Estrus and ovulation synchronization in beef heifers

Dr. Marcos G Colazo

Research Scientist, Alberta Agriculture & Rural Development

Edmonton, Alberta, Canada

E-mail: marcos.colazo@gov.ab.ca; mgcolazo@yahoo.com

Outline of talk

- Estrous cycle of the heifer
- What is CR and PR?
- Controlling the estrous cycle
  - Synchronization of estrus
  - Synchronization of ovulation
  - Protocols
- Advantages and disadvantages
- Cost

Estrous cycle of the heifers

- Average 21 days long (18 to 24)
- Two phases luteal and follicular
- Four stages
  - Proestrus (Day 18-20)
  - Estrus (Day 0)
  - Metestrus (Day 1 - 3)
  - Diestrus (Day 4 - 17)

Pregnancy Rate (PR) =

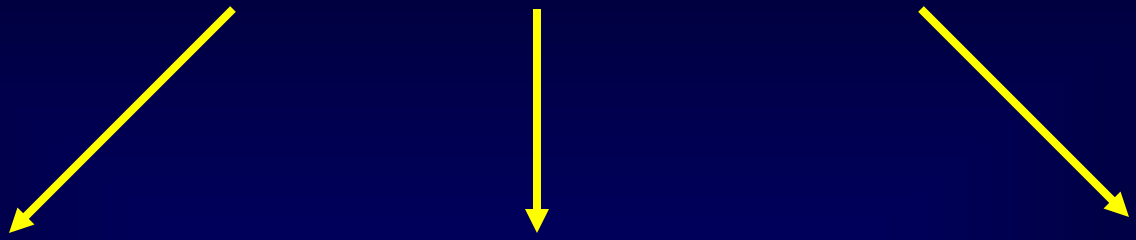
Estrus Detection Efficiency (EDE)

x

Conception rate (CR)

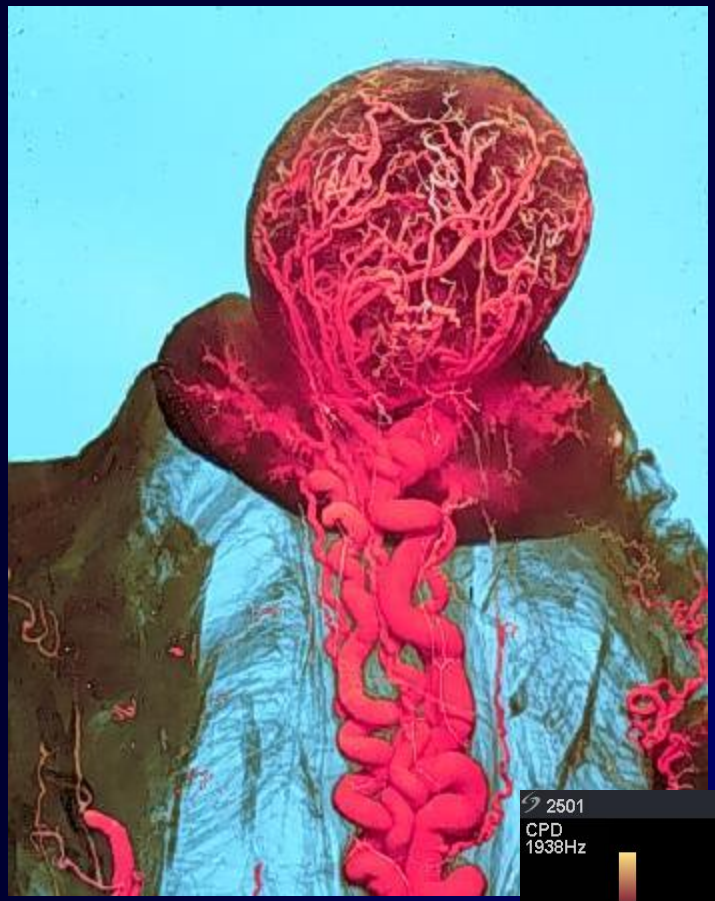
n	EDE (%)	CR (%)	PR (%)
100	50	50	25
100	80	50	40
100	100	50	50

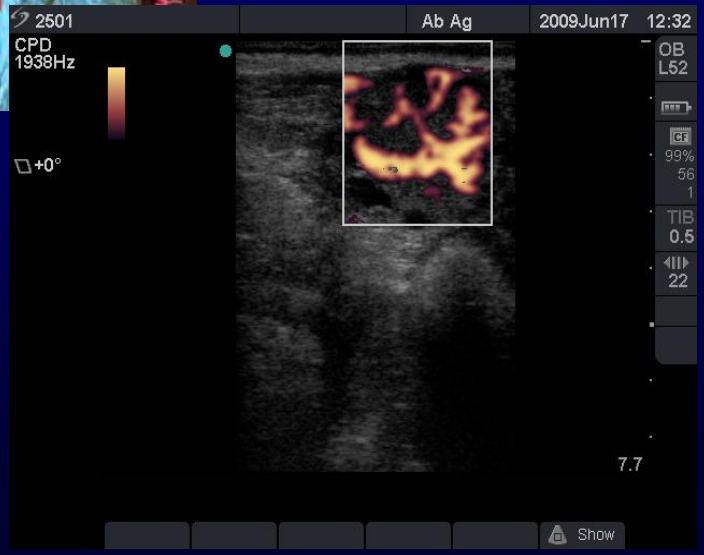
Controlling the estrous cycle

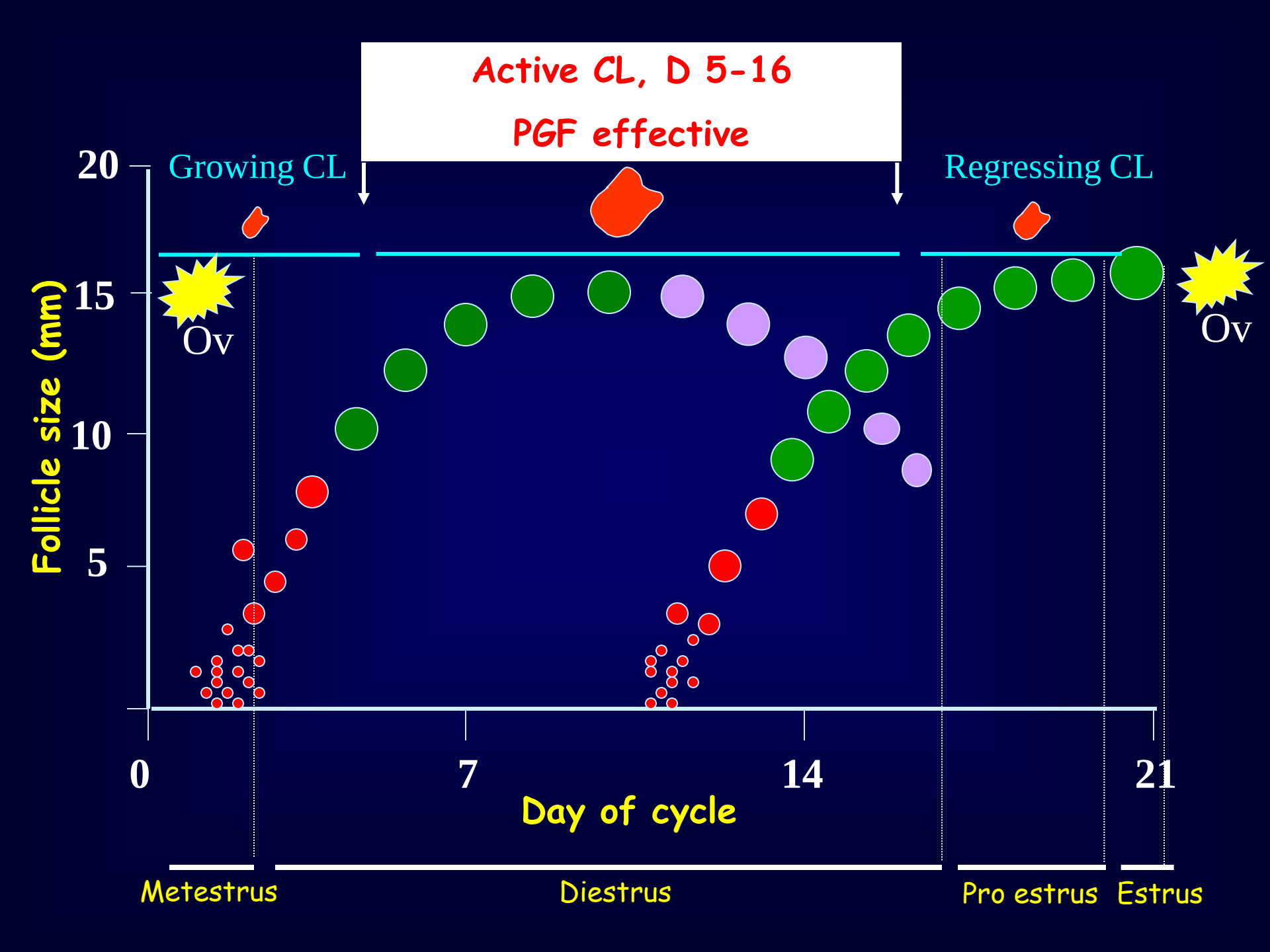


Shortening the luteal phase	Simulating the luteal phase	Controlled follicle growth & ovulation
(e.g.)	(e.g.)	(e.g.)
ProstaglandinF2α	Progesterone	Estrogens & GnRH

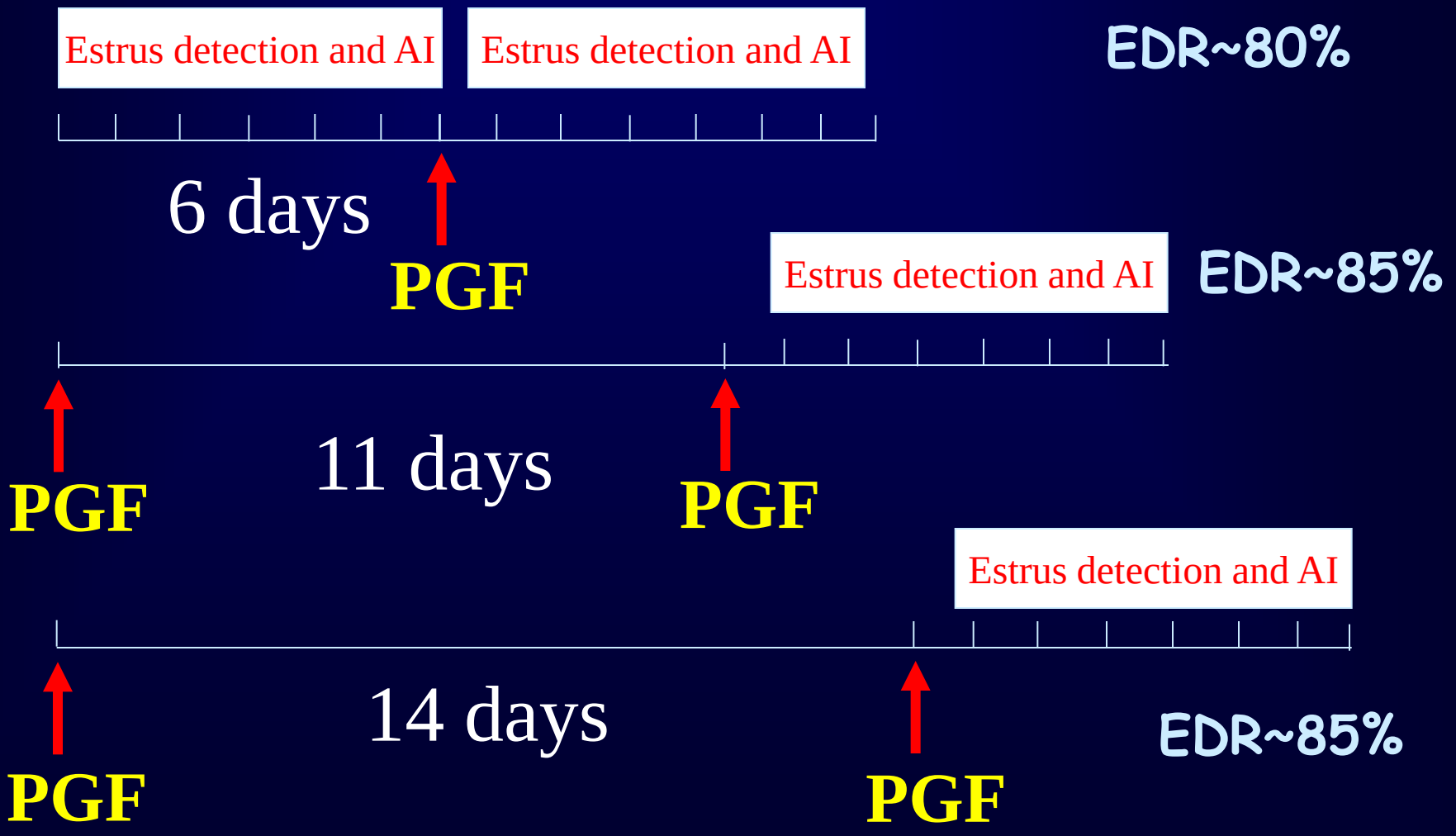
Commercially available PGF products



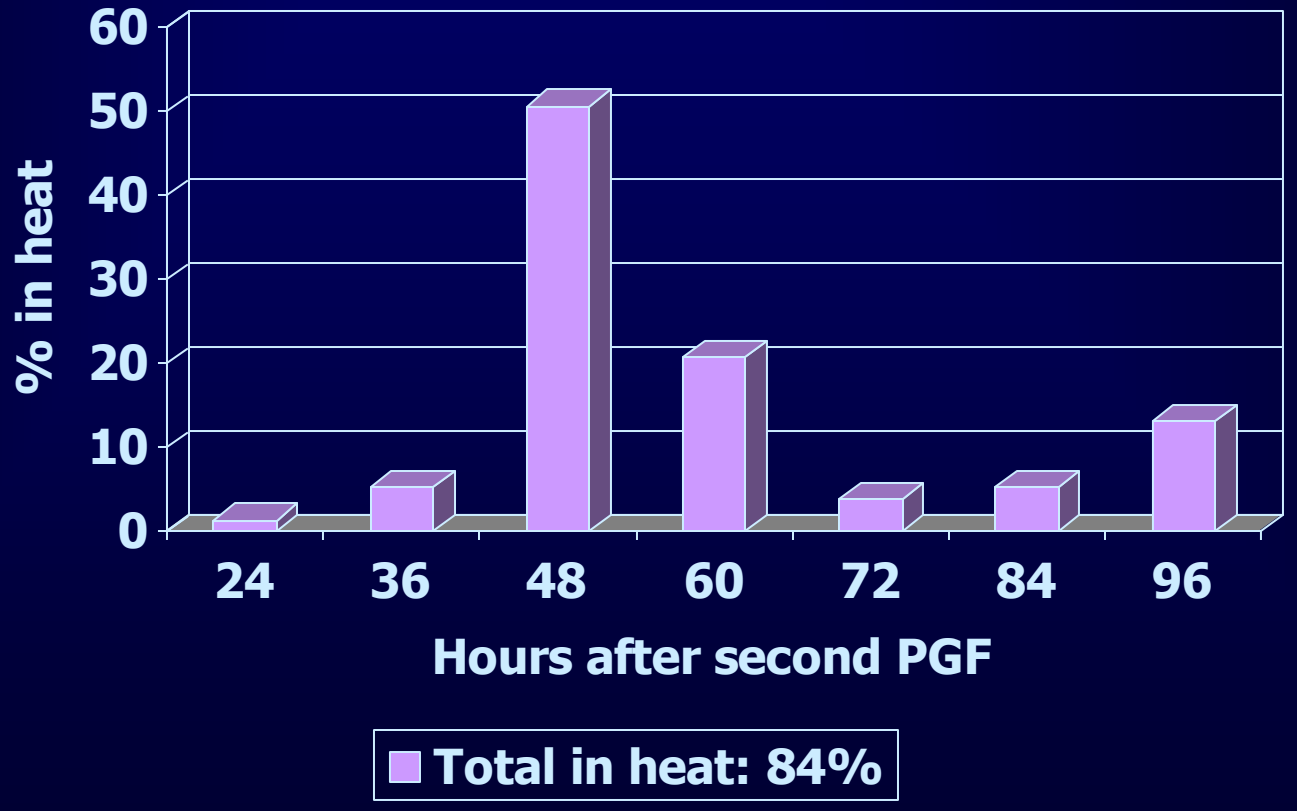

2501
Ab Ag
2009Jun17 12:32
CPD
1938Hz
+0°
OB
L52
99%
56
1
TIB
0.5
22
7.7
Show


Active CL, D 5-16
PGF effective
Growing CL
Regressing CL
Ov
Ov
20
15
10
5
Follicle size (mm)
0
7
14
21
Day of cycle
Metestrus
Diestrus
Pro estrus
Estrus

Common Protocols using PGF

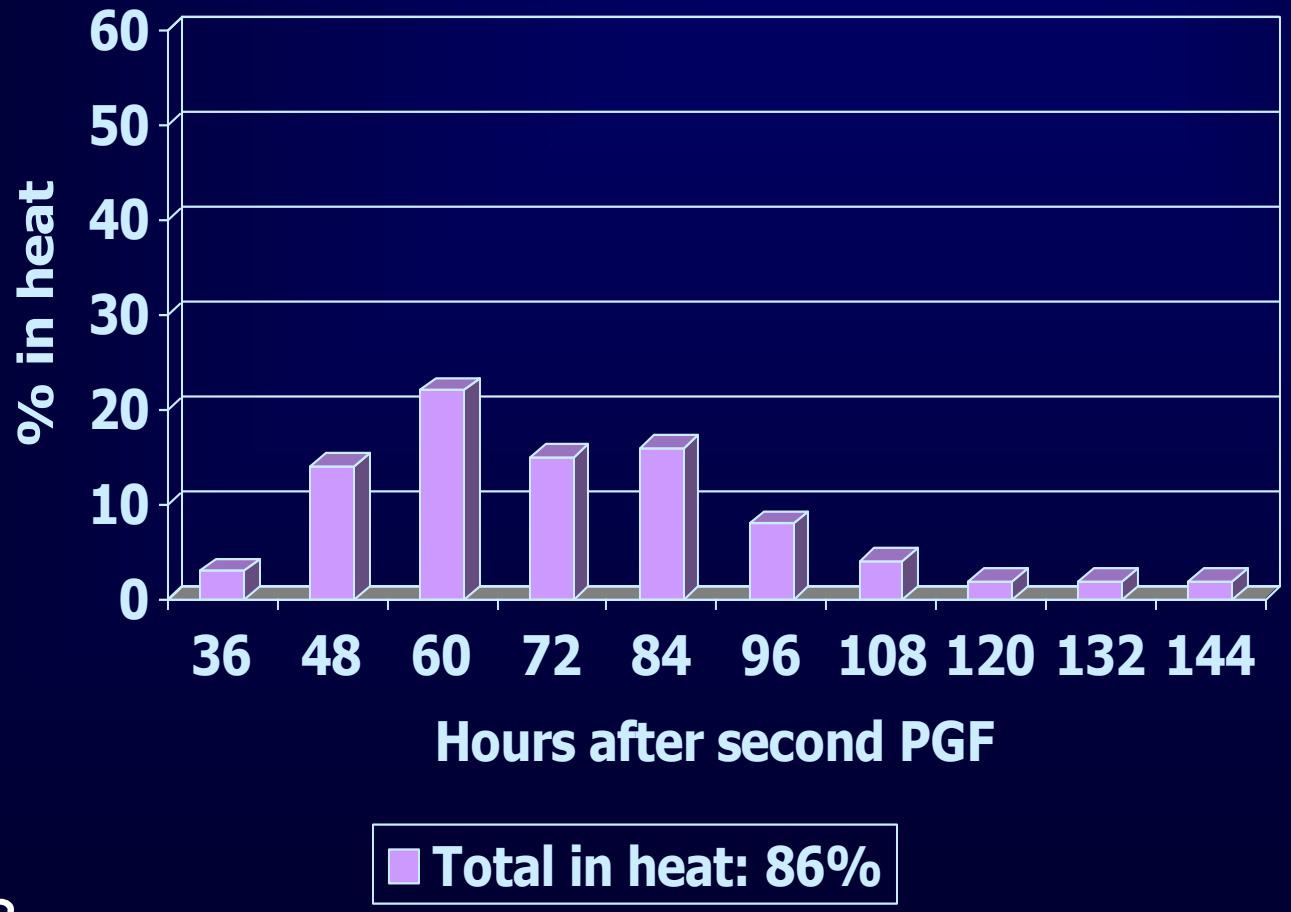


Distribution of heat in beef heifers given PGF 11 d apart



Butler et al., 2001

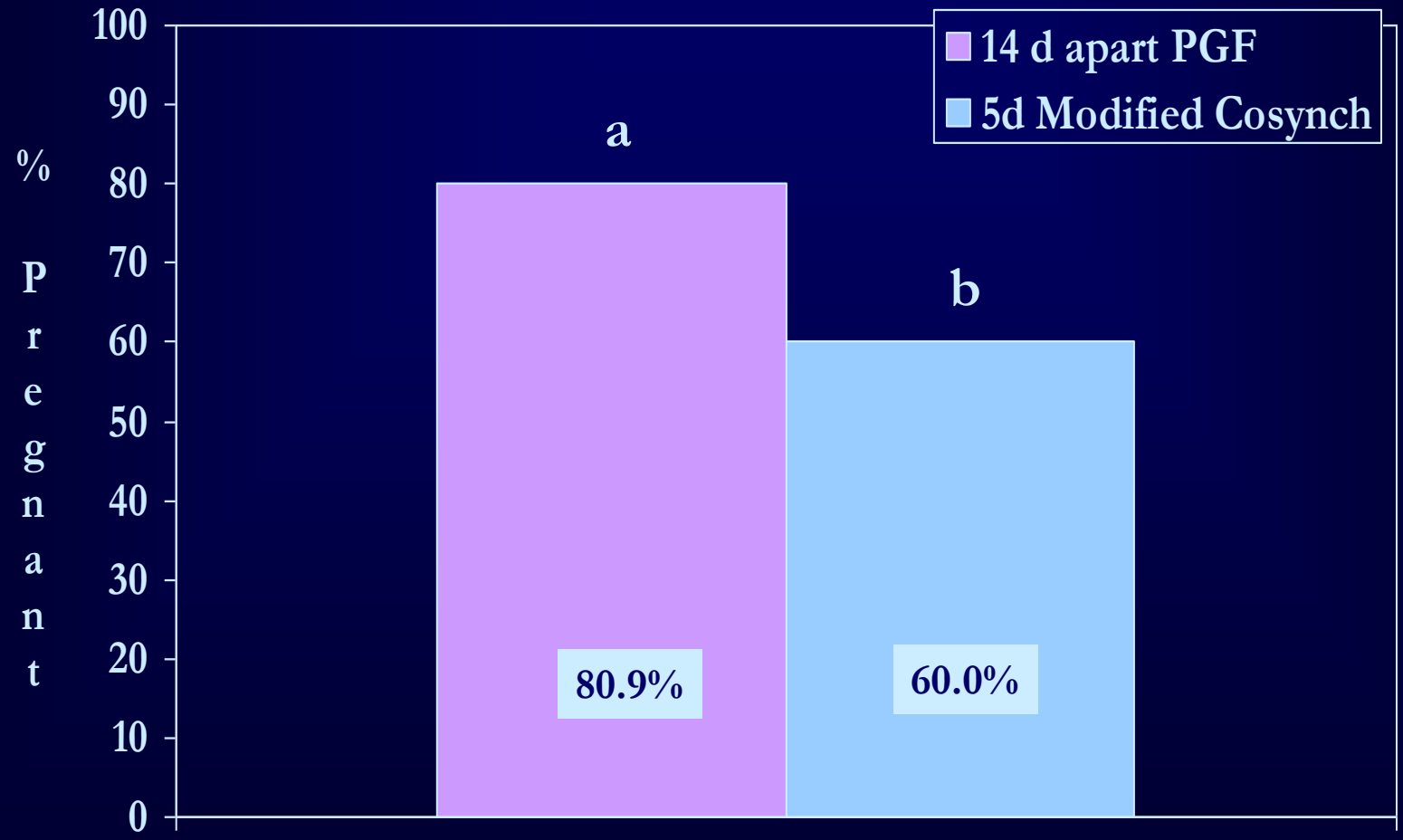
Distribution of heat in Holstein heifers given PGF 14 d apart



n = 132

Colazo, unpublished

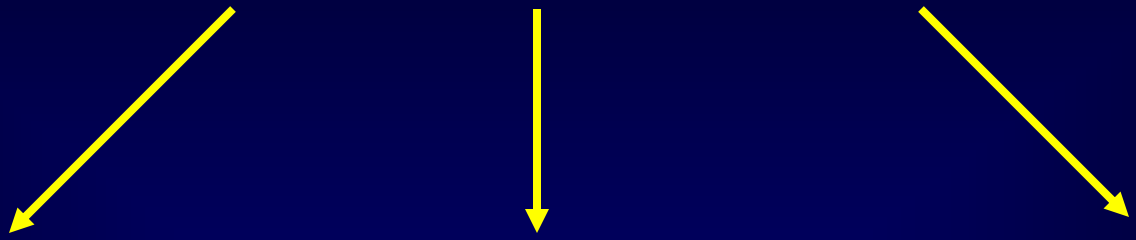
Conception Rate



~half AI with sexed semen

a, b Effect of TRT $P < 0.05$

Controlling the estrous cycle



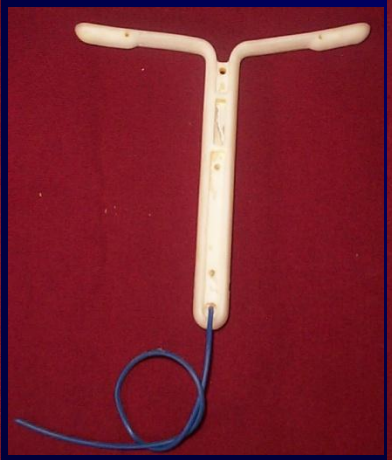
Shortening the luteal phase	Simulating the luteal phase	Controlled follicle growth & ovulation
(e.g.)	(e.g.)	(e.g.)
ProstaglandinF2α	**Progesterone**	Estrogens & GnRH

Oral Progestins: Melengestrol Acetate (MGA)

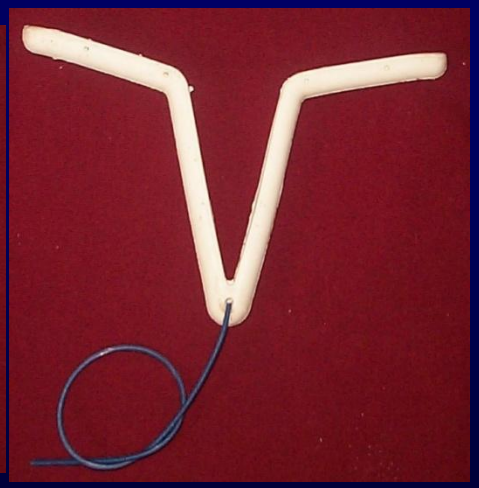
Ear implants Crestar

Intravaginal Devices

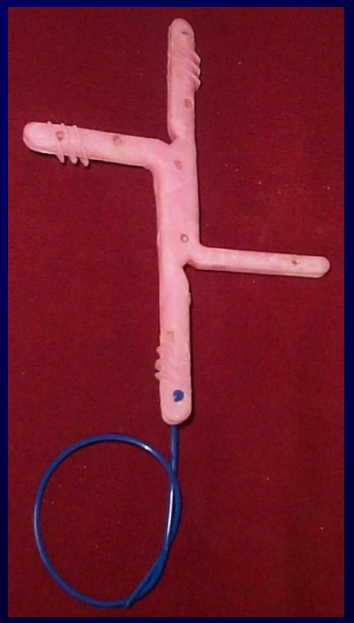
PRID



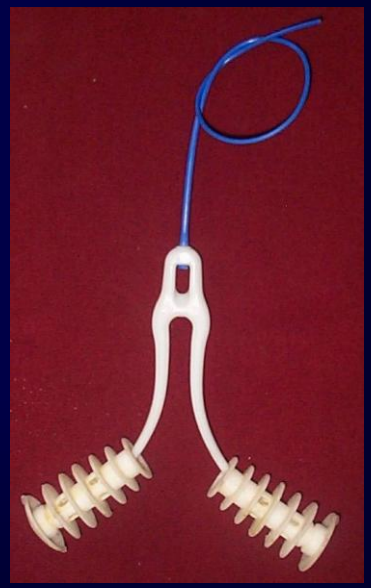
CIDR-B



DIB



TRIU-B

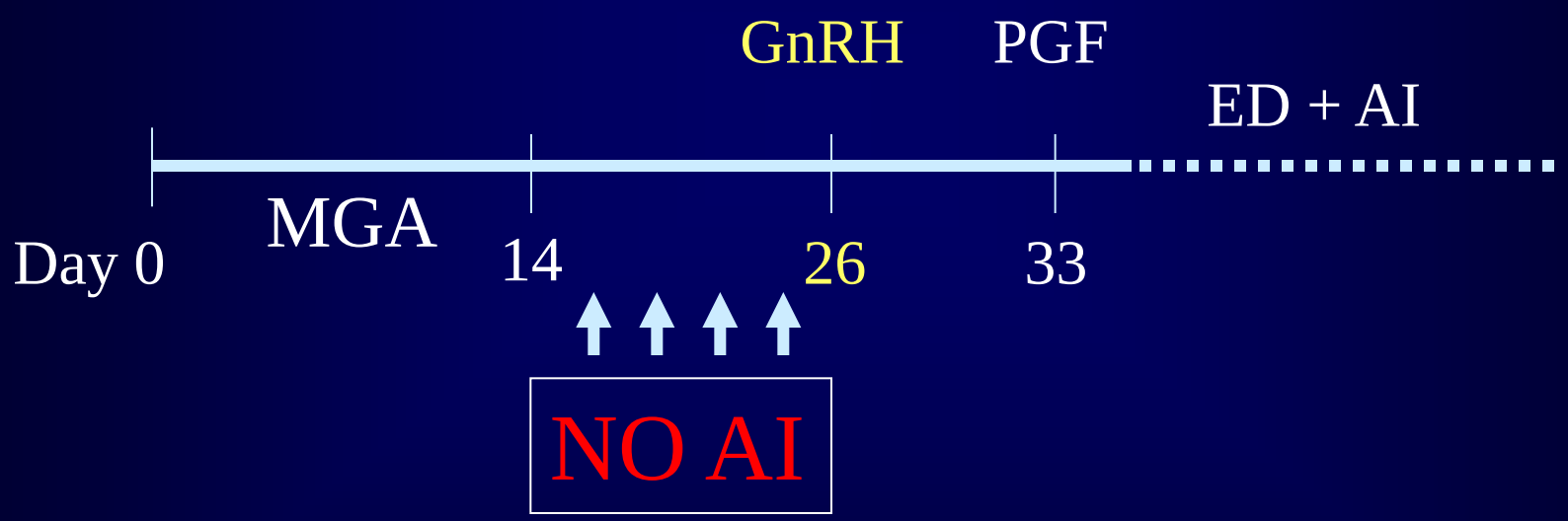


CUE-MATE

Program with MGA for estrus synchronization

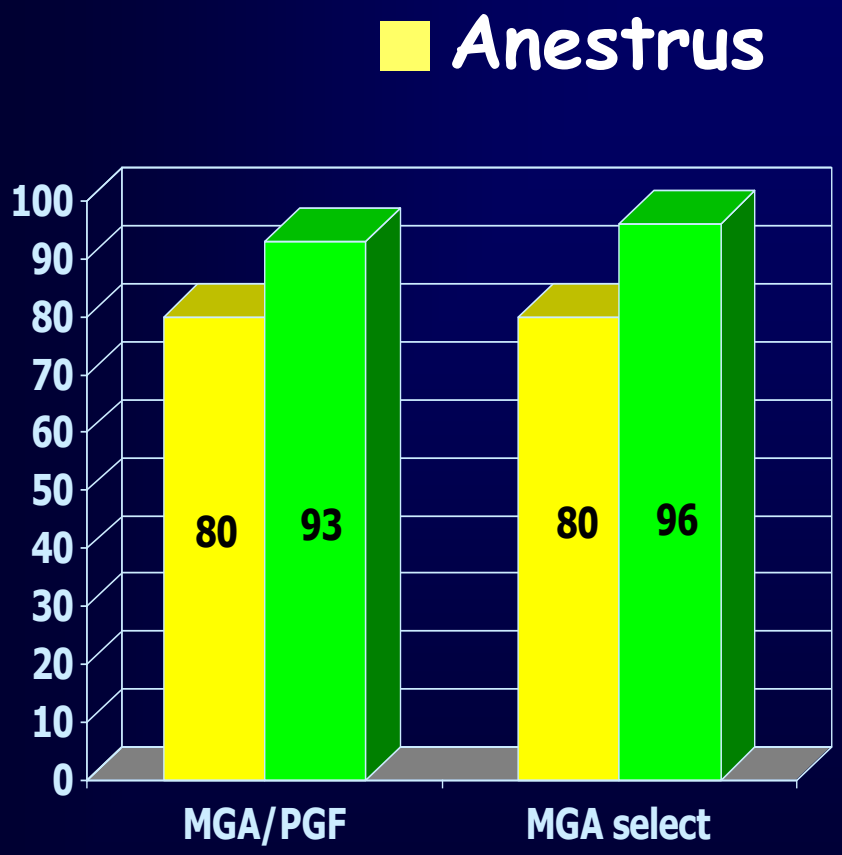
MGA = melengestrol acetate @ 0.5 mg/heifer/day

Modified MGA program (MGA select)

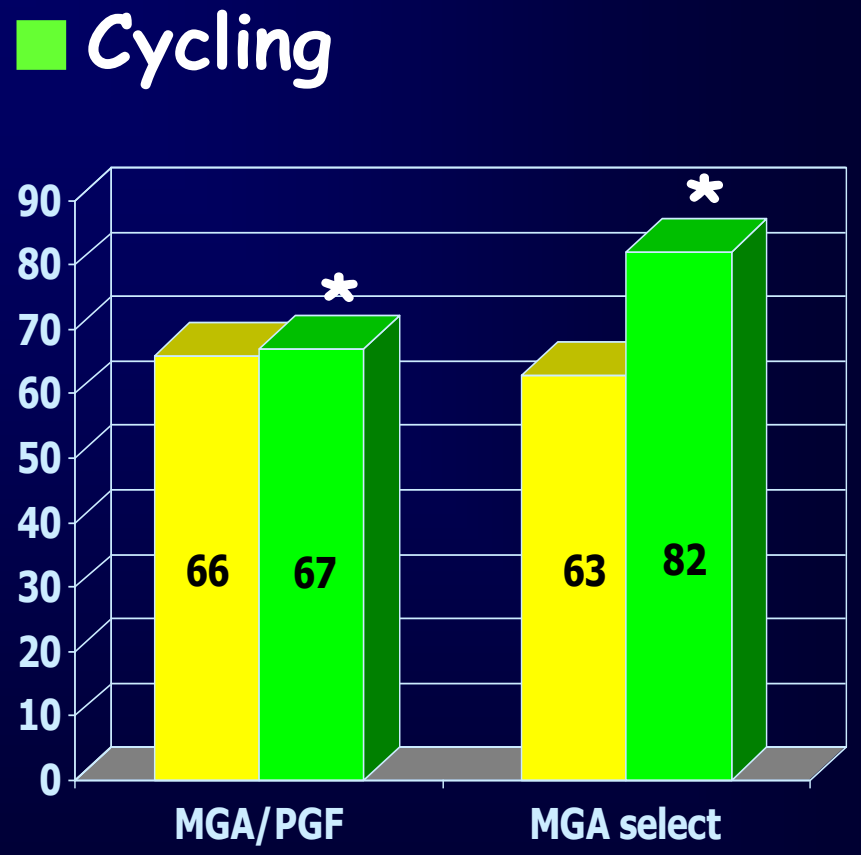


Wood-Follis et al., 2004

MGA/PGF vs. MGA Select (ED + AI for 6 days)



Estrus rate



Pregnancy rate

N = 124

Wood-Follis et al., 2004

Increase estrus detection rate

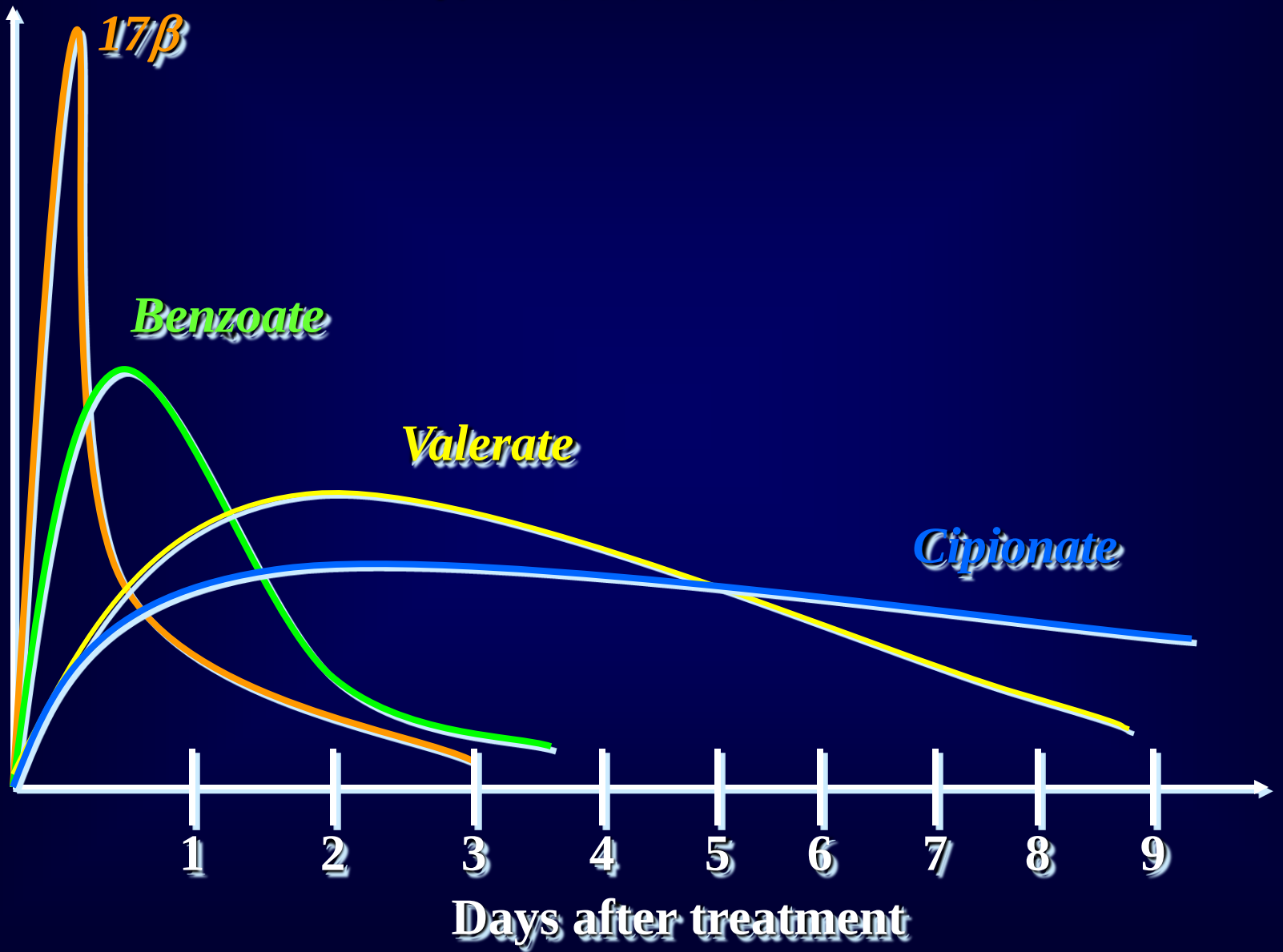
- Aggressive estrus detection
- Increased frequency of observation
- Use of estrus-detection aids
  - Tail paint, Kamar, electronic aids

Controlling the estrous cycle

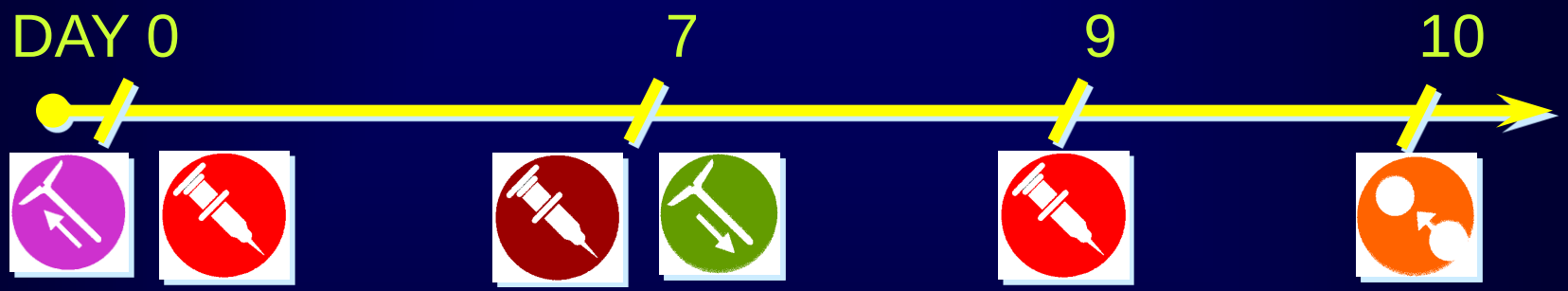
Shortening the luteal phase	Simulating the luteal phase	Controlled follicle growth & ovulation
(e.g.)	(e.g.)	(e.g.)
ProstaglandinF2α	Progesterone	**Estrogens & GnRH**

We used them in combination for TAI

Plasma concentrations



TAI protocol (Progesterone & Estrogen)



Insert CIDR
Give
1 or mg EB
o 5 mg E-17B

Remove CIDR
Give PGF

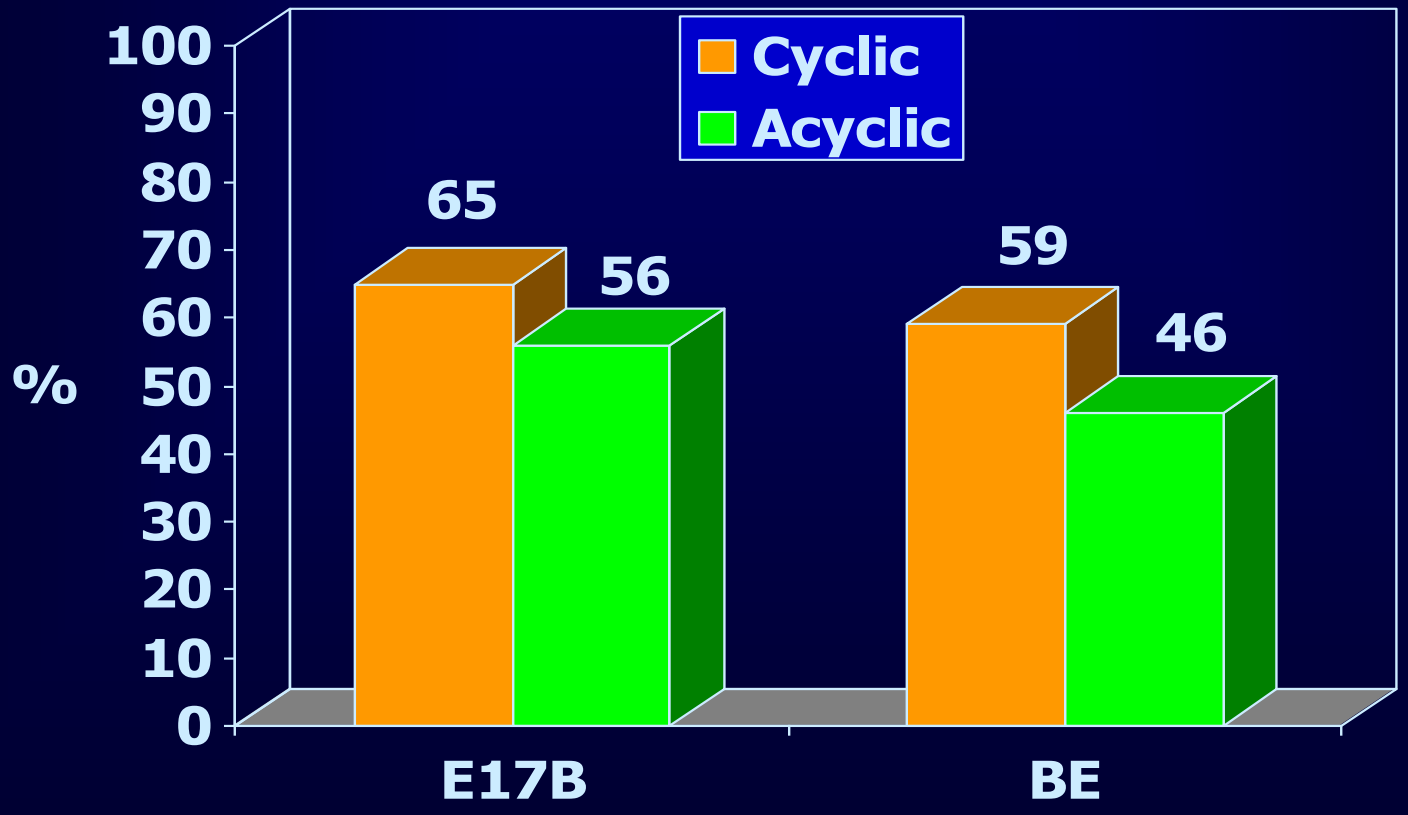
1 mg EB

TAI

TAI protocol-Schedule (Progesterone & Estrogen)

MON am	TUE am	WED pm	THU	FRI	SAT	SUN
EB or 17B CIDRi						
CIDRr PGF	EB	TAI				

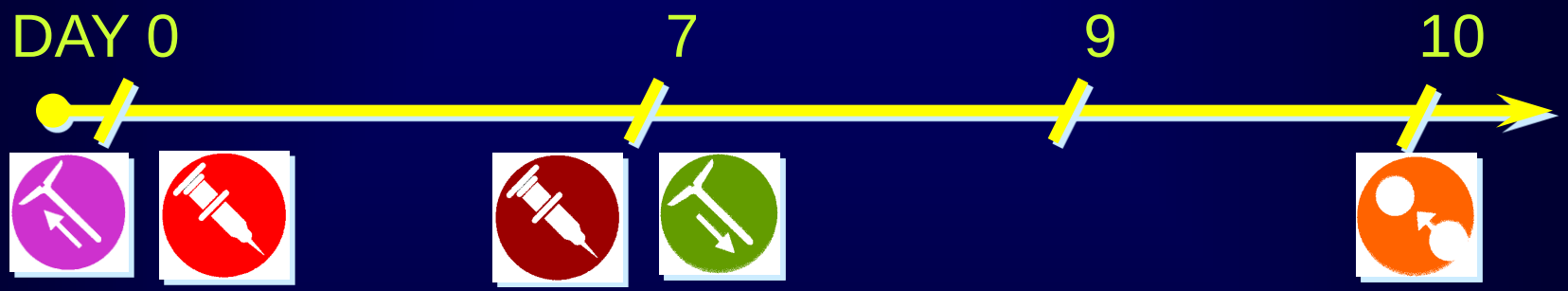
Pregnancy rate in heifers treated with E17B or EB



n = 1428 heifers

Colazo unpublished

TAI protocol (Progesterone & Estrogen)

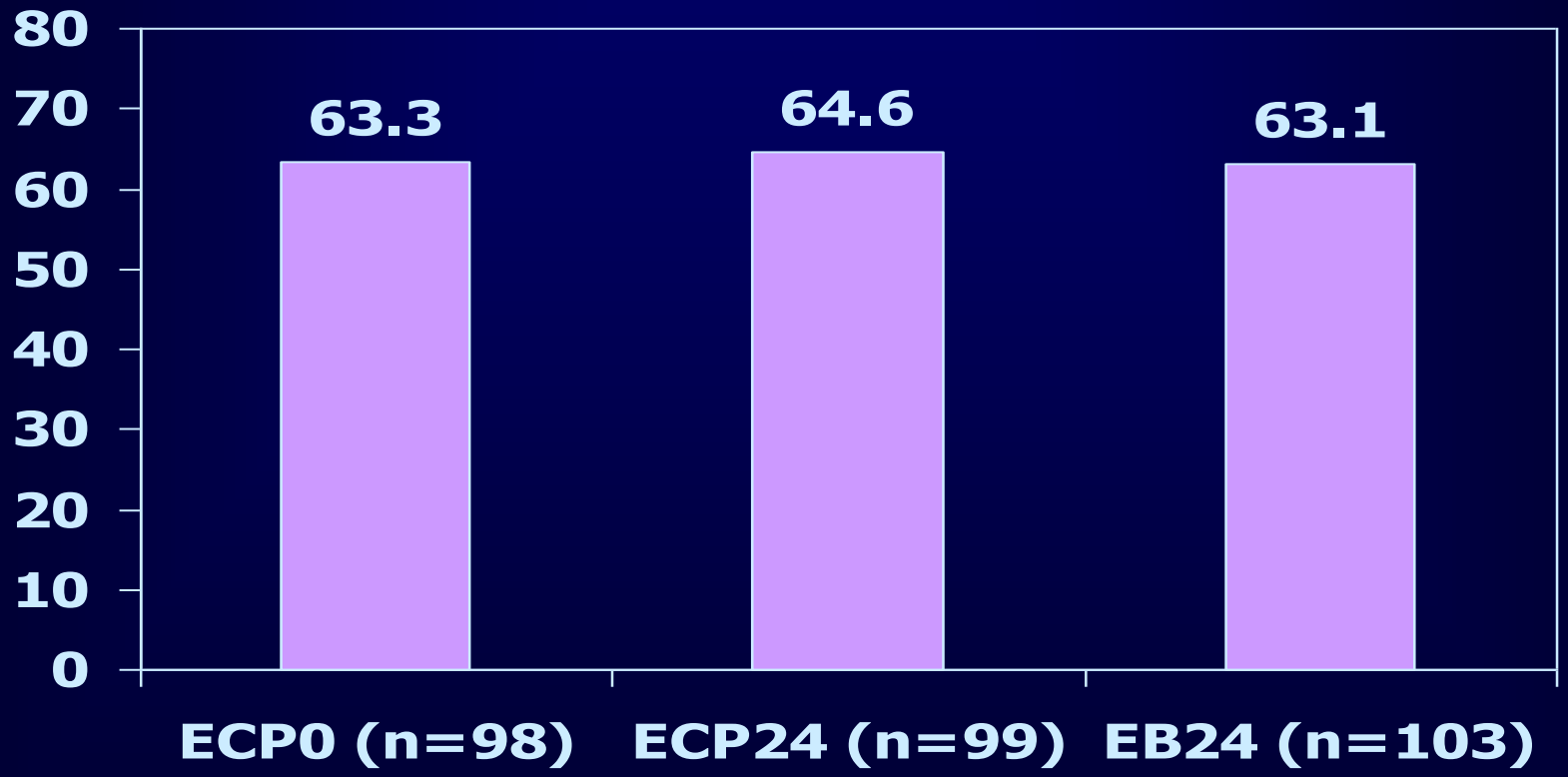


Insert CIDR
Give
5 mg E-17B

Remove CIDR
Give PGF
0.5 mg ECP

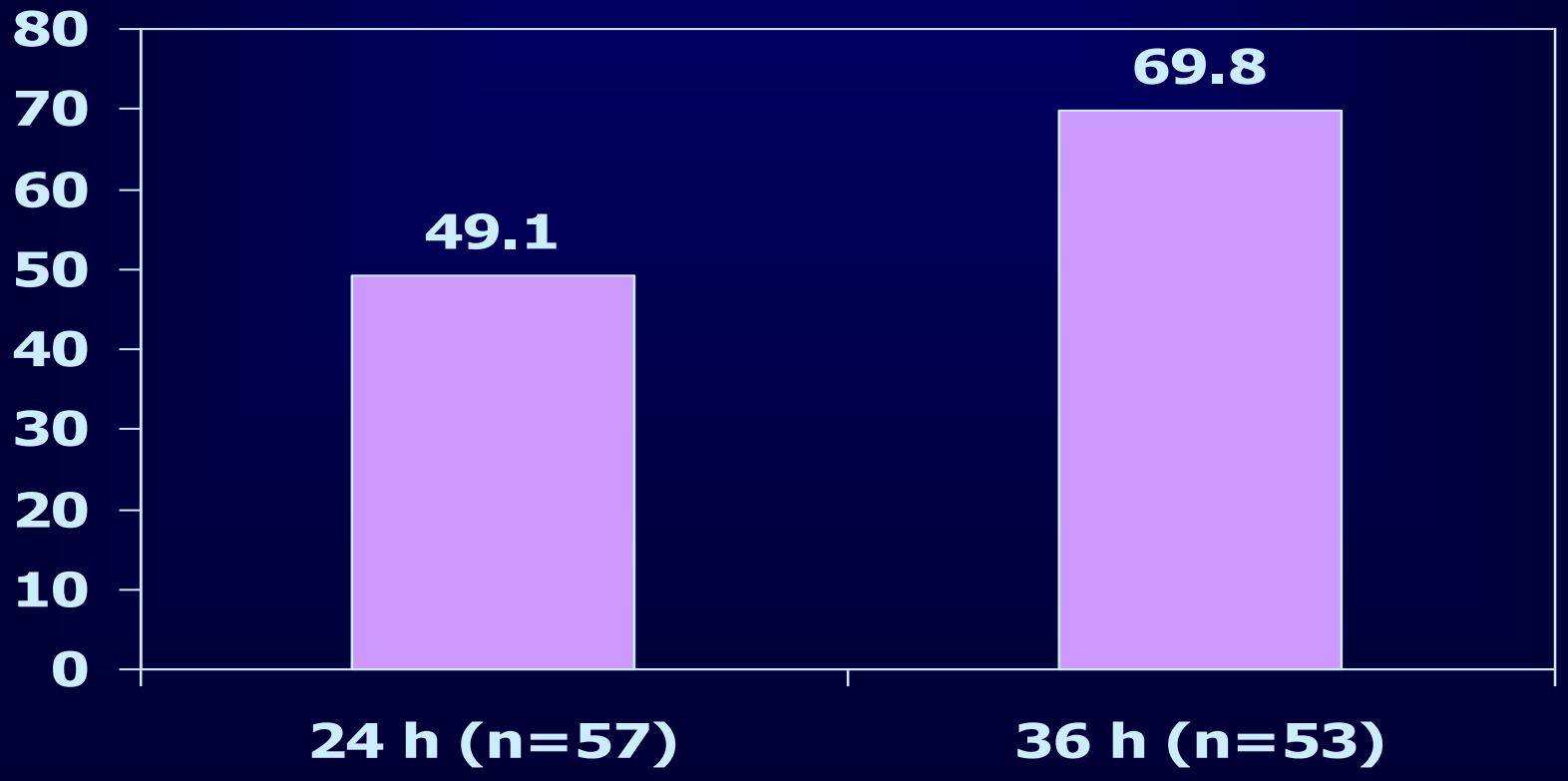
TAI

PREGNANCY RATES



Colazo et al., 2003

Pregnancy rate for cattle inseminated 24 versus 36 h after second EB treatment



Colazo et al., 2005

Some commercially available GnRH products

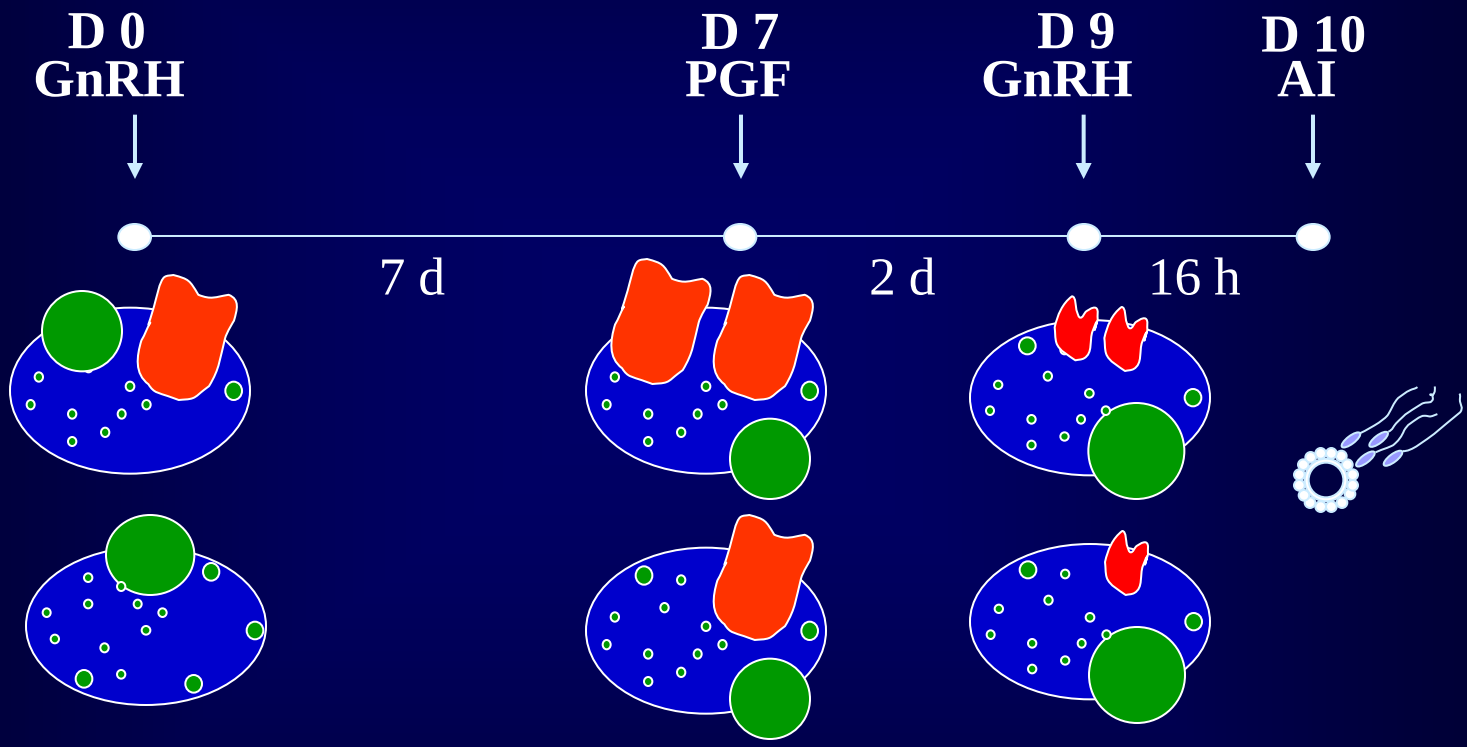
Fertiline (Vetoquinol)

Cystorelin (Merial)

Factrel (Pfizer Animal Health)

Fertagyl (Merck Animal Health)

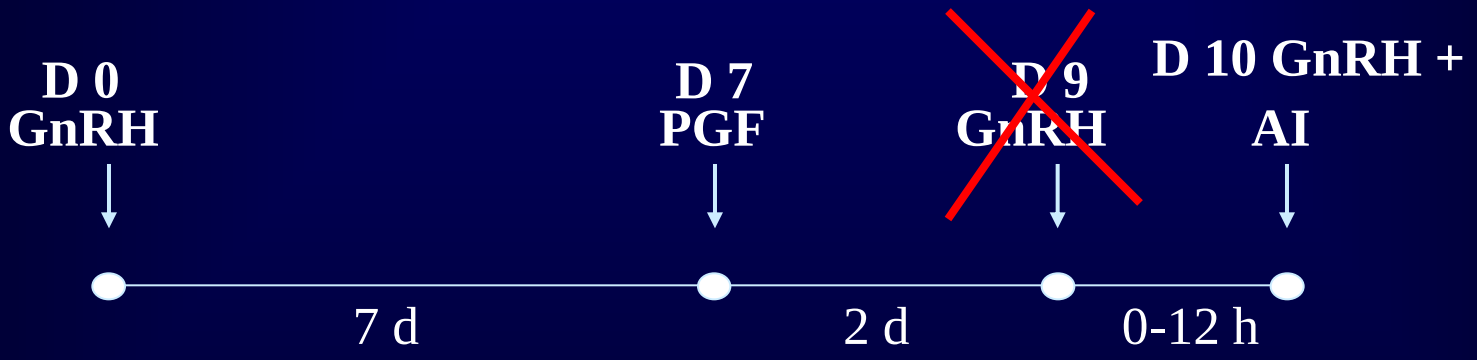
How Ovsynch works?



Pursley et al., 1995

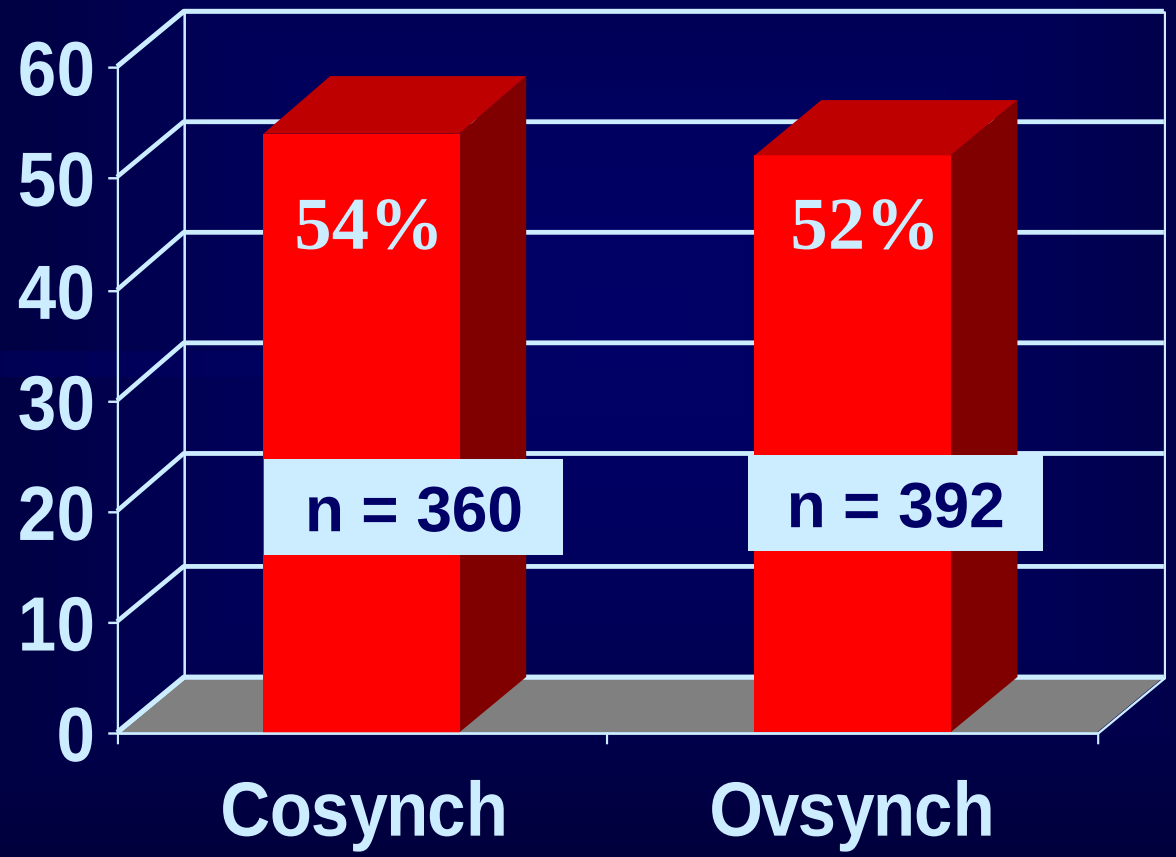
Cosynch

- Second GnRH given at time of AI



- Advantage: Reduced handling
- Possible disadvantage: Delayed ovulation

Pregnancy Rates (%)



Geary et al., 2001

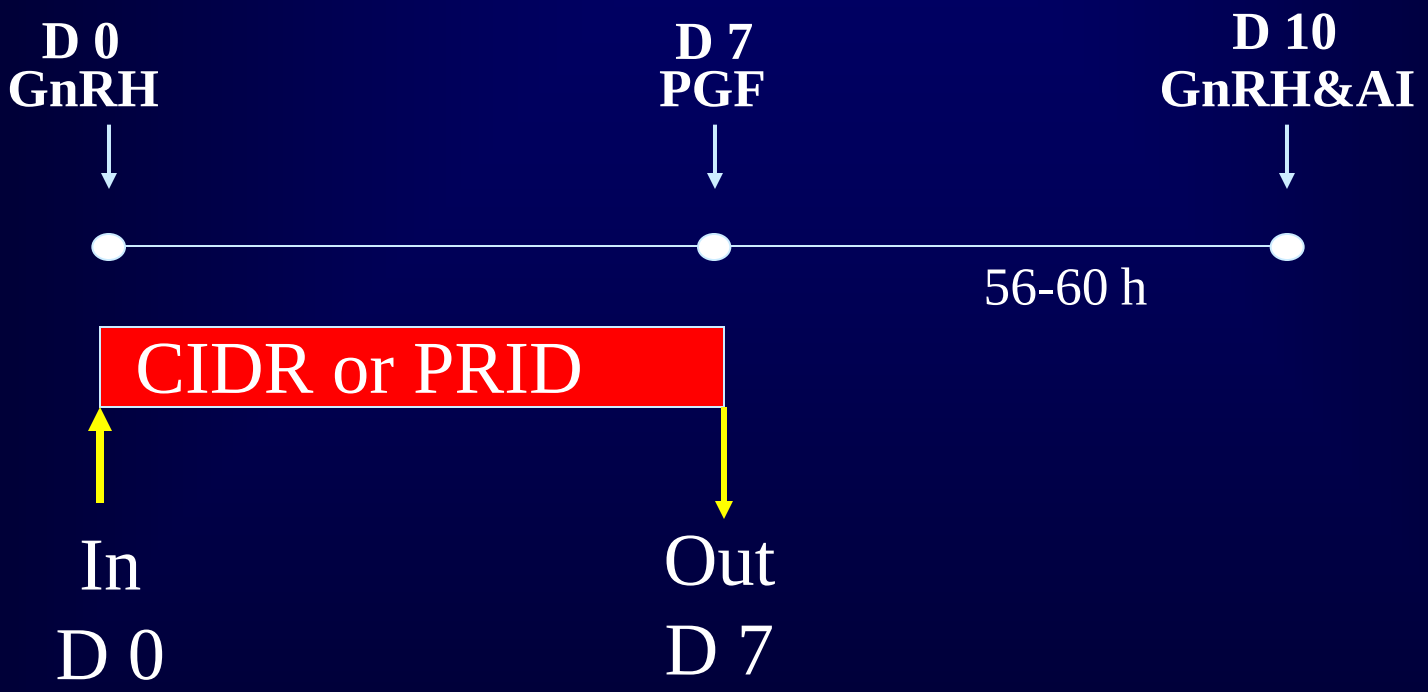
Pregnancy rates to AI in cows and heifers after estrus or Ovsynch

	IDE%	OVS/TAI%	P
Cows	39 (154)	38 (156)	>.10
Heifers	74 (78)	35 (77)	<.01
P	<.01	>.10	

Ovsynch/Timed AI is not effective in heifers

Pursley et al. (1997) JDS 80:295

Cosynch plus CIDR or PRID



Pregnancy rate

Category	*Cosynch*	*CIDR+Cosynch*
Cows	**n = 71**	**n = 77**
	45.1%	**42.9%**
Heifers	**n = 23**	**n = 25**
	39.1%[a]	**68.0%[b]**

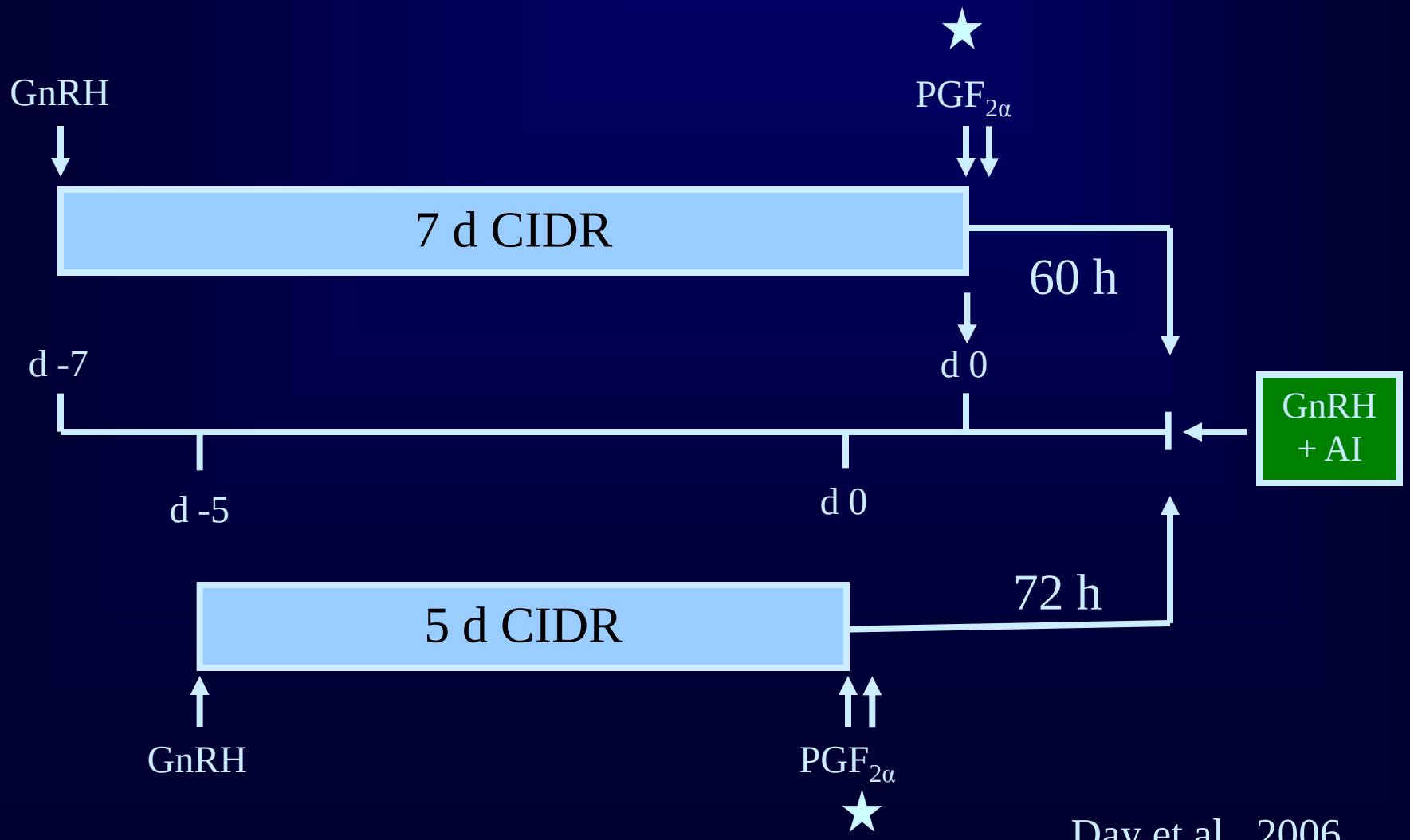
[ab] ($P<0.05$).

Martinez et al., 2002

TAI protocol-Schedule (7d Cosynch & CIDR)

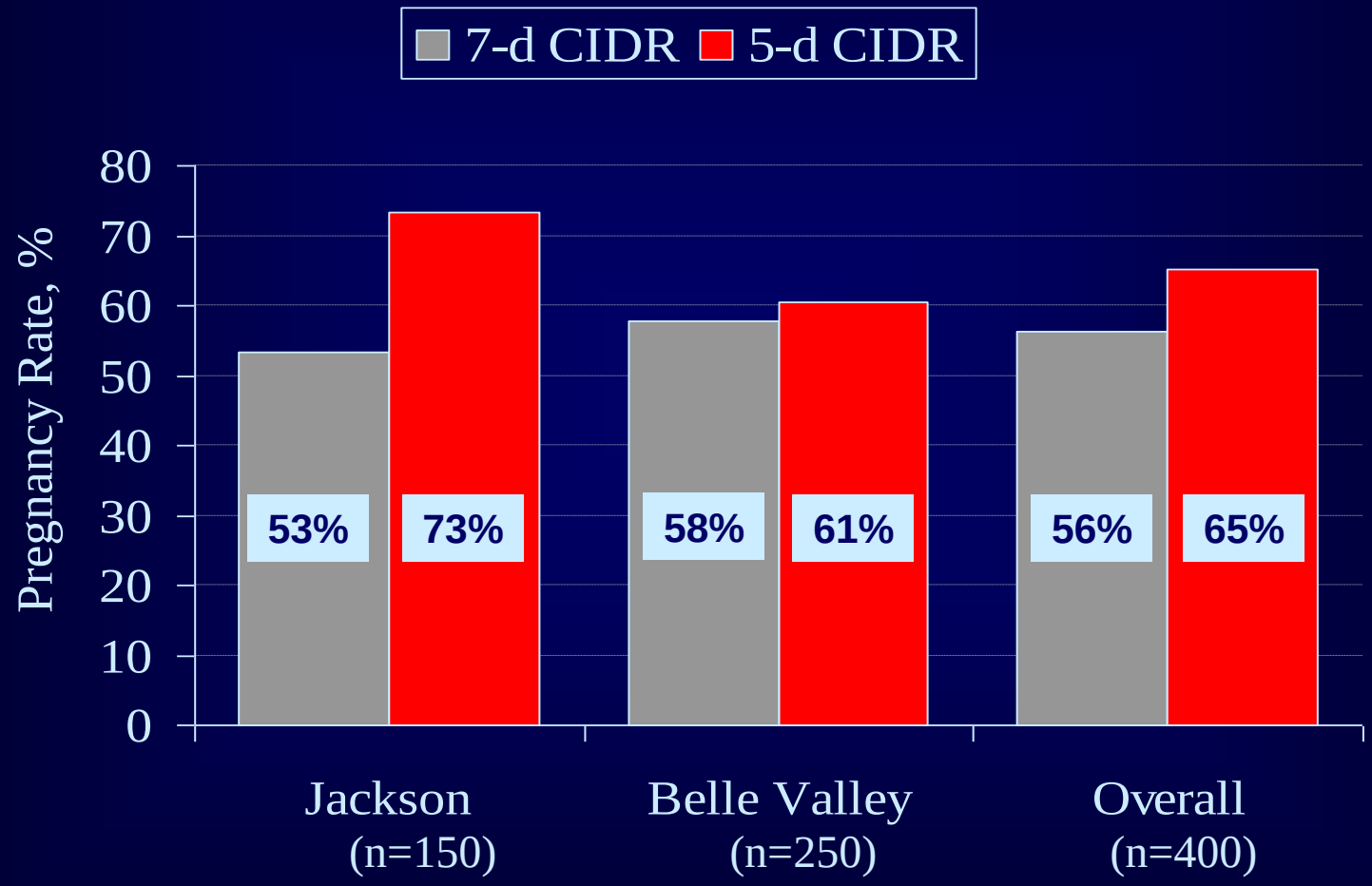
MON am	TUE am	WED pm	THU	FRI	SAT	SUN
GnRH CIDRi						
CIDRr PGF		GnRH & TAI				

Experimental Design - 5 d vs 7 d Cosynch



Day et al., 2006

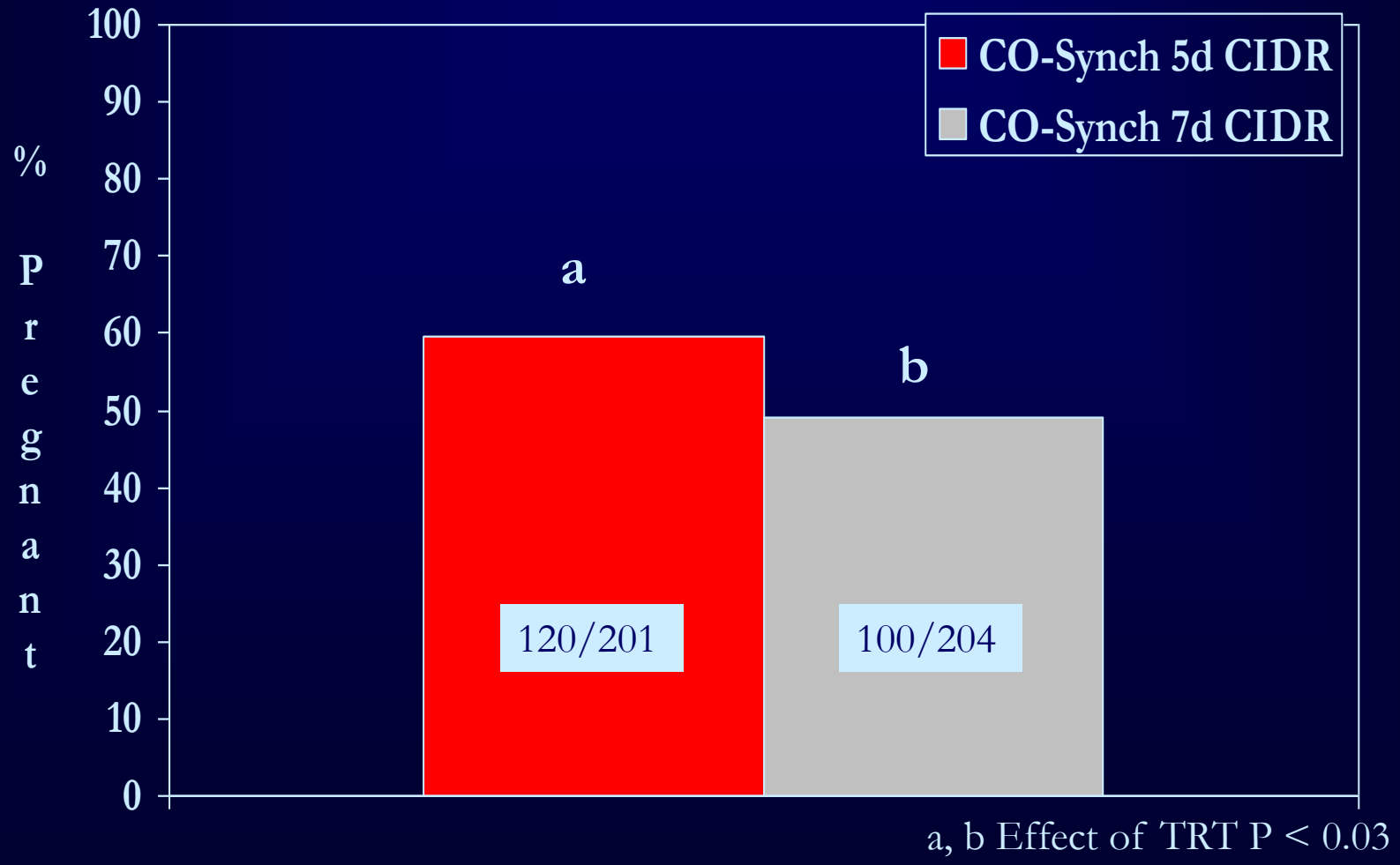
Timed AI Pregnancy Rate
5 d vs 7 d Cosynch



Trt, P<.03; TrtxLoc, P=.08

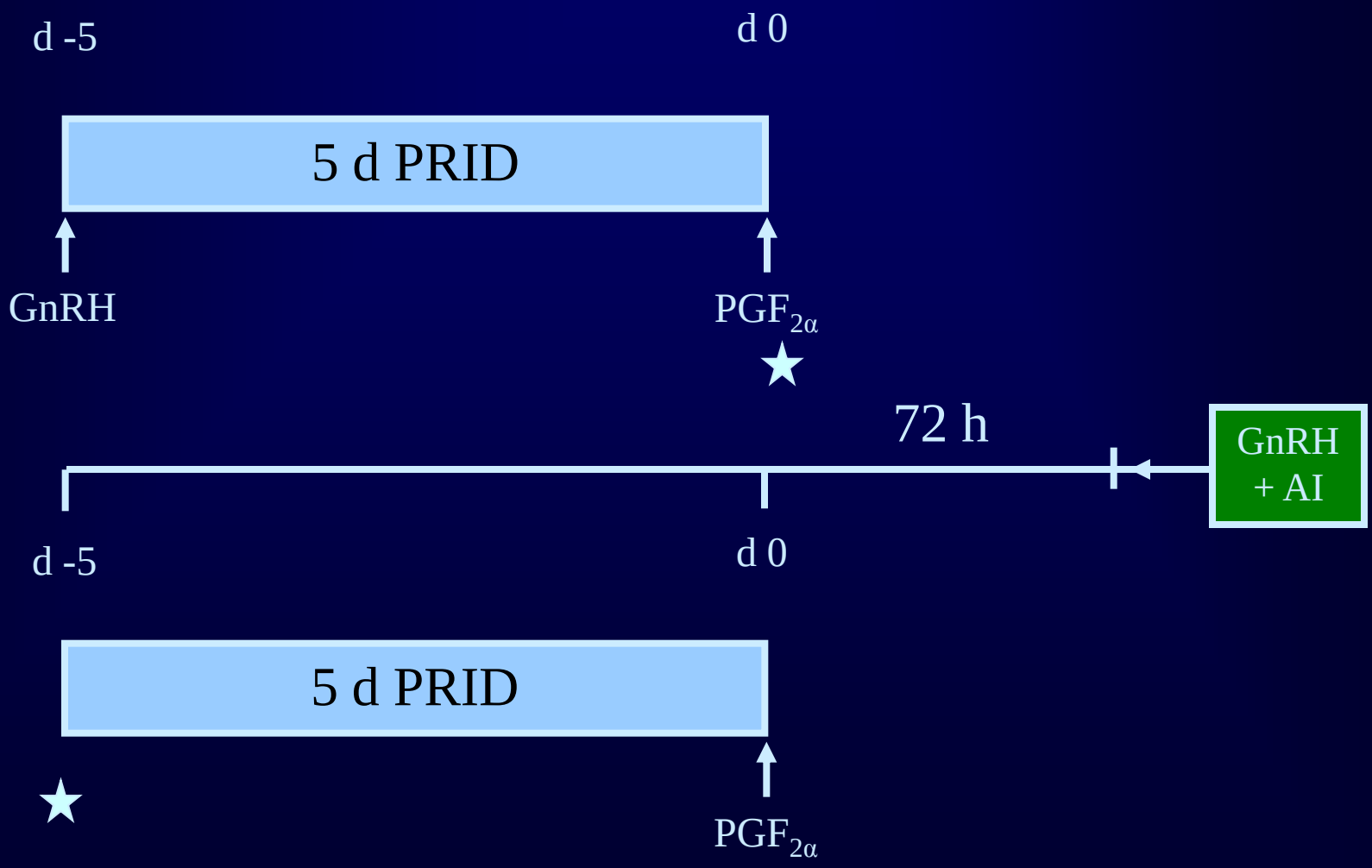
Day et al., 2006

TAI Pregnancy Rate



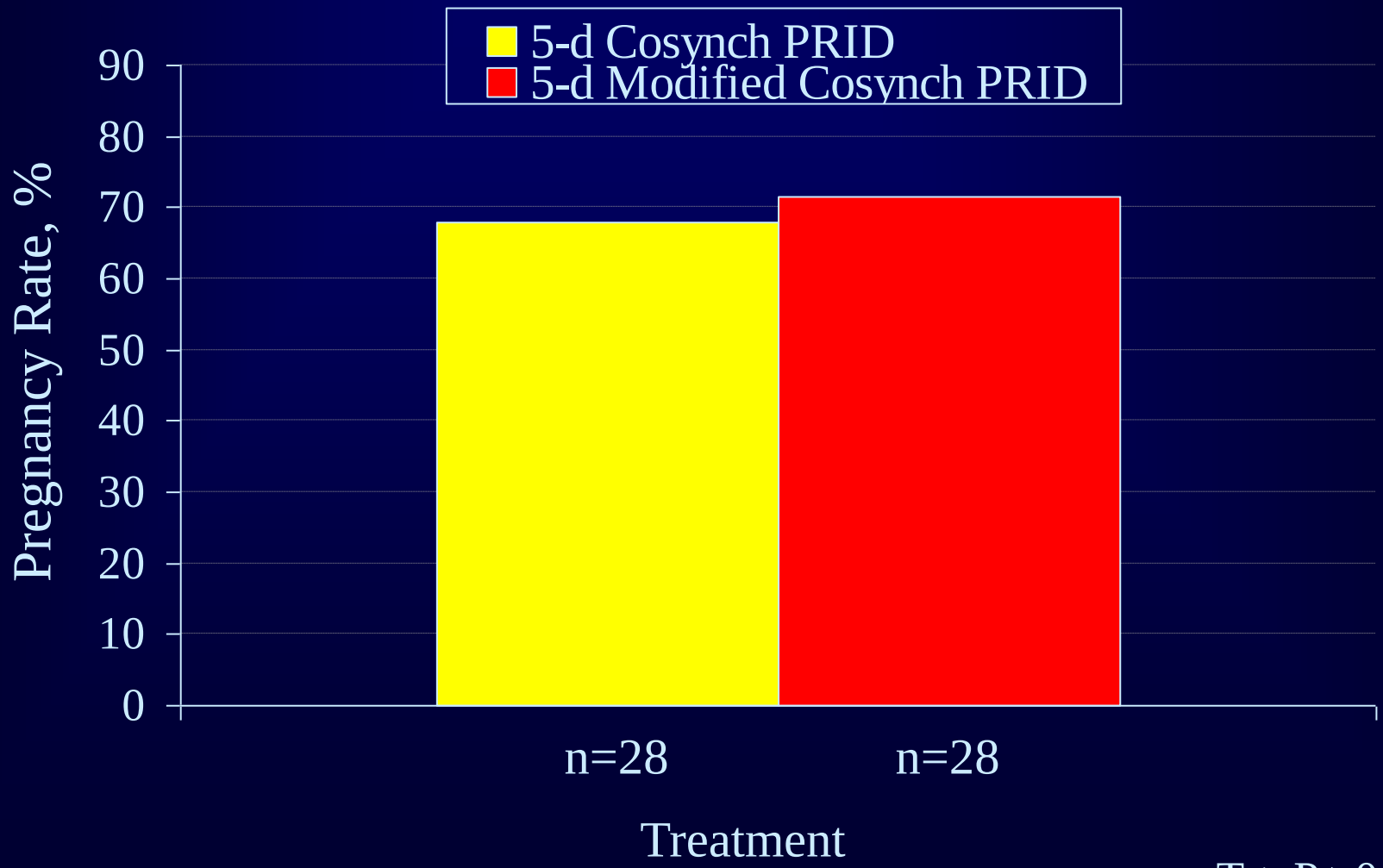
a, b Effect of TRT P < 0.03

Experimental Design – Modified 5 d Cosynch



Colazo and Ambrose, 2011

Timed-AI Pregnancy Rate



Trt, P >0.05

Colazo and Ambrose, 2011

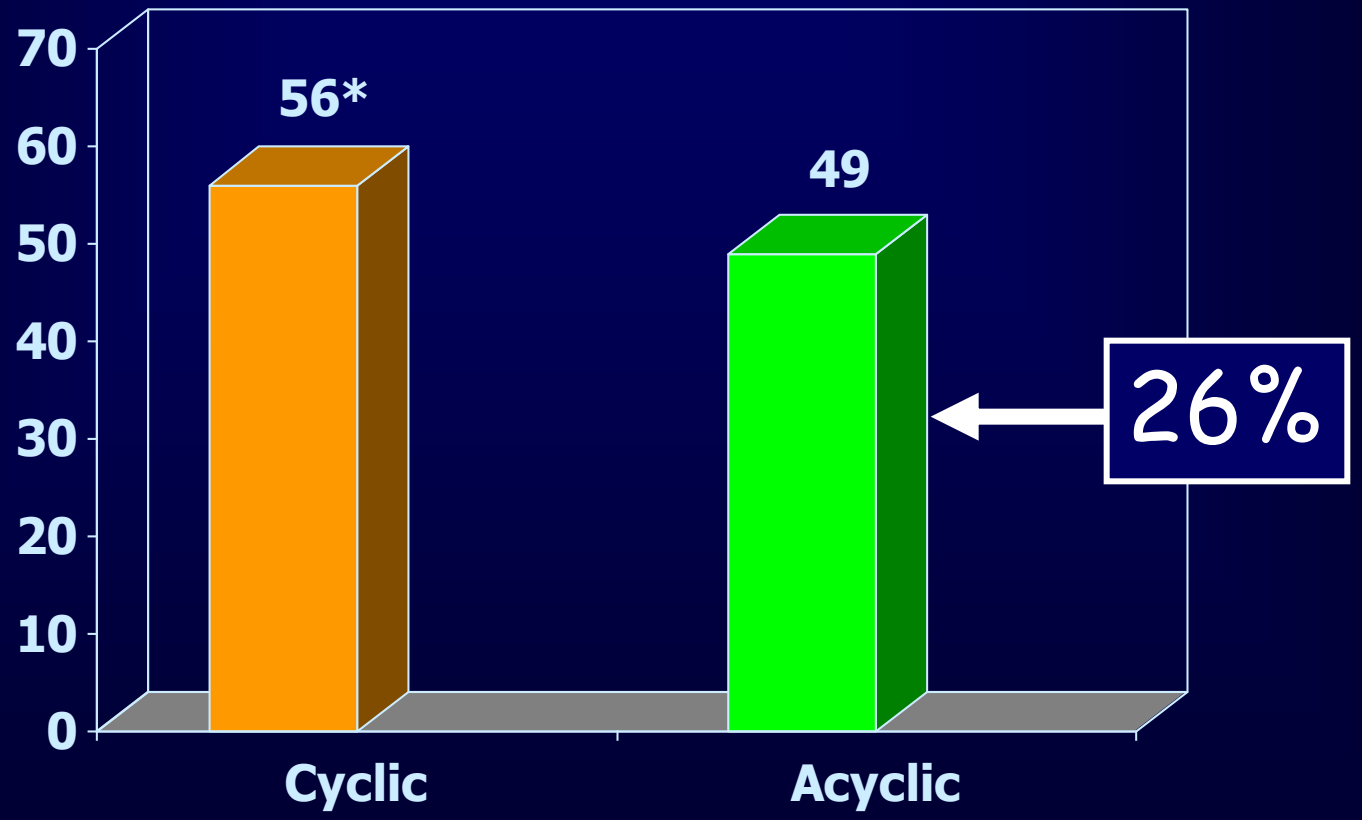
TAI protocol-Schedule (5d Cosynch & PRID)

MON am	TUE am	WED am	THU am	FRI	SAT	SUN
		GnRH PRIDi				
PRIDr PGF	PGF		GnRH & TAI			

Timed-AI programs: Overall results

- ✓ Studies published between 2000 and 2006
- ✓ Treated beef heifers: 3109
- ✓ GENMOD en SAS
- ✓ Pregnancy rate: 53.9 %
- ✓ Range: 47,3 % to 70,0 %

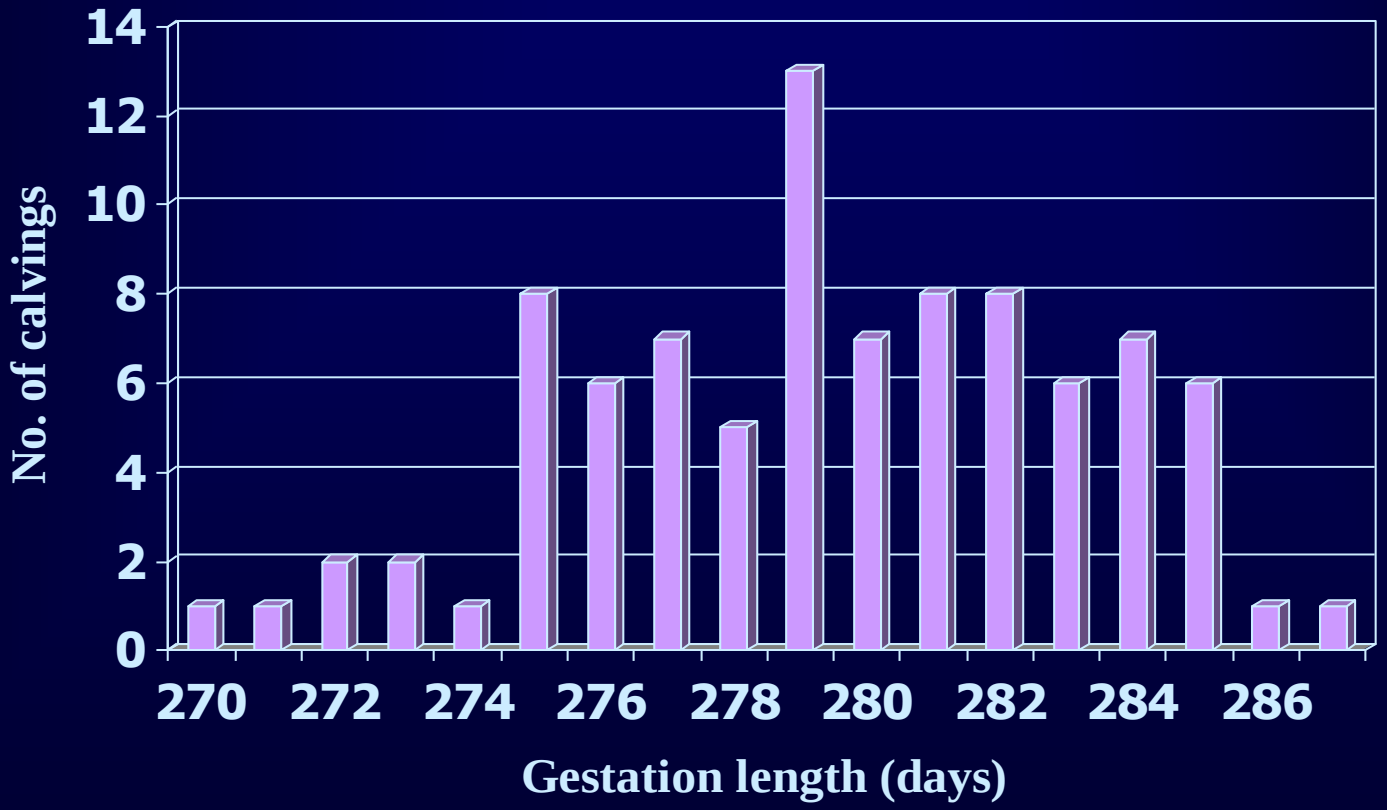
Timed-AI programs (Cycling vs. anestrus)



P < 0.01

n = 3110 heifers

Calving distribution of 90 beef heifers all bred on a single day



N = 90

Reuter and Rinette, 2009

Resynchronization of timed inseminated heifers with a used CIDR or MGA and E/P

Groups		CIDR			MGA		
	Control	CIDR	+E/P	+E/P/E	MGA	+E/P	+E/P/E
Preg. to 1st AI (%)	45.2^{ab}	47.3^{a}	49.5^{a}	33.3^{b}	54.8^{a}	45.2^{ab}	48.4^{a}
	42	44	46	31	51	42	45
Estrus rate (%)	88.2^{ac}	91.8^{ab}	95.7^{a}	95.2^{a}	83.3^{bc}	84.3^{c}	77.1^{c}
n	45/51	45/49	45/47	59/62	35/42	43/51	37/48
Conception rate (%)	62.2^{ab}	64.4^{ab}	73.3^{a}	59.3^{b}	40.0^{c}	53.5^{bc}	54.0^{bc}
n	28/45	29/45	33/45	35/59	14/35	23/43	20/37
Pregnancy rate (%)	**54.9^{ab}**	**59.2^{ab}**	**70.2^{a}**	**56.4^{ab}**	**33.3^{c}**	**45.1^{bc}**	**41.7^{bc}**
n	28/51	29/49	33/47	35/62	14/42	23/51	20/48
TAI & Rebreeding	**75.3^{ab}**	**78.5^{ab}**	**84.9^{ac}**	**71^{b}**	**69.9^{b}**	**69.9^{b}**	**69.9^{b}**

^{abcd}Percentages are different ($P<0.05$)

Resynchronization of heifers with a used CIDR (12,13 or 14 d after AI)

- ✓ 983 beef heifers TAI over 3 days
- ✓ All received a used CIDR device
- ✓ 336 heifers reinseminated over 5 days (78.2%)
- ✓ 542 pregnant to TAI (55.2%) and 232 pregnant to re-insemination
- ✓ Overall PR of 78.7%

Timed-AI programs: Cost per pregnancy based on 100 heifers

	CIDR/EB	CIDR/OVS	CIDR/COS7	CIDR/COS5	CIDR/COSM5
Drugs	$ 26.5	$ 30.0	$ 30.0	$ 35.0	$ 26.5
Labour	$ 300	$ 300	$ 240	$ 300	$ 240
Semen + AI	$ 2500	$ 2500	$ 2500	$ 2500	$ 2500
PR	65%	55%	50%	65%	60%
Per Preg	**$ 83.8**	**$ 105.5**	**$ 114.8**	**$ 96.9**	**$ 89.8**

May, 2004

THANK YOU !

Marcos G Colazo

Research Scientist, Alberta Agriculture & Rural Development

Edmonton, Alberta, Canada

E-mail: marcos.colazo@gov.ab.ca; mgcolazo@yahoo.com