. Lucy
Department of Animal Sciences,
University of Missouri, Columbia 65211



Yearly averages for conception rate to artificial insemination for lactating dairy cows in either New York State (United States; Butler, 1998) or Ireland (O'Farrell and Crilly, 1999) during the past half-century.

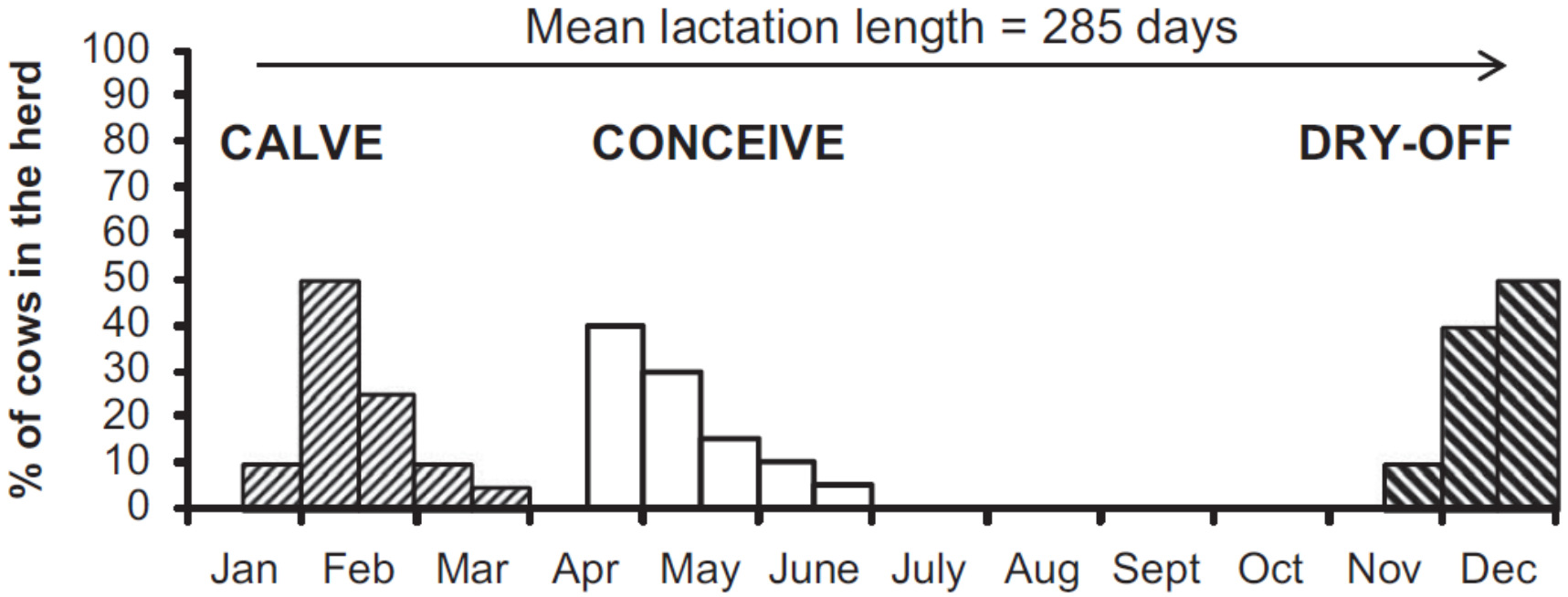


Figure 1 Schematic representation of pasture-based seasonal-calving systems of milk production. Top panel: temporal patterns of pasture growth and herd feed demand. Bottom panel: Seasonal pattern of calving, breeding and drying off. Figure courtesy of B. Horan, Teagasc Moorepark and adapted from Holmes *et al.* (2002).

Butler (2014) Reproduction 8:s1 15-26

It's not your grandparent's dairy repro program anymore!

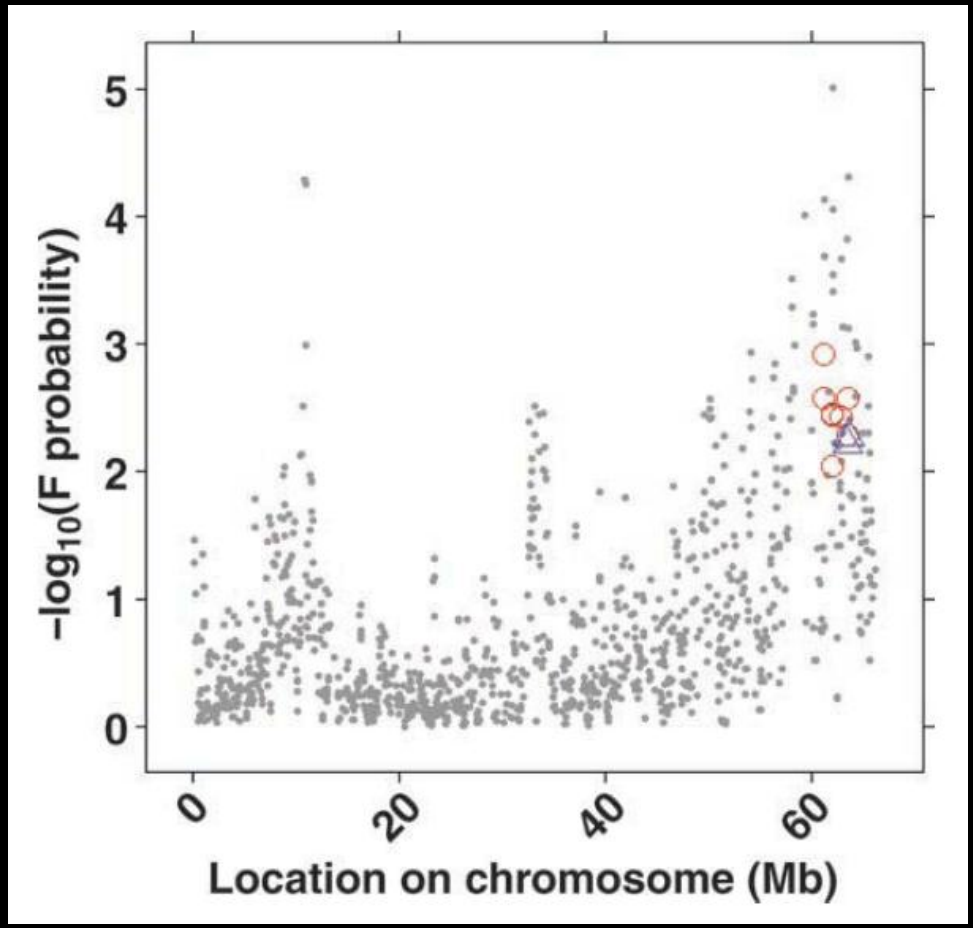
For more information contact:
Ken Olson, PhD, PAS
American Dairy Science Association
Tel: +1-630-237-4961
keolson@prodigy.net

FOR IMMEDIATE RELEASE

ADSA® Foundation Announces Plan to Publish Third Edition of *Large Dairy Herd Management*

Champaign, IL , April 22, 2015 - To benefit a broad segment of the global dairy industry, the ADSA Foundation will undertake another major initiative, this time to meet the growing information needs of dairy farmers, service professionals, and students worldwide. In 1978, a symposium designed specifically to produce a book, *Large Dairy Herd Management* (*LDHM*), was held in Gainesville, Florida. Speakers' presentations were developed into book chapters. In 1992, the book was updated under the co-editorship of Jack Van Horn and Charlie Wilcox.

Innovations of the past decade: Bovine SNP chips and the identification of fertility markers



Fertility markers on chromosome 18
Price et al. (2010)

DNA marker based genetics (Genomics)

Holstein Association USA Genomic Testing Services

Offering a wide array of tests to meet your needs. Don't delay - order your genomic testing kits today! Call Holstein Association USA Customer Service at 800.952.5200.

Whether your animals are Registered or grade, Holstein Association USA can fulfill your testing needs. Holstein Association USA offers a full complement of genomic and other genetic testing services.

Genomic Testing Options

**Pricing effective January 1, 2011*

CLARIFIDE™

Predict the future now.

Genomics will accelerate genetic progress and redefine “high fertility”

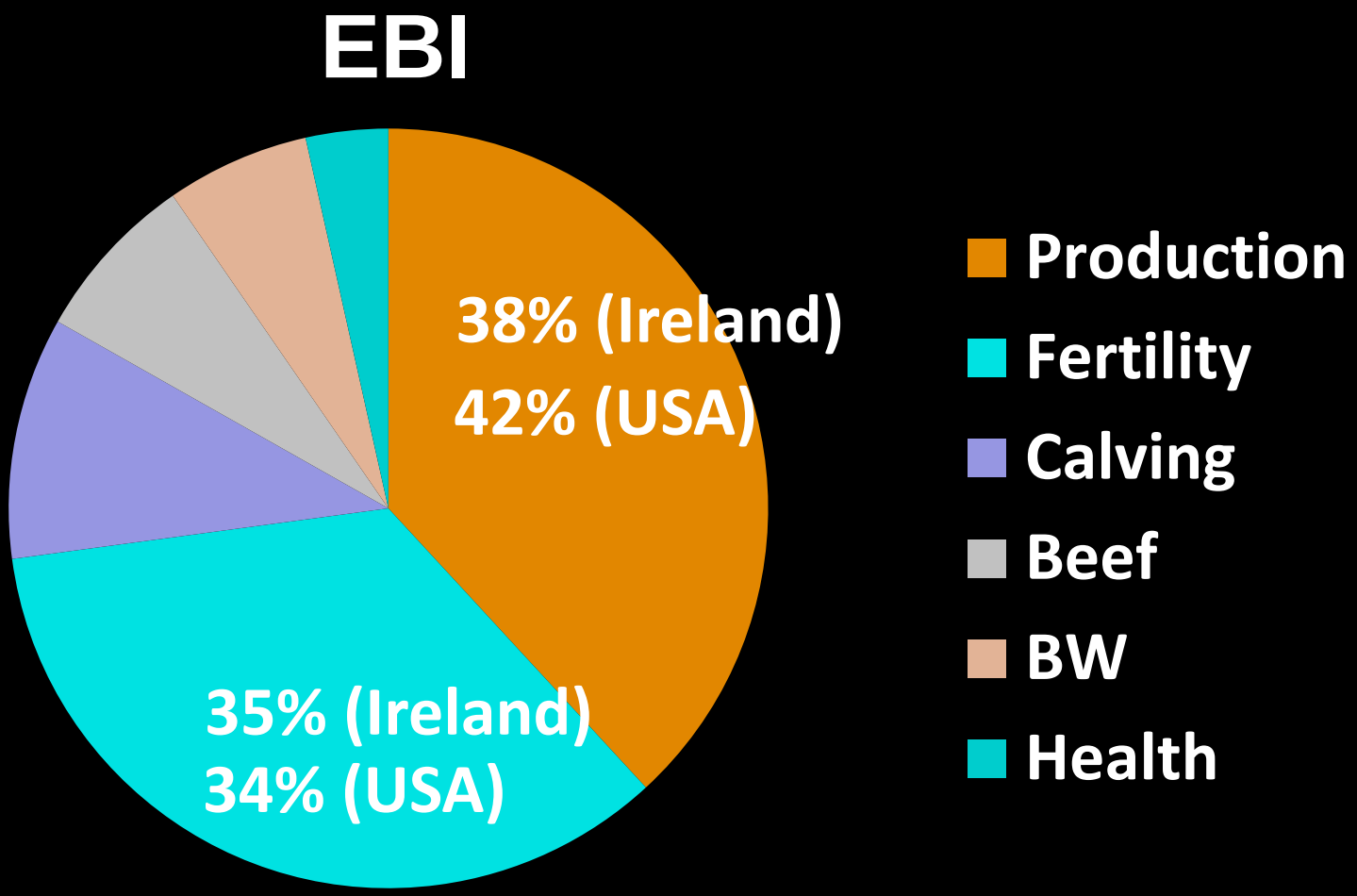
Net Merit – over the years

Traits included	USDA genetic-economic index (and year introduced)								
	PD$ (1971)	MFP$ (1976)	CY$ (1984)	NM$ (1994)	NM$ (2000)	NM$ (2003)	NM$ (2006)	NM$ (2010)	NM$ (2014)
Milk	52	27	–2	6	5	0	0	0	–1
Fat	48	46	45	25	21	22	23	19	22
Protein	...	27	53	43	36	33	23	16	20
PL	...	...	...	20	14	11	17	22	19
SCS	...	...	...	–6	–9	–9	–9	–10	–7
Udder composite	...	...	...	...	7	7	6	7	8
Feet/legs composite	...	...	...	...	4	4	3	4	3
Body size composite	...	...	...	...	–4	–3	–4	–6	–5
DPR	...	...	...	...	...	7	9	11	7
CCR	...	...	...	...	...	...	...	...	2
HCR	...	...	...	...	...	...	...	...	1
CA$	...	...	...	...	...	...	6	5	5

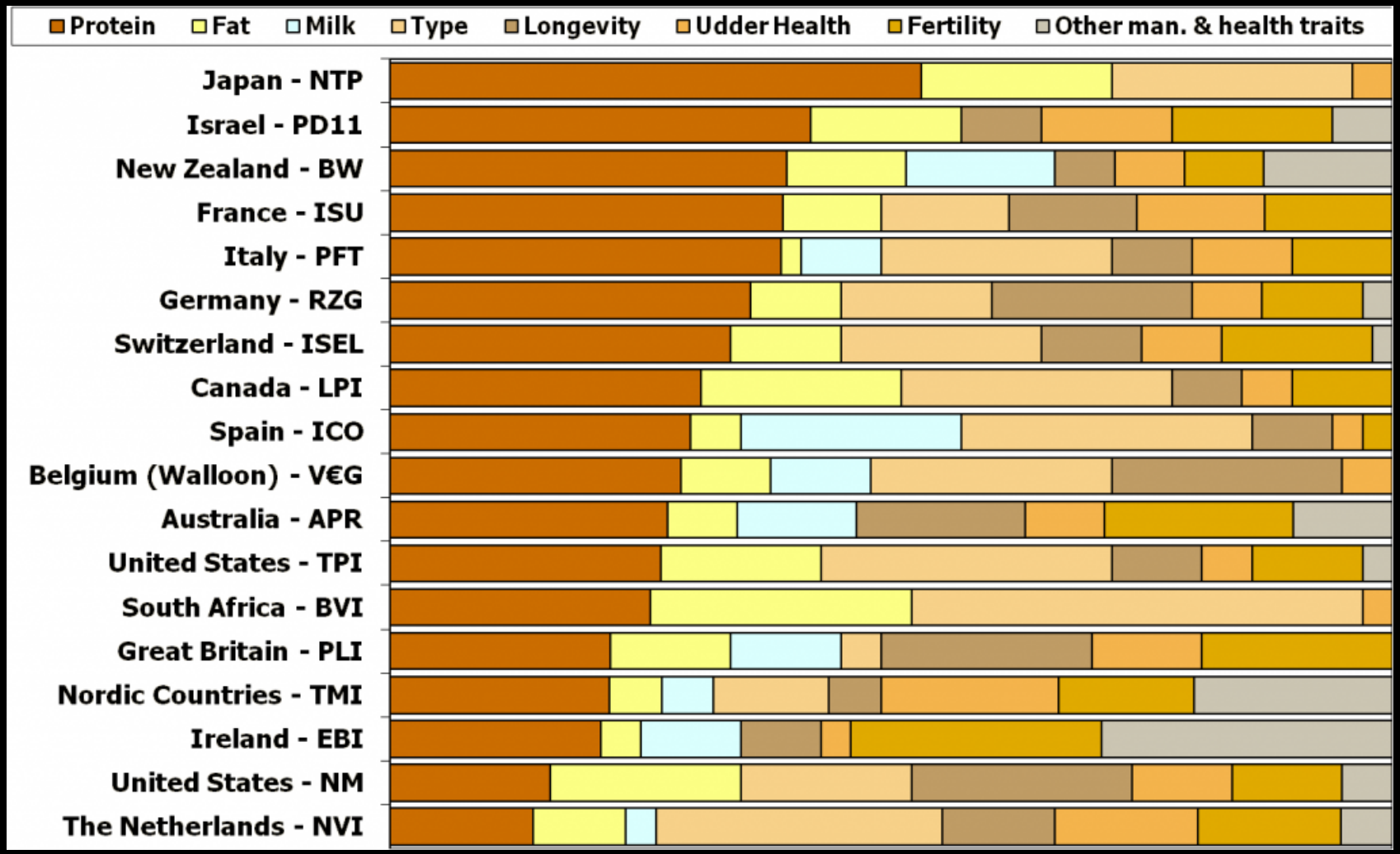
Emphasis on yield traits has declined as other fitness traits were introduced. As protein yield became more important, milk volume became less important because of the high correlation of those 2 traits. A more complete history and comparisons with selection indexes used by other countries are available (Shook, 2006; VanRaden, 2002; VanRaden, 2004).

USDA AIPL 2014

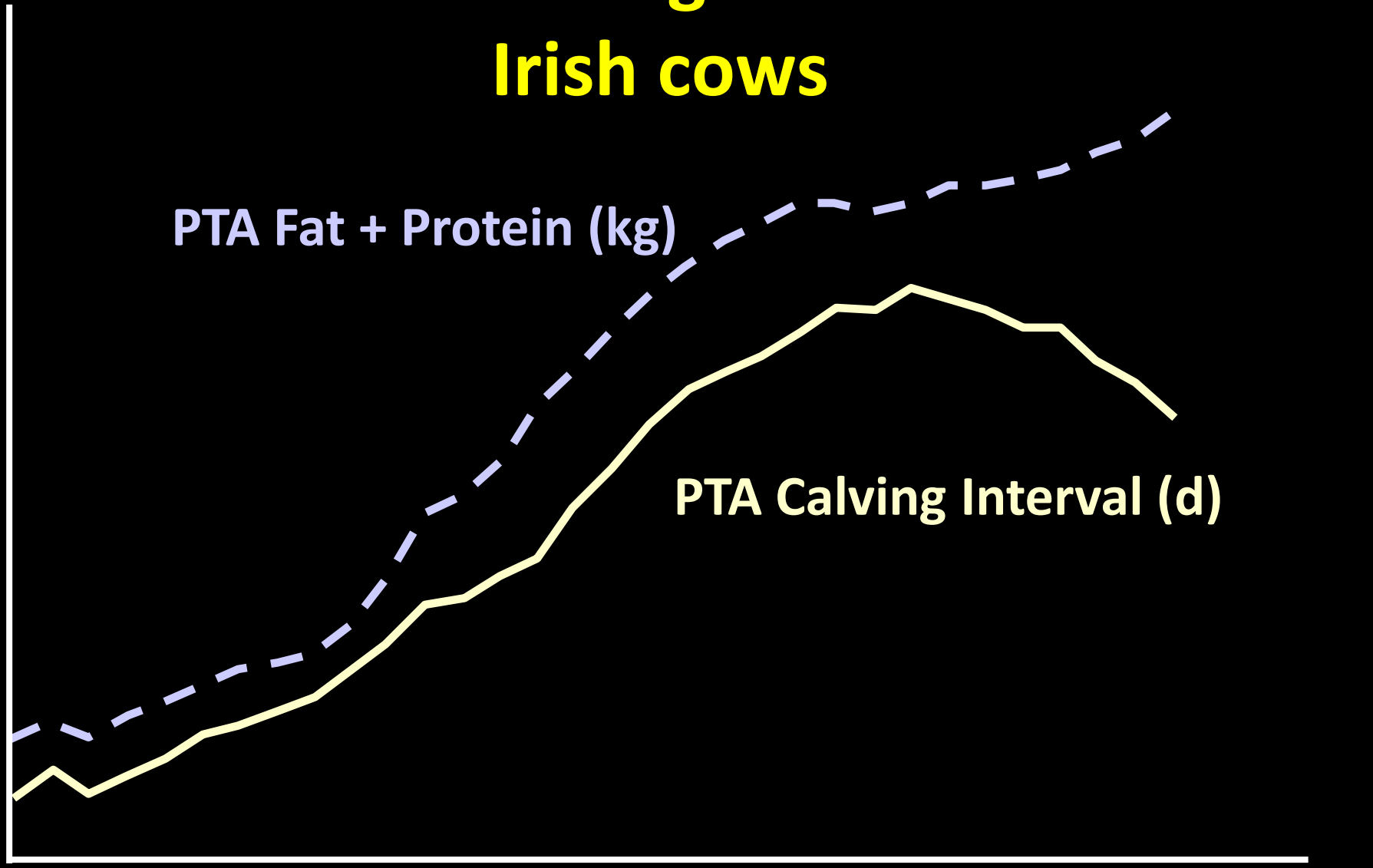
EBI (Ireland) vs. Net Merit (USA)



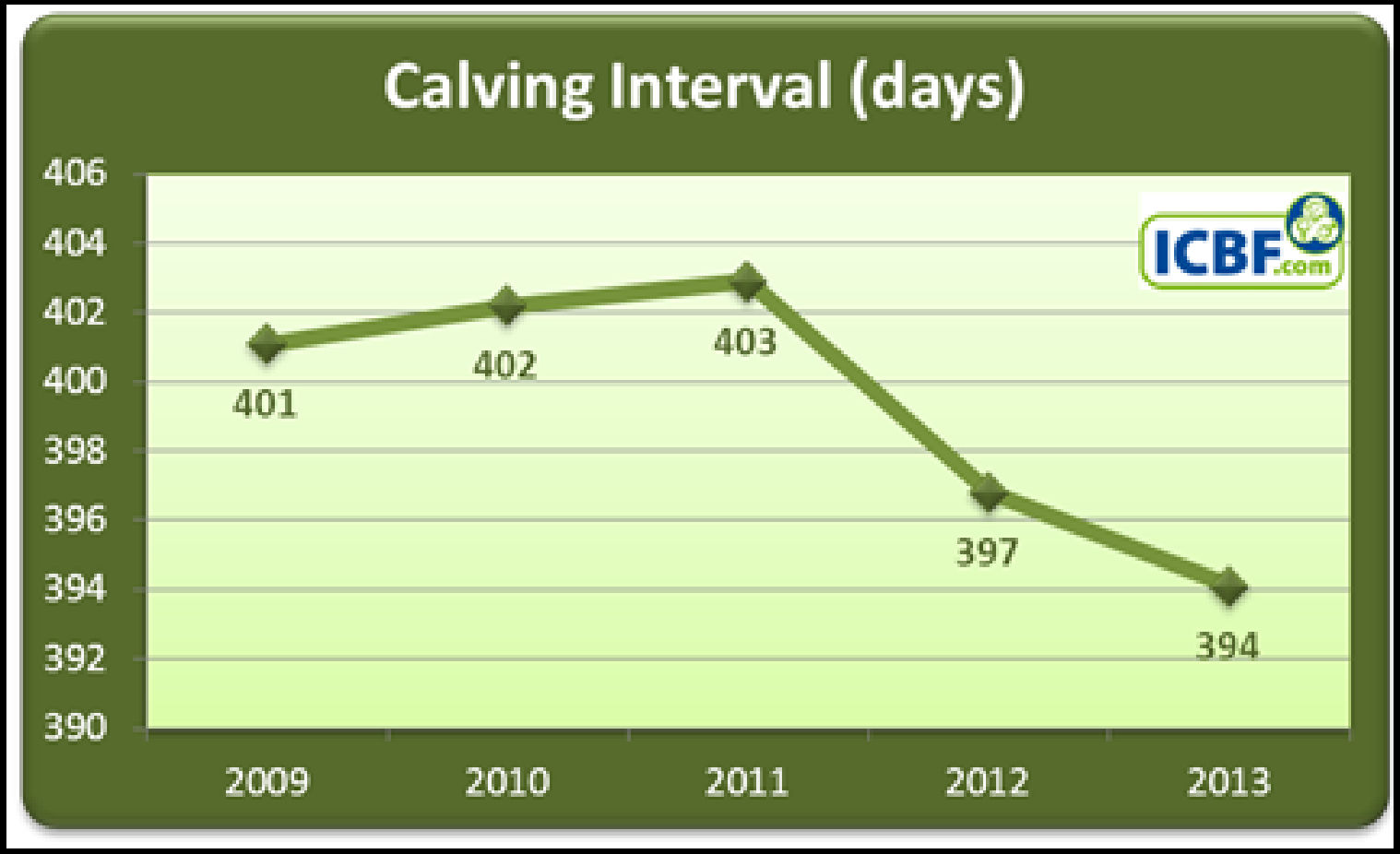
Worldwide genetic indices



Genetic change over time
Irish cows

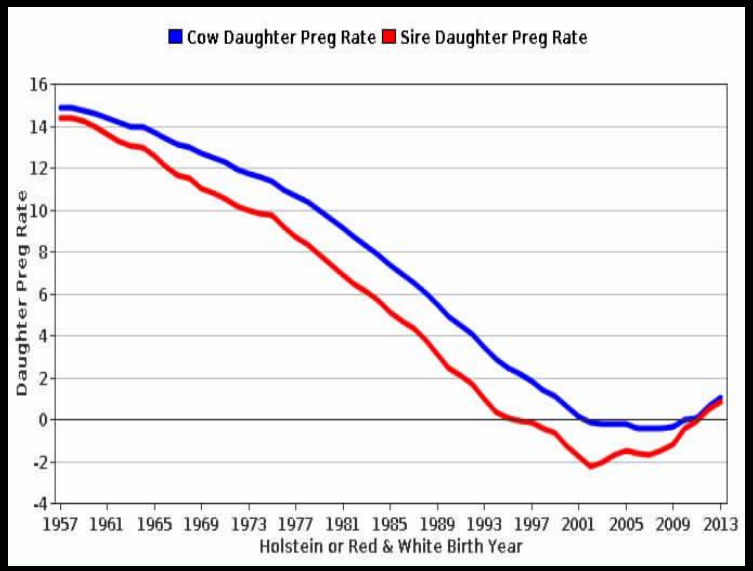


1.07 million Irish dairy cows
On farms on 30 June 2013

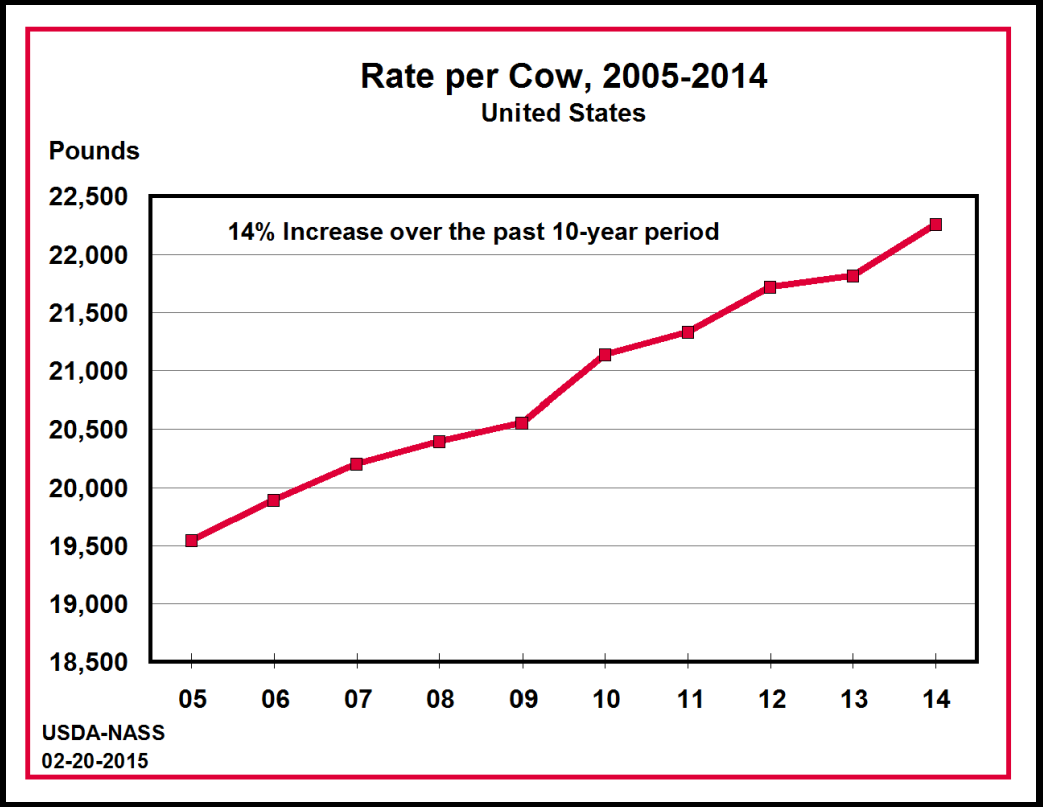


ICBF News, 10 Sept 2013

10-year trends
milk production and fertility



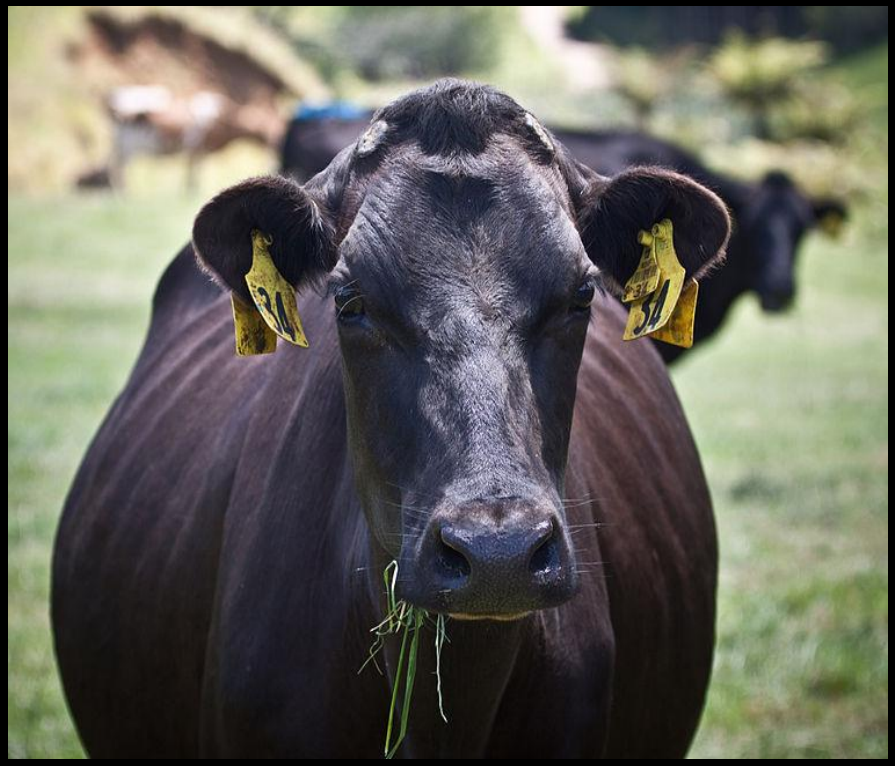
USDA AIPL 2015



USDA United States Department of Agriculture
National Agricultural Statistics Service

UNIVERSITY OF MISSOURI
COLLEGE OF AGRICULTURE, FOOD AND NATURAL RESOURCES

Now is the time to define "high fertility"!



Pregnant after an observed in estrus and AI

Pregnant after a timed AI

Innovations in dairy reproduction

- Highly Effective Synch Programs for Cows
  - Presynch Ovsynch
  - G6G
  - 5 day Cosynch 72
  - Double Ovsynch
- Highly effective Resynch Programs for cows

Programs for grass-based dairies *are different!*

- Calving seasons
- Planned start of mating dates
- Late calvers
- Non-cyclers

Programs for grass-based dairies *are different!*

- Highly effective synch programs for cows
  - CIDR_Ovsynch_56
  - Southwest Center Synch
  - Show_me_synch
- Highly effect synch programs for heifers
  - Show_me_synch
- Highly effective resynch programs for cows
  - CIDR_Ovysnch_56

Risks and Rewards of Synchronization

Matt Lucy

Animal Reproductive Biology Group

Division of Animal Sciences

University of Missouri-Columbia, USA

UNIVERSITY OF MISSOURI
COLLEGE OF AGRICULTURE,
FOOD AND NATURAL RESOURCES

DCRC

DAIRY CATTLE REPRODUCTION COUNCIL

Member Login

Register as a new member

Search

About | Resources | Annual Meeting | Membership | Reproduction Awards | Sponsors | Contact

Dairy Cattle Reproduction Council

The Dairy Cattle Reproduction Council (DCRC) is a proactive organization with long-term interest in raising awareness of issues critical to reproductive performance. Through information and communication, it strives to deliver the latest in technology and resources.

The Council consists of a wide array of dairy industry professionals—researchers and consultants, practitioners and producers—engaged in a collaborative effort to take cattle reproduction technology to the next level.

January 30th Webinar

DCRC will host a webinar featuring the University of Minnesota's Dr. Ricardo Chebel as he discusses Transition Management Grouping Strategies. The webinar will start at 12 p.m. Central Standard Time. Sponsored by Arm & Hammer Animal Nutrition.

Click Here to Pre-Register

MEMBERSHIP

- Discounted Registration for Annual Meeting
- Networking
- Educational Resources

Join Today!

SOUTHWEST RESEARCH CENTER HONORED WITH DAIRY BREEDING AWARD

September 30, 2013
Story: Kyle Spradley | spradleyk@missouri.edu

In November, the Southwest Research Center will be awarded the Platinum certification from the Dairy Cattle Reproduction Council for its breeding program that produces cattle such as this one.

Search for:

Search

Related Stories

Calcium and Productivity
Vine to the Plate
Safeguarding History
International Collaborations
Field Day Schedule Finalized for 201

Stories from CAFNR

Self-Repairing Plants?
Newborn Collaboration
Devoted to Agriculture
Earth-Friendly Leather
Faster Drug Therapies

Tags

agricultural and applied econc
Alumni animal sciences
Atmospheric Sciences Beef
Bradford Research Ce
cattle corn
Division of Applied Social Sciences
Drought Field Days
Fisher Delta Research Center
Float Your Boat for the Food Bank Cardboar
food Food bank
food science genetics History
Ingolf Gruen
Lee Greenley Jr. Memorial Research Center
plant sciences research
rural sociology
School of Natural Resouces

Reproduction – SW Center University of Missouri

Submission Rates

		2014 TAI	2013 TAI	2012 TAI	2011 Synch	2010	2009	2008	2007	2006	Goals
1st 3 weeks		100.0	100.0	100.0	89.1	74.2	75.5	72.6	70.8	87.1	87
1st 6 weeks		100.0	100.0	100.0	95.7	85.6	92.6	92.6	93.75	96.1	
1st 9 weeks		100.0	100.0	100.0		91.8	96.8	96.8	100	100	

Pregnancy Rates

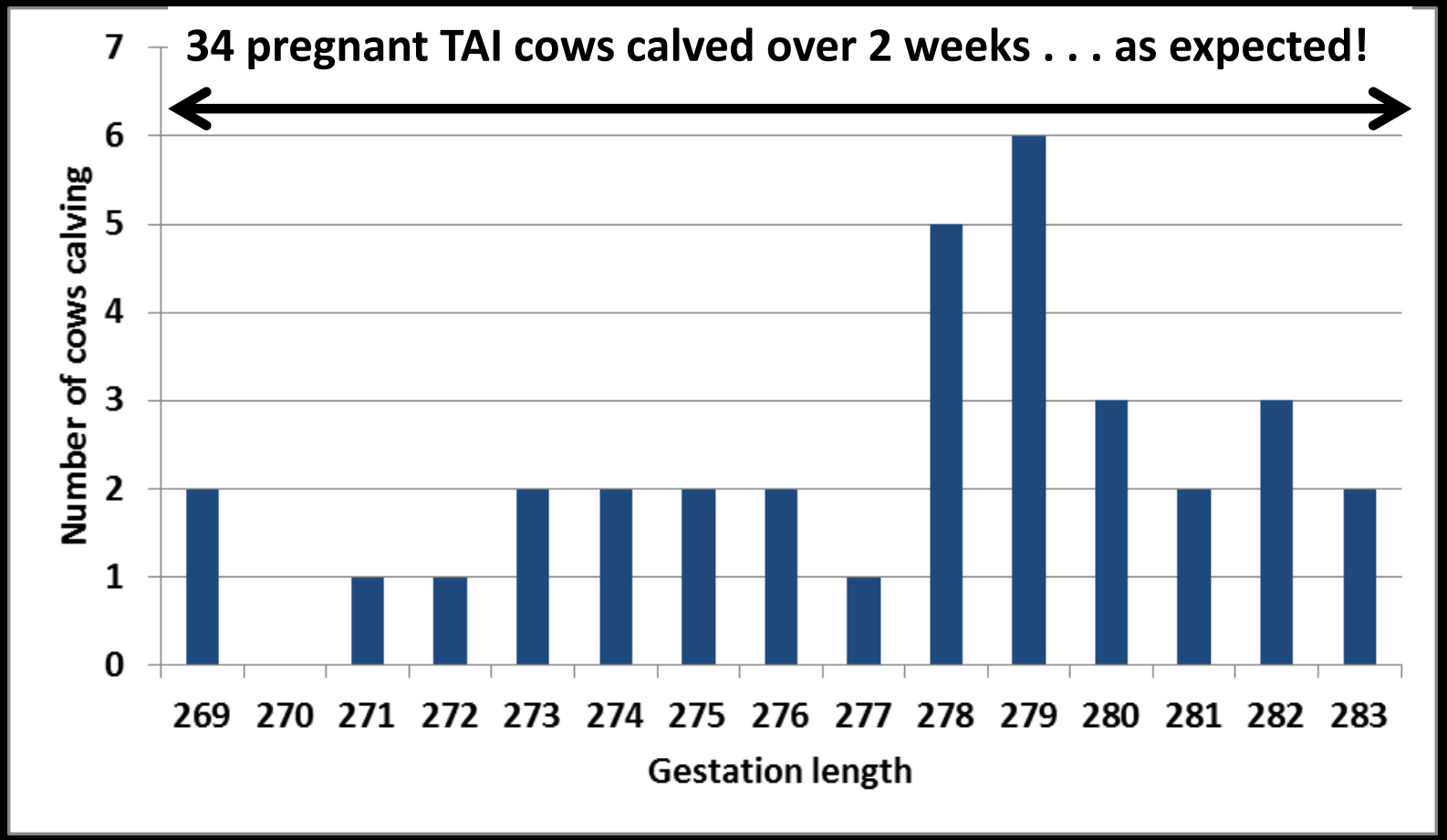
1st 3 weeks		57	75.6	71.6	41.4	36.1	43.6	43.2	42.7	57.7	
1st 6 weeks		88.5	88.9	87.0	78.4	51.5	62.8	64.2	66.7	75.6	75
1st 9 weeks			97.8	93.8		86.6	80.9	76.8	84.2	86.8	

UNIVERSITY OF MISSOURI Extension
Pasture-Based Dairy Program

Synchronization vs none – 100 cow herd
Stacey Hamilton (University of Missouri)

			23-Jan	24-Jan	25-Jan	26-Jan	27-Jan	28-Jan	29-Jan	30-Jan	31-Jan	1-Feb	2-Feb	3-Feb
1259331		Non-Synch	38	42	41	44	45	44	45	42	43	44	44	44
1288102		Show-Me			38	42	41	41	43	45	45	43	44	44
					$20									
	# milk/100 cows		mean calving date		Gross Income	Income/synch cost					Labor			
Non-Synch	1,259,331		2/19		$251,866.14	$251,306.14					1 hour/day heat detection @ $10/hr			
Show-Me	1,288,102		2/5		$257,620.32	$256,257.82								
	cost/cow	100	Labor	TOTAL				non-synch	hrs		ShowMe	hrs		
Non-Synch	1	100	460	560			breeding		4		CIDR removal	1.5		
Show-Me	12	1200	162.5	1362.5							Lut	1		
									46		GnRH	1		
									460		Breeding	2.5		1.5
Advantage above synch cost											Repeat			
Show Me vs Non Synch	$4,951.68										Breeding	1.25		
												16.25		
												162.5		

But I can't handle 100's of cows calving on the same day . . .



UNIVERSITY OF MISSOURI
COLLEGE OF AGRICULTURE, FOOD AND NATURAL RESOURCES

Mean = 276; SD = 4.5
Fricke et al. (2015)

Start with a plan

follow the plan
(no freelancing)

and then . . .


37
14
41
42
DUNKIN' DONUTS
YA GOTTA BELIEVE

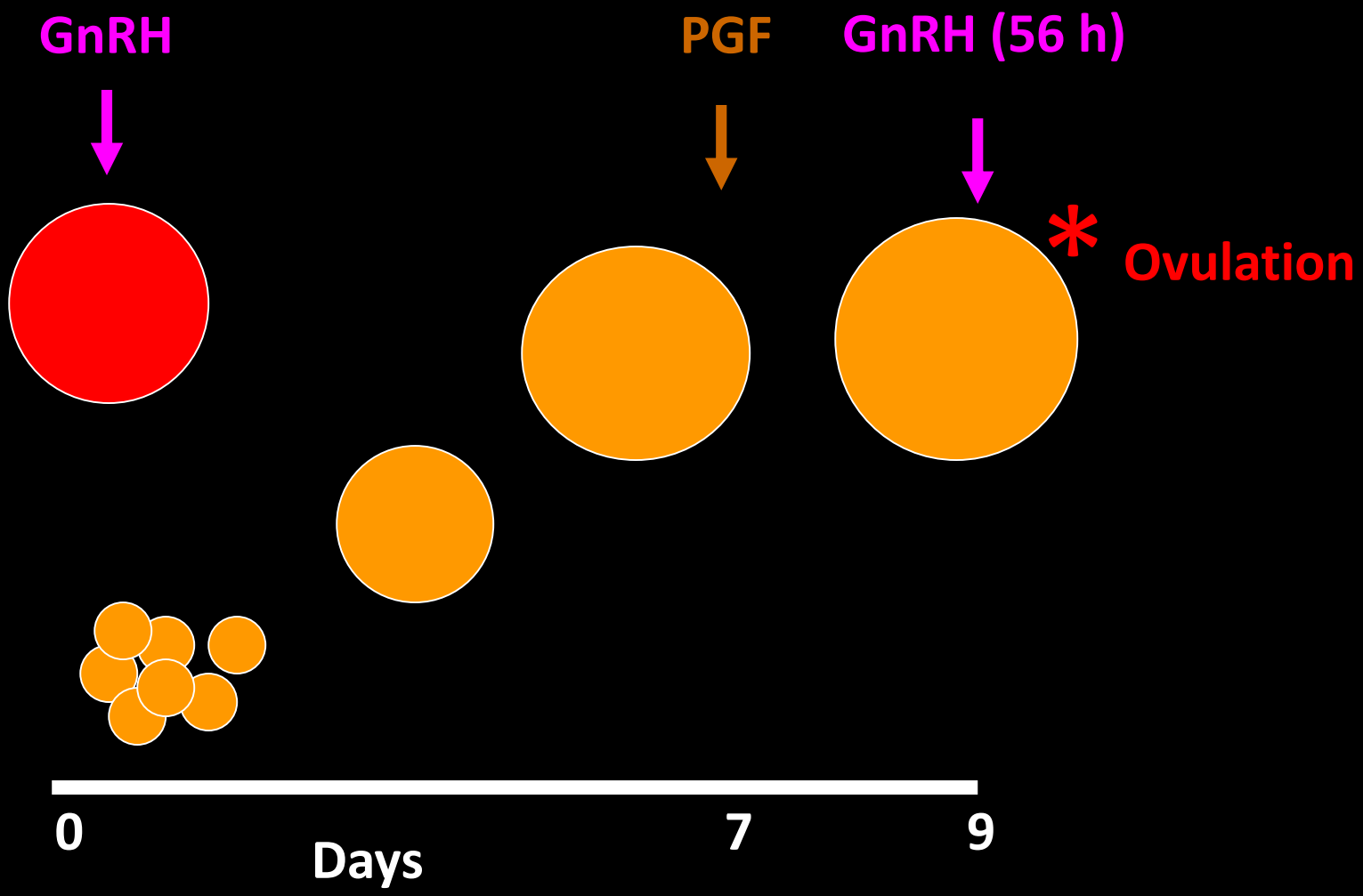
Getting them bred!

Start with a clean, comfortable, healthy cow in good body condition

Estrous Cycle Control (Programmed Breeding)

- Prostaglandin
- GnRH
- Progestogens

Synchronization of Follicular Waves



Fixed Time AI Protocol with CIDR

Timed AI pregnancy results CIDR_Ovsynch_56 Moorepark and Missouri cows

P/AI (PAG test):

Missouri: 79/155 (51%)

Moorepark: 17/32 (53%)

PERFECT TIMING

Using timed AI to get more pregnancies in late-calving cows

MATT LUCEY, PAUL FRICKE AND STEPHEN BUTLER*

For most spring-calving systems, the breeding season will commence in the next few weeks. The primary objective is to get as many cows and heifers pregnant as quickly as possible after the start of the breeding season.

During the recent open day, the most frequently asked question to the fertility board was "What should I do with my late-calving cows?"

The two factors that determine the rate at which cows become pregnant after the mating start date (MSD) are the submission rate and the conception rate. Both of these factors are compromised in the late-calving cow (less than 42 days calved at MSD).

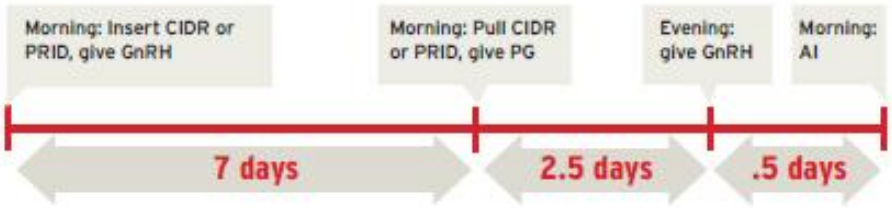
Submission rates are decreased because late-calvers may not have started cycling before the MSD. Conception rates are decreased because the uterus may not have completely recovered from the previous pregnancy and the cow may not have had one complete oestrus cycle before first breeding.

So should I breed a late-calver before day 45 postpartum knowing that I only have approximately one in three chance of pregnancy?

Your first service conception rate is low (35%), but in all likelihood you will have a second opportunity for AI and will pick up additional pregnancies. By starting to

Timed AI or once a day milking can help get more late calvers in calf

Figure 1: A timed AI programme for late-calving cows



ing progesterone when the GnRH is given. Progesterone is important and improves conception rates to AI.

example, Wednesday evening).

Breed all cows the following morning (Thursday),

ensure 100% submission rate to first AI. The timed AI will also synchronise an oestrus cycle. The synchronised cycle will advance the time of second AI in cows that do not conceive to first AI and increase the total number of pregnancies.

It is not necessary to examine the repro tract of the late-calving cow before starting the timed AI program. Cows with or without a CL will respond to the program. If a cow does have a CL, then her

FTAI protocol for Dairy and Beef Heifers
Show-me Synch

14-d CIDR-PG (Show-me Synch; Mallory et al., 2011)

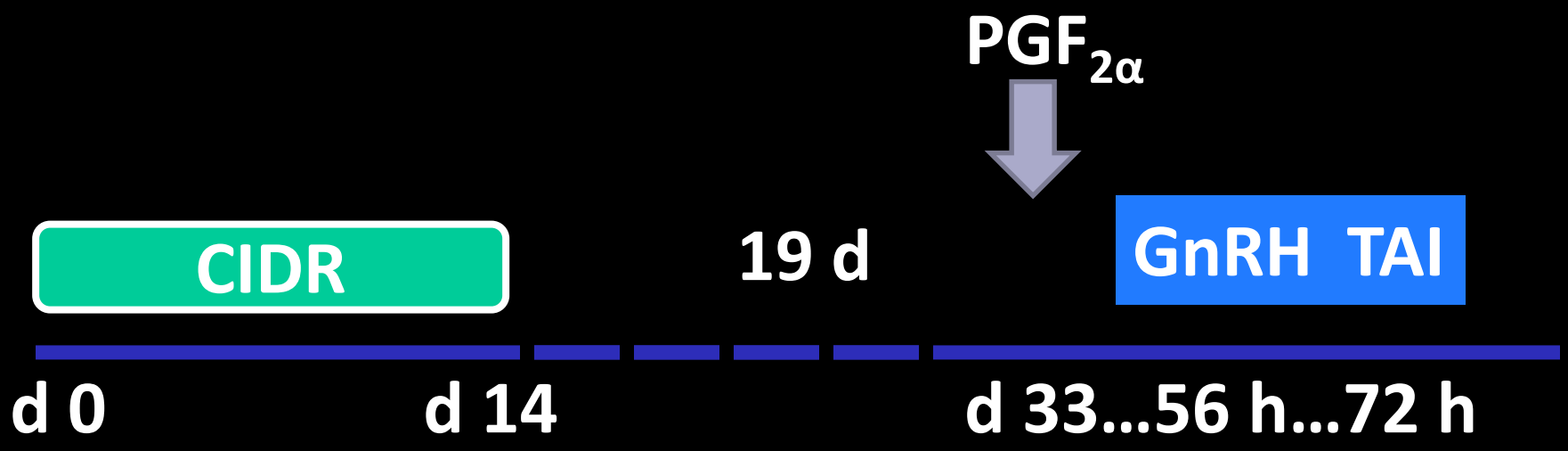
FTAI pregnancy rate totals:
1729/2656 (65%)

Mallory et al. (2011) J. Anim. Sci. 89:1358-1365

Missouri Dairy Results since 2010
Show-me synch (heifers)
From Scott Poock

- 83/120 (69.1%) pregnant to TAI for conventional semen
- Jersey heifers 34/60 (56%) to TAI with gender selected
- 4 years at SWC, 70-74% to TAI with conventional semen

Show-me Synch (14dCIDR_TAI) Program for cows



UNIVERSITY OF MISSOURI
COLLEGE OF AGRICULTURE, FOOD AND NATURAL RESOURCES

Escalante et al. (2013) J. Dairy Sci. 96:300-306.

Missouri Dairy Cow Results (Dr. Scott Poock)

- 7 day CIDR program vs 14 day CIDR (Show-me Synch)
- No difference between the 2 programs (50-60% PR to TAI depending on farm)
- Majority of producers choose the short program

Show-me synch vs. SW Center Synch for cows

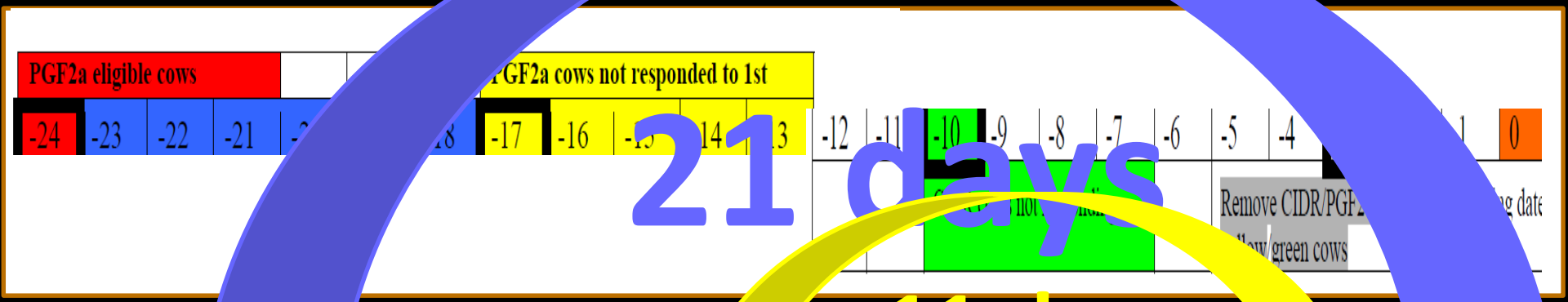
SW Center Synch (Control) Program

PGF2a eligible cows							PGF2a cows not responded to 1st					
-24	-23	-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	
-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0
		CIDR cows not responding					Remove CIDR/PGF2a yellow/green cows				Breeding date	

http://agebb.missouri.edu/dairy/grazing/protocols/index.htm

Escalante et al. (2013) J. Dairy Sci. 96:300-306.

SW Center Synch (Control) Program



21 days

11 days

$PGF_{2\alpha}$ $PGF_{2\alpha}$ $PGF_{2\alpha}$

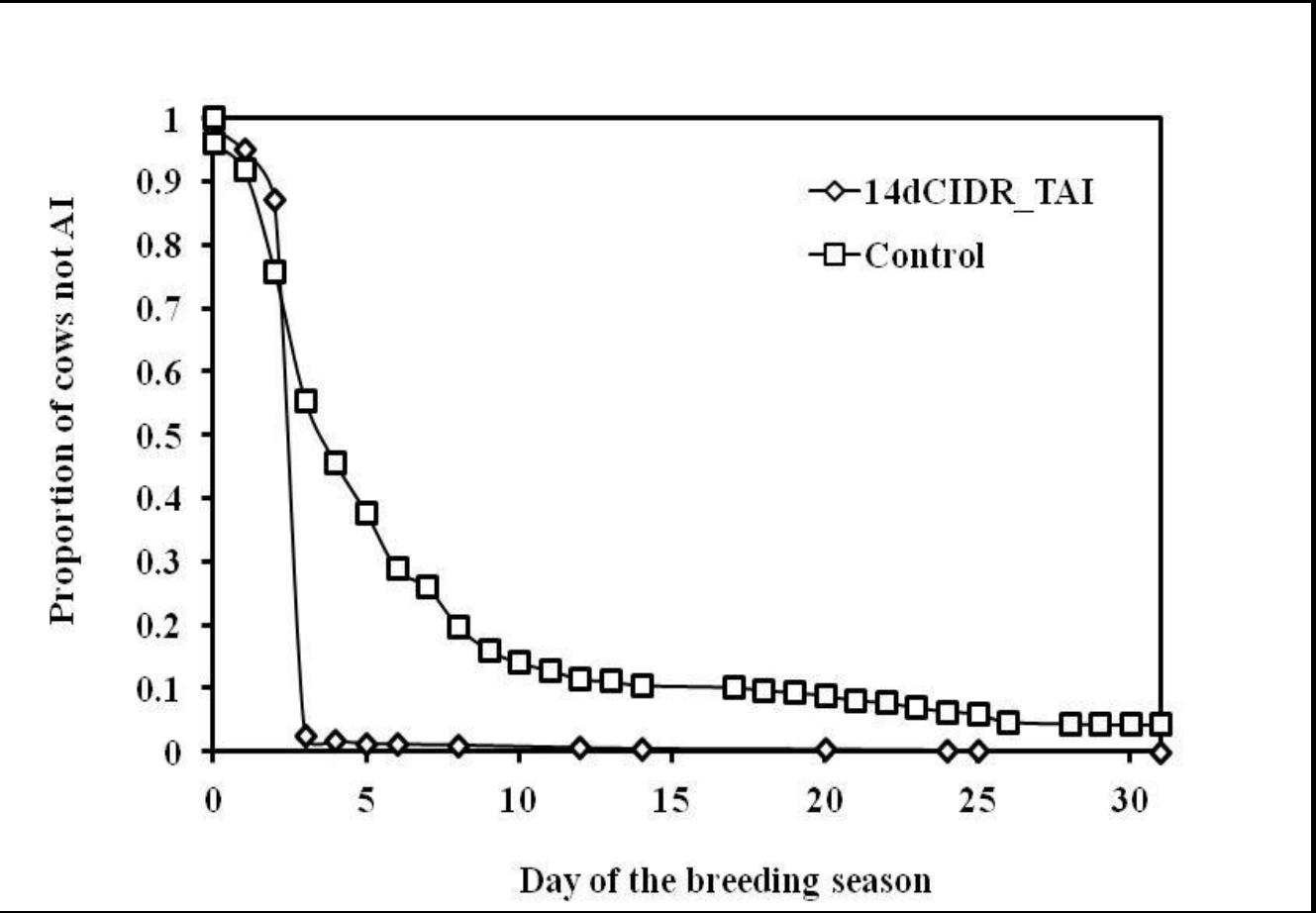
CIDR

-24 -21 -17 -14 -10 -3

UNIVERSITY OF MISSOURI
COLLEGE OF AGRICULTURE, FOOD AND NATURAL RESOURCES

Escalante et al. (2013) J. Dairy Sci. 96:300-306.

Show-me synch vs. SW Center Synch (Control) Survival – Interval to first AI



Escalante et al. (2013) J. Dairy Sci. 96:300-306.

Show-me synch vs. SW Center Synch (Control)
First insemination

Item	Treatment[1]		Total
	14dCIDR_TAI	Control	
First Insemination[2]			
Farm 1	119/273 (43.6%)	140/245 (57.1%)	259/518 (50.0%)
Farm 2	140/304 (46.1%)	120/210 (57.1%)	260/514 (50.6%)
Farm 3	69/122 (56.6%)	88/113 (77.9%)	157/235 (66.8%)
Farm 4	23/38 (60.5%)	18/33 (54.5%)	41/71 (57.7%)
Total	351/737 (47.6%)	366/601 (60.9%)	717/1338 (53.6%)

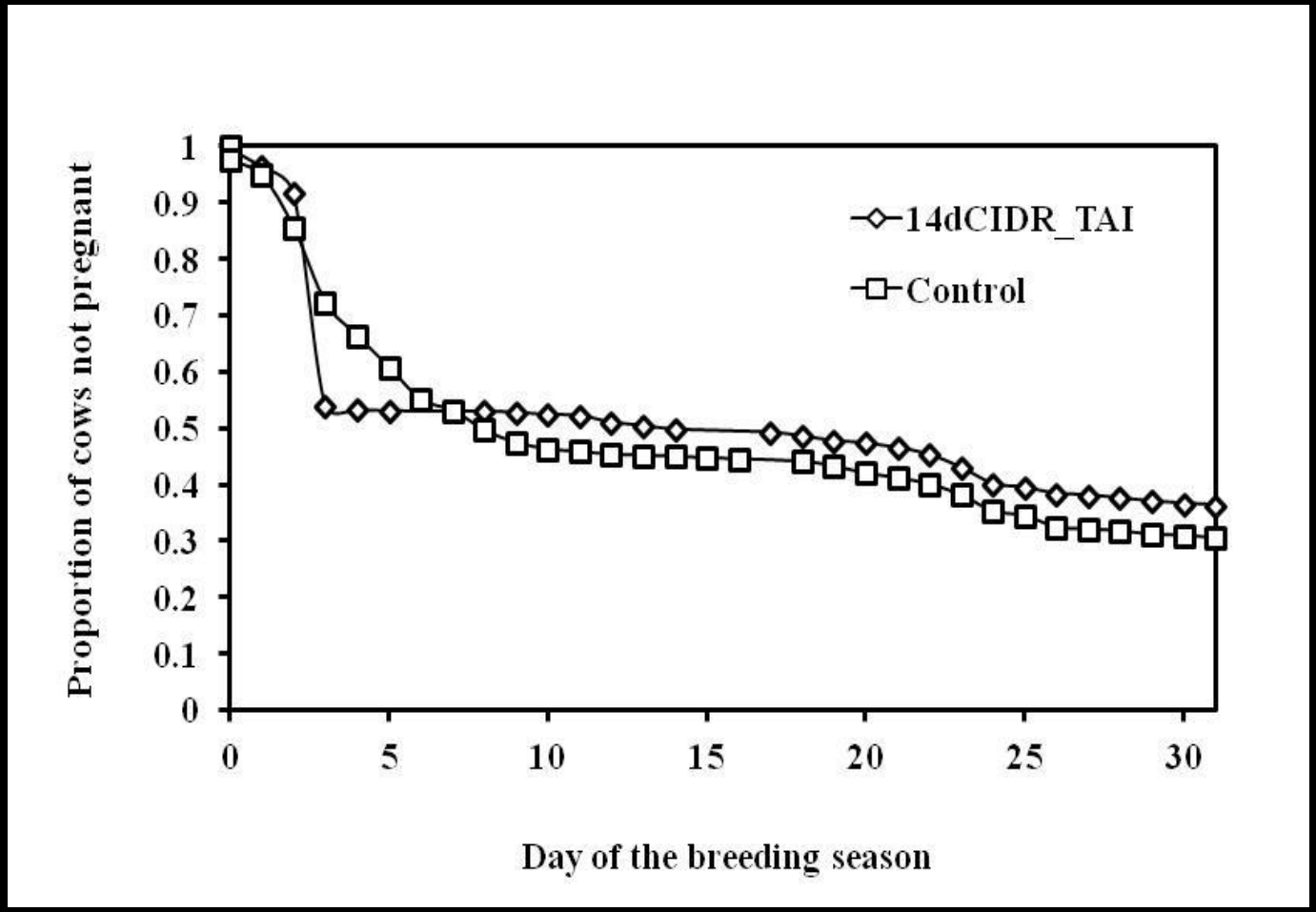
Escalante et al. (2013) J. Dairy Sci. 96:300-306.

Show-me synch vs. SW Center Synch for cows
Pregnant cows/total number of cows

Item	Treatment[1]		Total
	14dCIDR_TAI	Control	
Farm 1	169/273 (61.9%)	178/270 (65.9%)	347/543 (63.9%)
Farm 2	181/304 (59.5%)	139/210 (66.2%)	320/514 (62.3%)
Farm 3	91/122 (74.6%)	97/113 (85.8%)	188/235 (80.0%)
Farm 4	28/38 (73.7%)	21/33 (63.6%)	49/71 (69.0%)
Total	469/737 (63.6%)	435/626 (69.5%)	904/1363 (66.3%)

Escalante et al. (2013) J. Dairy Sci. 96:300-306.

Show-me synch vs. SW Center Synch for cows Survival – interval to pregnancy



Escalante et al. (2013) J. Dairy Sci. 96:300-306.

Second insemination is messy business!

Second insemination

You need a plan . . .

and doing nothing or letting the bull deal with it may not be the best plan!

Step 1

Start with
FIRST insemination

Step 2

Get your heat detection in order

Step 3

Resynch non-pregnant cows

Pregnancy diagnosis

DCRC Protocol Sheet
Free and on line

Dairy Cow Synchronization Protocols - 2013

Resynch methods

Any cow that is diagnosed open at pregnancy diagnosis (**PD**) can be resynchronized. Methods can be used with or without estrous detection and AI after observed estrus (**EDAI**).

A. Start Ovsynch method after PD.

Example: Ovsynch56 Starting after PD

S	M	T	W	R	F	S

PGF GnRH TAI PD

The black rectangle denotes PD. PGF is administered to cows diagnosed open (not pregnant). Pregnant cows are not treated. A CIDR can be used in a resynch program according to the instructions on page 1.

Intensity of red color within EDAI denotes periods to expect most cows in estrus during EDAI. Open cows are typically observed in estrus on days 20 to 25 after AI. Nomenclature: The interval in days from previous AI to the start of the resynch program (first GnRH) is denoted in front of the program (d32Ovsynch56, etc.).

B. Start timed AI method before PD.

Example: Ovsynch56 Starting before PD

S	M	T	W	R	F	S

Example: 5dCosynch72 Starting before PD

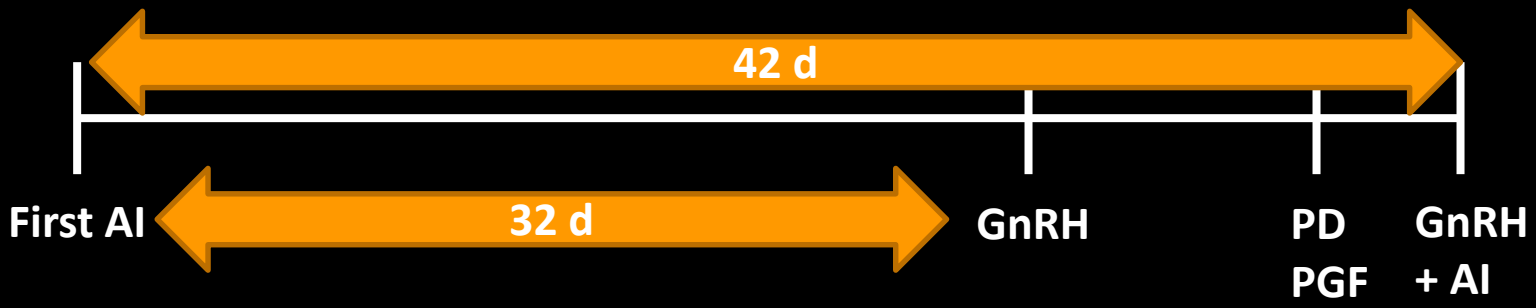
S	M	T	W	R	F	S

*PGF is given to open cows (not pregnant). Pregnant cows are not treated after PD.

UNIVERSITY OF MISSOURI
COLLEGE OF AGRICULTURE, FOOD AND NATURAL RESOURCES

www.dcrcouncil.org

Why d32_Ovsynch is popular for second insemination resynch



- Allows cows to come into estrus and be inseminated before resynch is started.
- Excellent fertility for second AI (theoretically started on d 5-10 of cycle)
- Fast and definitive ultrasound examination (d 39)
- Resynch treatments on same day as first AI treatments

Lucy (2012) WCDS Proceedings

TAI Breeding Calendar – PAG only – 28 d resynch

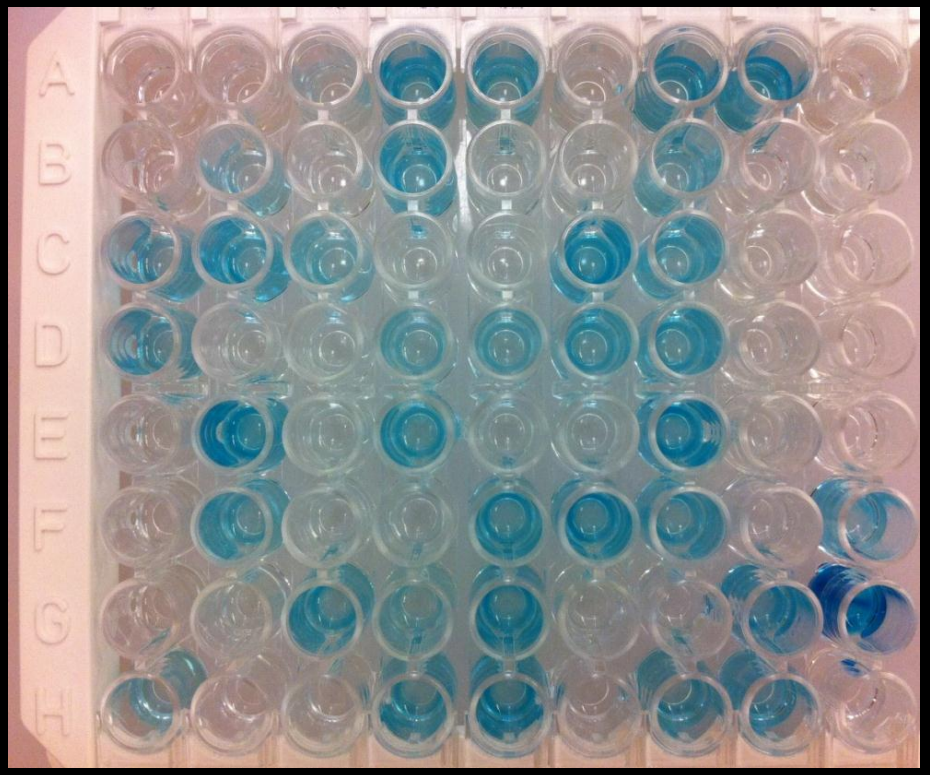
Sun	Mon	Tue	Wed	Thur	Fri	Sat
Week 1	GnRH					
Week 2	PGF		GnRH	TAI	1	2
Week 3	4	5	6		8	9
Week 4	11	12	13			16
Week 5	18 GnRH	19	20		22	23
Week 6	25 PREG √ PGF	26	27 GnRH	TAI	29	30
Week 7	32	33	34	35	36	37

28 Days

UNIVERSITY OF MISSOURI
COLLEGE OF AGRICULTURE, FOOD AND NATURAL RESOURCES

No heat detection

Blood pregnancy test (PAG)
25 days after AI
Blue = pregnant
Clear = open



	51 beef cows
First AI pregnant	70.6%
Resynch AI pregnant	46.2%
4 week in-calf rate	82.4%

Lucy, Hamilton, and Poock (unpublished).

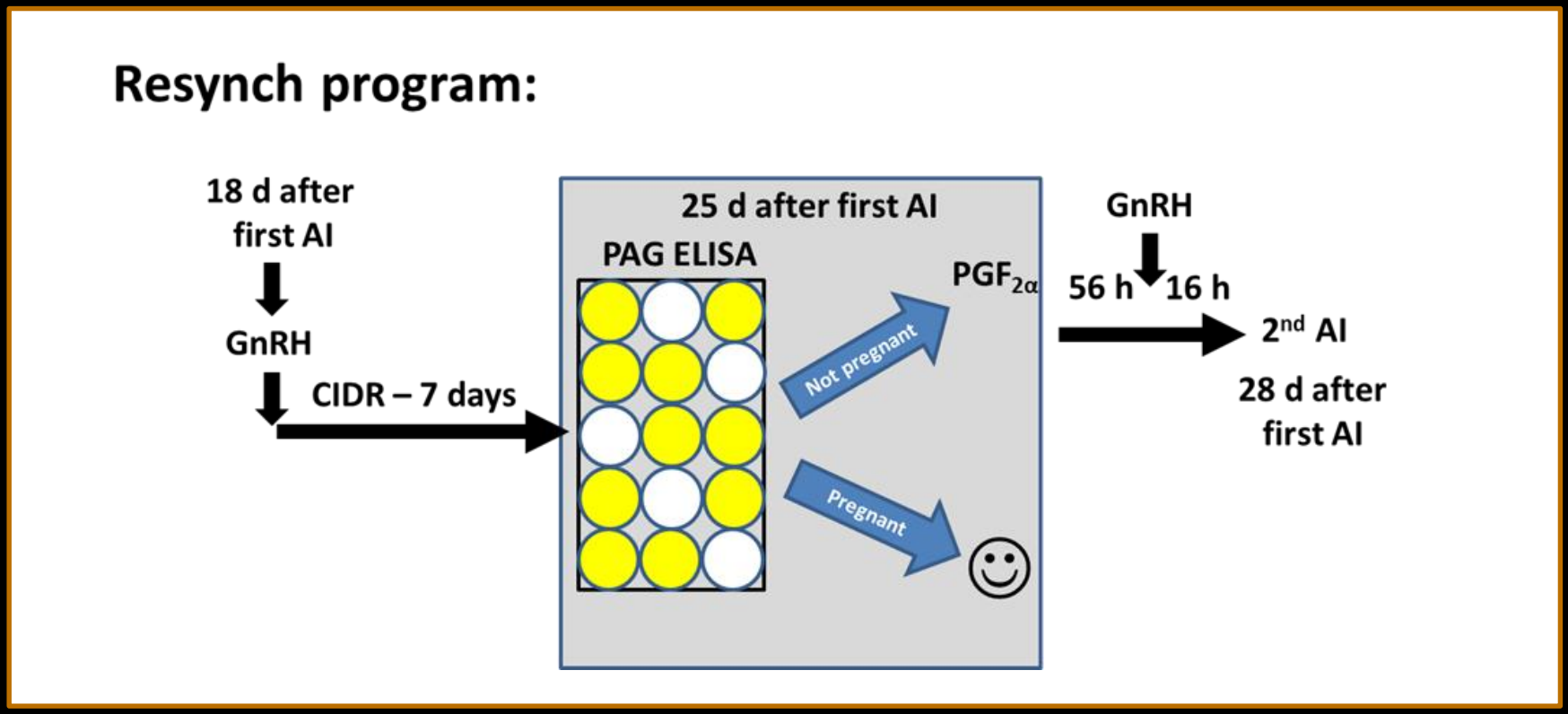
Show-me synch vs. CIDR-Ovsynch with or without Resynch

Grazing dairy cows

		Program used for first AI	
		Show-Me-Synch	CIDR-Ovsynch
Program used for second AI:	Resynch	Show-me synch Resynch	CIDR-Ovsynch Resynch
	Bulls	Show-me synch Bulls	CIDR-Ovsynch Bulls

Lucy, Hamilton, and Poock (unpublished).

Show-me synch vs. CIDR-Ovsynch for cows
Resynch protocol



Lucy, Hamilton, and Poock (unpublished).

Show-me synch vs. CIDR-Ovsynch with or without Resynch

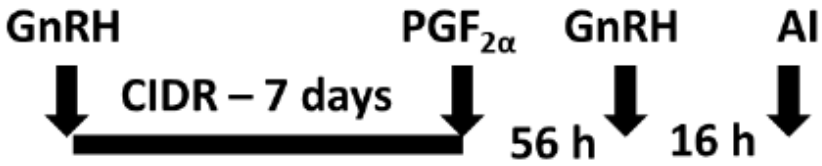
			Program used for first AI	
			Show-Me-Synch	CIDR-Ovsynch
			45% (n=147)	51% (n=155)
Program used for second AI:	Resynch	41% (n=78)	Show-me synch Resynch 64% (n=74)	CIDR-Ovsynch Resynch 71% (n=77)
	Bulls	47% (n=79)	Show-me synch Bulls 67% (n=73)	CIDR-Ovsynch Bulls 81% (n=78)

4 wk inCalf rate

Lucy, Hamilton, and Poock (unpublished).

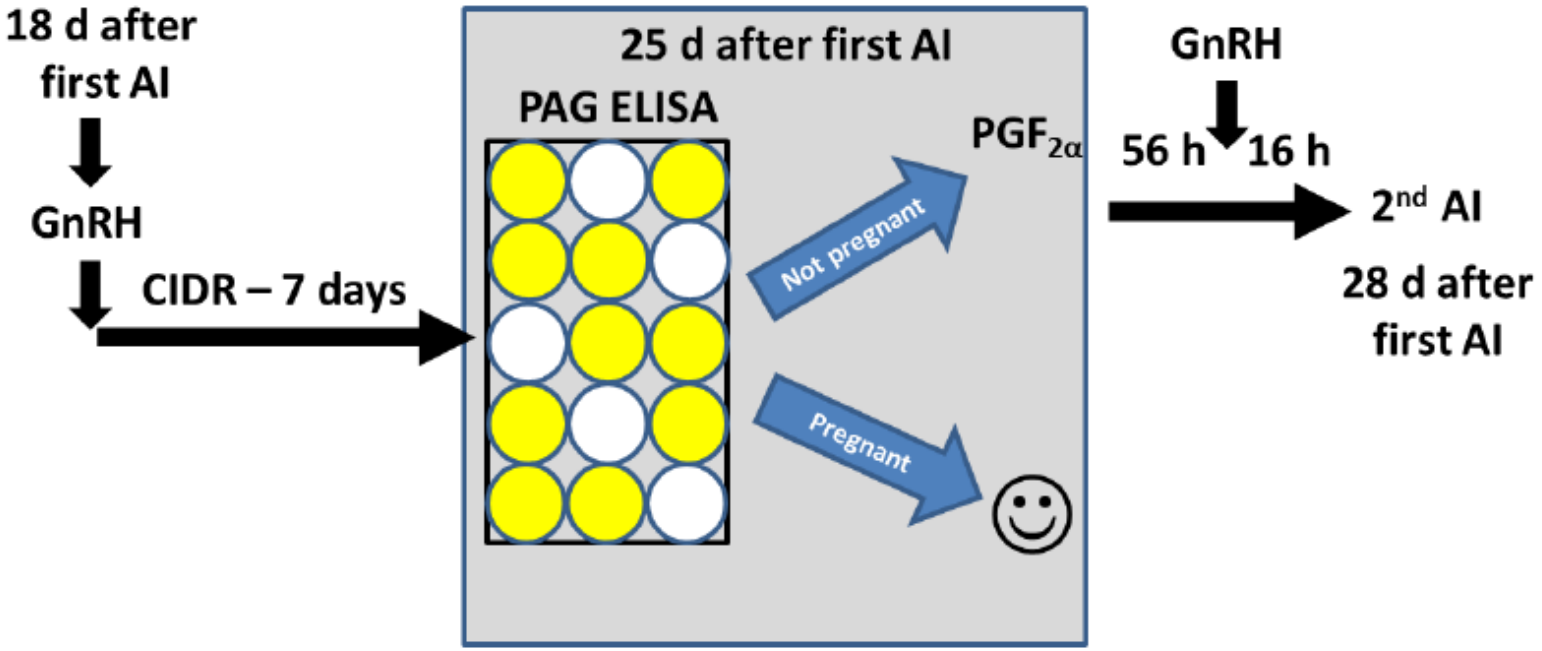
First AI (whole herd synchronization program)

CIDR-Ovsynch program:



Second AI (whole herd re-synchronization program)

Resynch program:



Take home messages for grass-based dairy farmers

- Real progress is being made toward improving fertility and increasing milk production per cow.

- Be aware and open to new technology that can increase productivity and bring calving interval to the desired 365 days.

Thank you!