UF IFAS
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Beef Cattle Reproductive Challenges in Florida

Presented to the **Ona Seminar Series**
June 12th 2018

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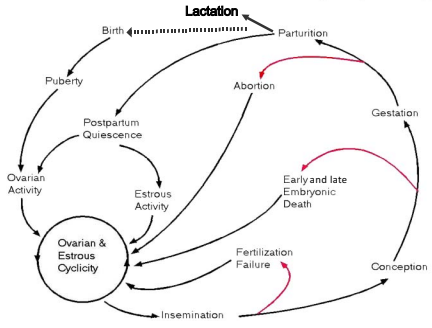
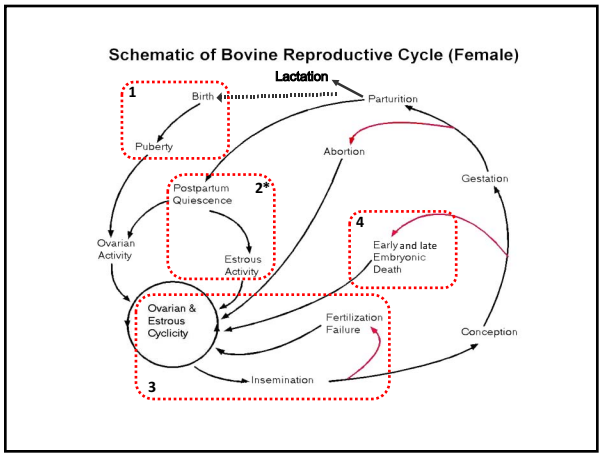
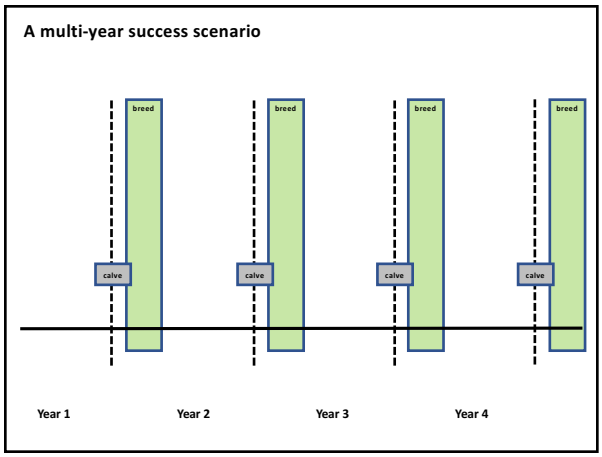
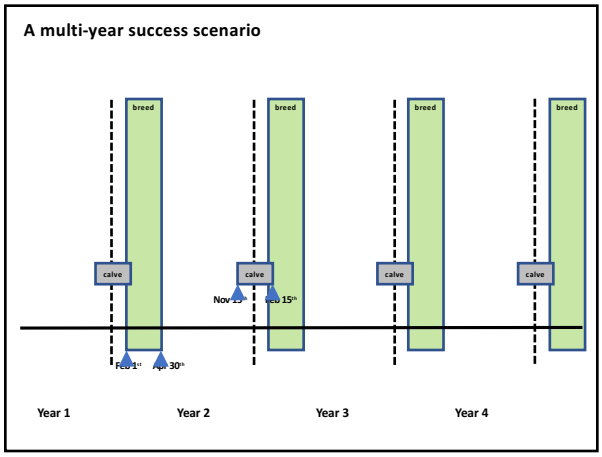
Schematic of Bovine Reproductive Cycle (Female)




Schematic of Bovine Reproductive Cycle (Female)
Lactation
1
Birth
Puberty
Parturition
Abortion
Gestation
Postpartum Quiescence
2*
Ovarian Activity
Estrous Activity
4
Early and late Embryonic Death
Ovarian & Estrous Cyclicity
Fertilization Failure
Conception
Insemination
3


A multi-year success scenario
breed
calve
Year 1
Year 2
Year 3
Year 4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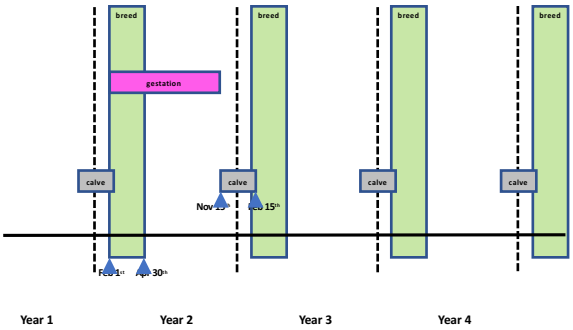
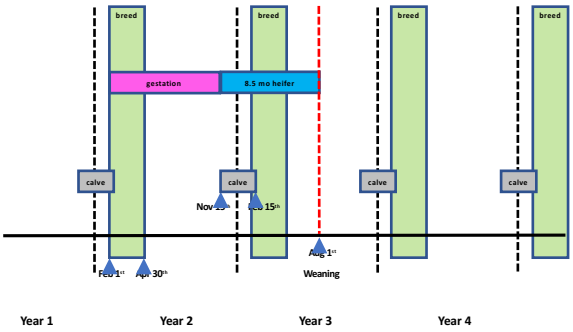
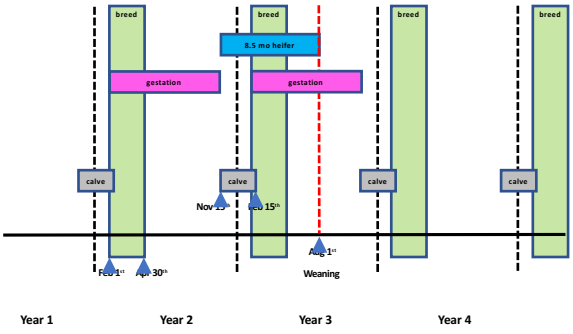
A multi-year success scenario: dam pregnant at the beginning of breeding season year 2



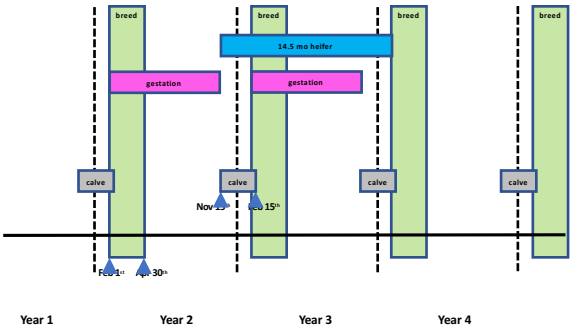
A multi-year success scenario: heifer born at the beginning of calving season year 3



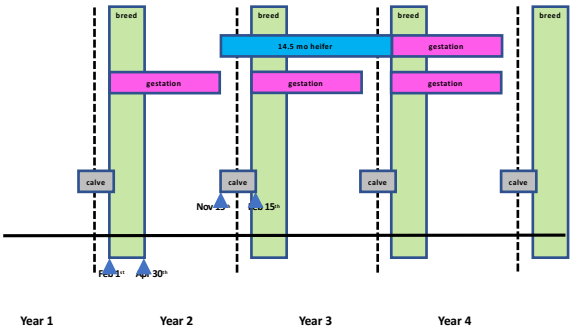
A multi-year success scenario: dam pregnant at the beginning of breeding season year 3



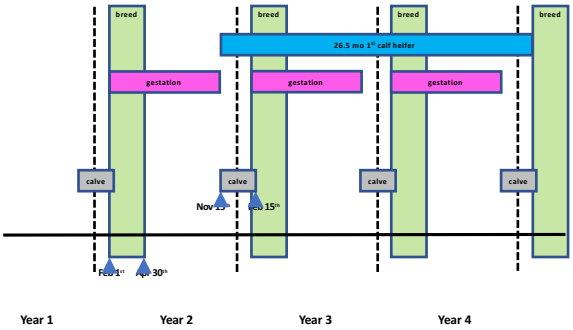
A multi-year success scenario: yearling heifer enters breeding season year 4 at 14.5 months of age



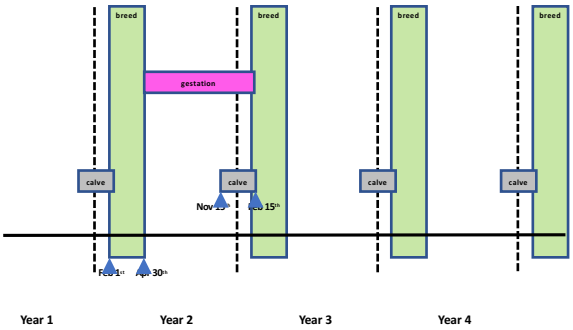
A multi-year success scenario: dam and yearling heifer pregnant at the beginning of breeding season year 4



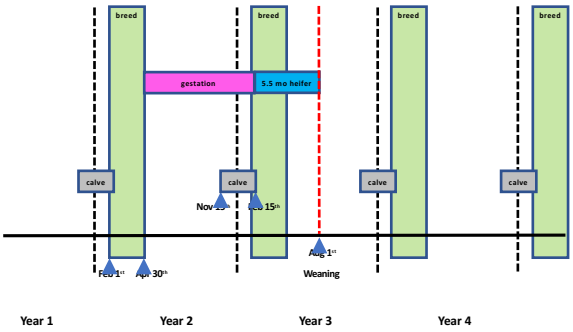
A multi-year success scenario: 1st calf heifer enters breeding season year 5 at 26.5 months of age



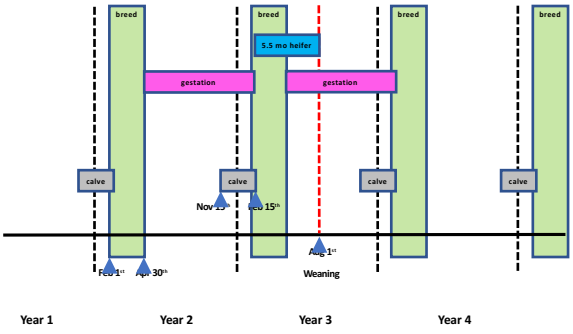
A multi-year challenging scenario: dam pregnant at the end of breeding season year 2



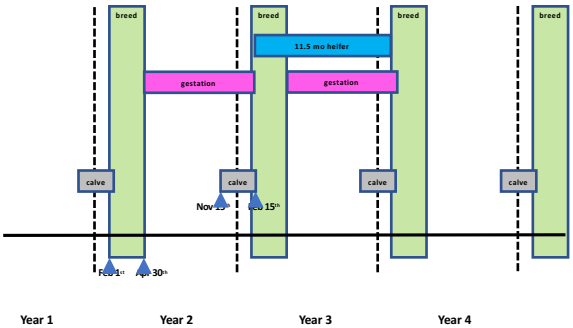
A multi-year challenging scenario: heifer born at the end of calving season year 3



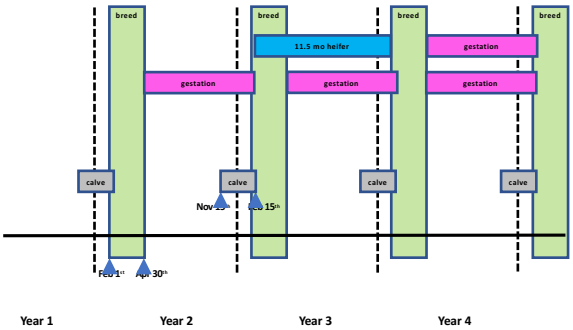
A multi-year challenging scenario: dam pregnant at the end of breeding season year 3



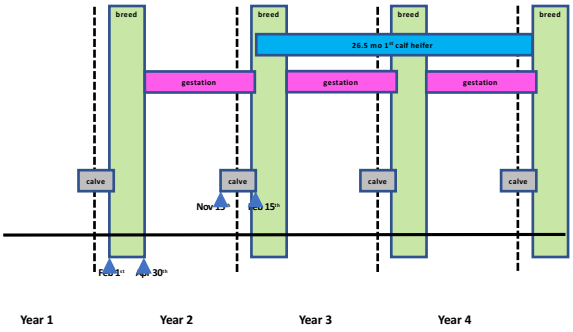
A multi-year challenging scenario: yearling heifer enters breeding season year 4 at 11.5 months of age



A multi-year challenging scenario: dam and yearling heifer pregnant at the end of breeding season year 4



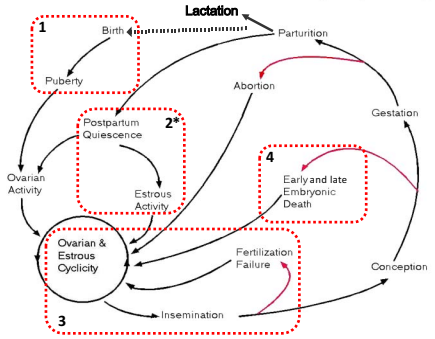
A multi-year challenging scenario: 1st calf heifer enters breeding season year 5 at 23.5 months of age



Take home point:

1. Focus management and nutrition to increase probability of pregnancy at the beggining of the breeding season.

Schematic of Bovine Reproductive Cycle (Female)



Reproductive technology level used in your operation
("X" if you use it; "O" if you want to use it; leave blank if don't and won't use it)

Technology	Seed stock herd			Commercial herd		
	Virgin heifers	Primiparous cows	Multiparous cows	Virgin heifers	Primiparous cows	Multiparous cows
No breeding season						
Breeding season <180d						
Breeding season <120d						
Breeding season<90d						
Bull only						
AI+Bull						
AI+AI+Bull						
AI only						
Check heat						
TAI+check heat						
TAI						
Resynch (TAI+TAI)						
Superovulation+ET						
OPU+IVF+ET						
ET commercial IVF embryo						
No preg check						
Preg check at weaning						
Preg check between end of breeding season and weaning						
Preg check within breeding season						
Multiple preg checks						

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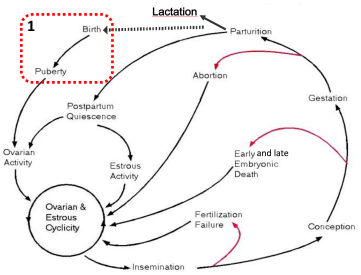
Preg check within breeding season						
Multiple preg checks						

1. Delayed puberty

-Lack of basic knowledge of mechanisms
-Lack of tools to select (phenotypes easy to collect and genomic markers)
-Lack of tools to induce (protocols and devices)
-Lack of tools to detect
-Lack of specialized bulls
-Cost to develop
-Cost to continue development after first calf
-Onset of breeding season considerations



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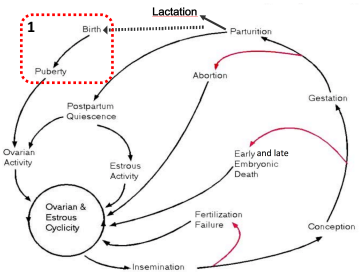
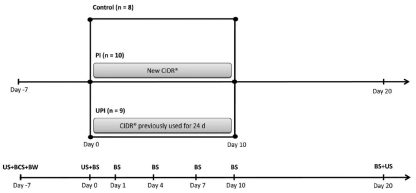


Impact of progesterone and estradiol treatment before the onset of the breeding period on reproductive performance of *Bos indicus* beef heifers

M.F. Sá Filho[a,*], L.F.T. Nasser[b], L. Penteado[c], R. Prestes[c], M.O. Marques[d], B.G. Freitas[a], B.M. Monteiro[a], R.M. Ferreira[a], L.U. Gimenes[a], P.S. Baruselli[a,*]

Nelore, 20-22 months, 100% pre-pubertal



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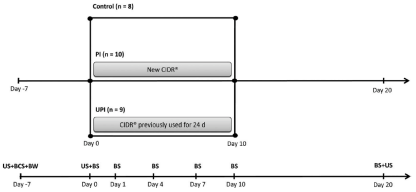

CL on D20:

Control: 0/8 (0%)

PI: 3/10 (30%)

UPI: 5/9 (55%)

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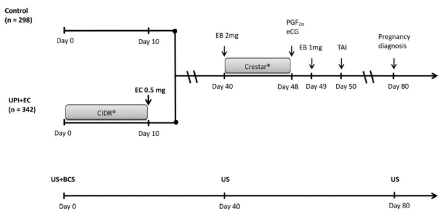
Nelore, 23-26 months, 100% pre-pubertal



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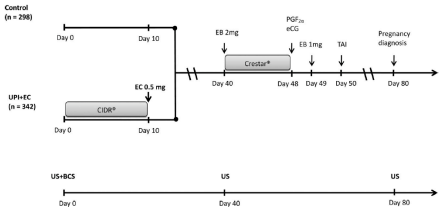
Nelore, 23-26 months, 100% pre-pubertal



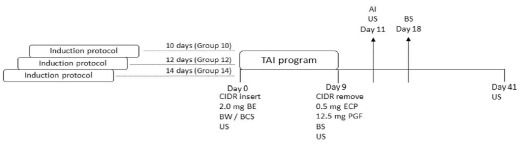
Pregnancy TAI:

Control: 79/298 (26.5%)

UPI: 148/342 (43.3%)

Effect of interval from induction of puberty to initiation of a timed AI protocol on pregnancy rate in Nellore heifers

A.D.P. Rodrigues[a], R.F.G. Peres[a], A.P. Lemes[b], T. Martins[a], M.H.C. Pereira[a], E.R. Carvalho[a], M.L. Day[c], J.L.M. Vasconcelos[a,*]



Nellore, 25 months, pre-pubertal, induction protocol: CIDR used previously 3x (27d total)

Effect of interval from induction of puberty to initiation of a timed AI protocol on pregnancy rate in Nellore heifers

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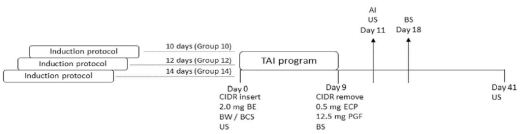
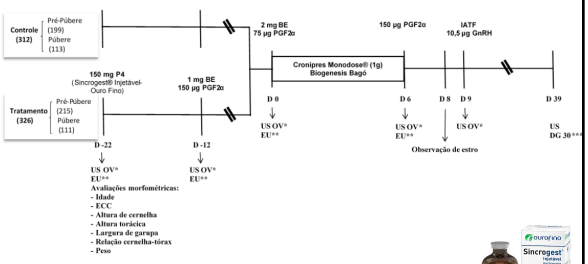


Table 2
Corpus luteum presence, progesterone concentration, follicular diameter on Day 9 and 11, and ovulation, conception, pregnancy, and final pregnancy rates in heifers in which ultrasonography (Days 9 and 11) and P_4 determination on Day 9 were performed.

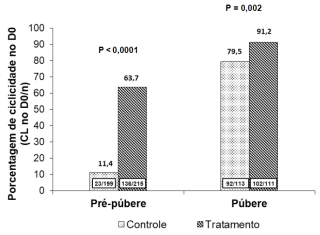
Variables	Group 10	Group 12	Group 14	P value
CL on Day 9 (%)	38.4[a] (58/151)	29.3[b] (46/157)	23.3[b] (38/164)	0.01
P_4 concentration on Day 9 (ng/mL)	2.61 ± 0.13	2.60 ± 0.13	2.91 ± 0.13	0.16
Follicular diameter on Day 9 (mm)	9.39 ± 0.15[a]	9.91 ± 0.15[b]	9.80 ± 0.15[b]	0.03
Follicular diameter on Day 11 (mm)	10.74 ± 0.17	11.08 ± 0.18	11.00 ± 0.19	0.26
Ovulation (%)	90.1 (136/151)	93.1 (145/157)	90.3 (147/164)	0.63
Conception (%)	40.8[a] (55/136)	56.0[b] (84/145)	50.8[b] (77/147)	0.05
Pregnancy (%)	36.4[a] (55/151)	51.8[b] (84/157)	45.5[b] (77/164)	0.04
Final pregnancy (%)	75.8 (111/151)	85.6 (128/157)	79.3 (125/164)	0.15

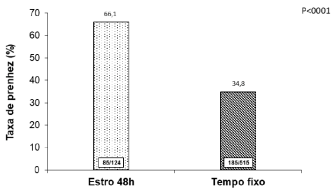
[a,b] Within a line, means without a common superscripts differed ($P \leq 0.05$).
Group 10: interval of 10 days from the induction protocol to beginning of the TAI protocol. Group 12: interval of 12 days from the induction protocol to beginning of the TAI protocol. Group 14: interval of 14 days from the induction protocol to beginning of the TAI protocol.
Abbreviations: P_4, progesterone; TAI, timed artificial insemination.

LIMA, R. S.: **Long-acting injectable progesterone for pre-synchronization of ovulation in Nelore heifers** [Emprego de progesterona injetável de longa ação para pré-sincronização da ovulação em novilhas Nelore]. 2017. 86 f. Tese (Doutorado em Ciências) - Faculdade de Medicina Veterinária e Zootecnia, Universidade de São Paulo, Pirassununga, 2017.



Nellore, 15-32 months, pre-pubertal and pubertal, induction protocol: single injection of P4 (Sincrogest)





Fonte: (LIMA, R.S., 2017).

Pregnancy rates:

Pre-pubertal: 33.6 vs 44.2%

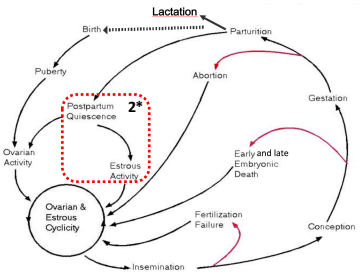
Pubertal: 41.1 vs 45.2%

Take home points:

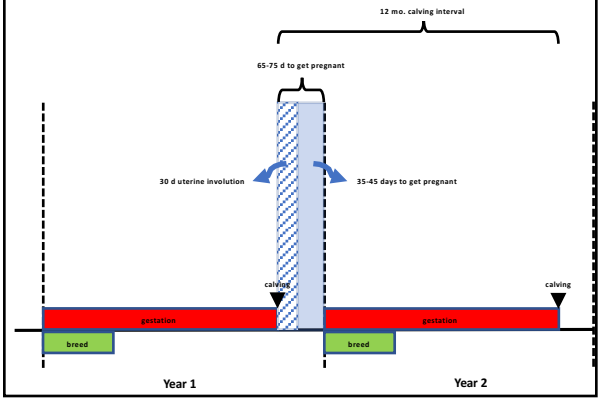
1. **Focus management and nutrition to increase probability of pregnancy at the beggining of the breeding season.**
2. **Pre-breeding season exposure to progesterone increases cyclicity at the beggining of the breeding season in heifers.**

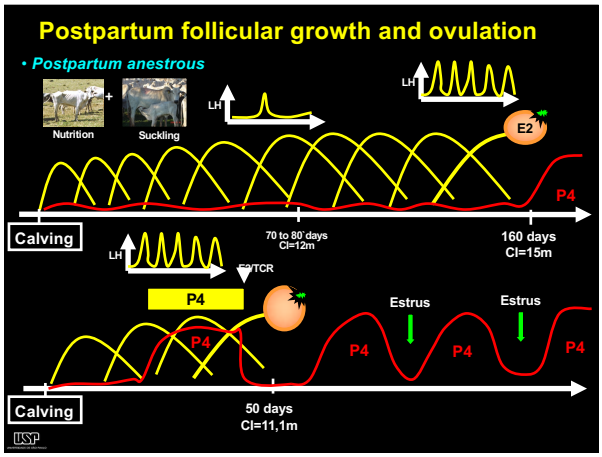
2. Delayed return to cyclicity after parturition *exacerbated in first calf yearling heifers

-Extremely delayed in *Bos indicus*
-Limited knowledge of extent of *Bos indicus* influence
-Progesterone is required to induce cyclicity and prevent short cycles
-Strategies to stimulate follicle growth and expression of heat



There is a 30-45 days window to get a cow pregnant in a 90 day breeding season, to keep a 12 mo. calving interval



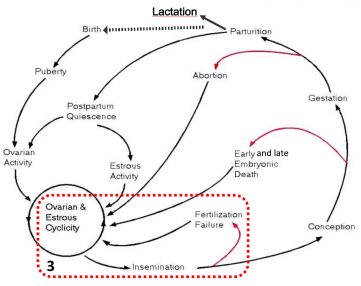


Take home points:

1. **Focus management and nutrition to increase probability of pregnancy at the beggining of the breeding season.**
2. **Pre-breeding season exposure to progesterone increases cyclicity at the beggining of the breeding season in heifers and in cows.**

3. Poor control of follicle growth and timing of ovulation

-Limited knowledge of extent of *Bos indicus* influence
-Limited pharmacologic tools
-High labor cost
-Poor fertility caused by ovulation of small follicle (insufficient E2 exposure)
-Poor fertility caused by poorly timed ovulation
-Poor fertility caused by not-skilled inseminator
-Low availability of bulls (Brahman): good semen quality? Potential to improve breed?
-Any use in natural breeding systems?



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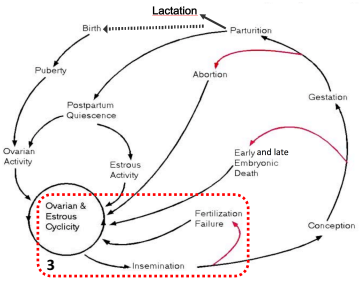
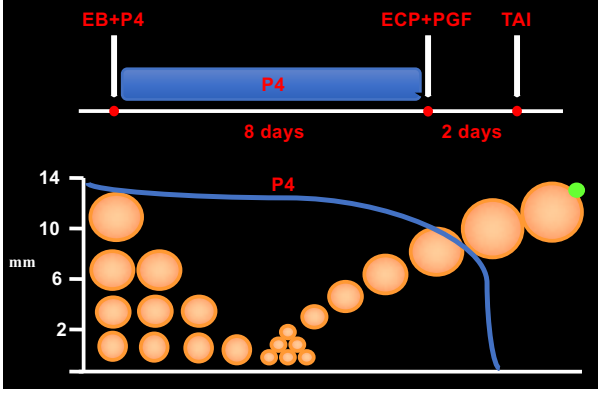
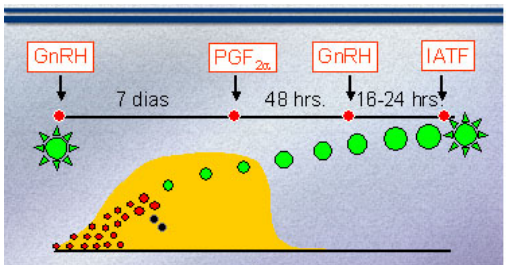


Concepts on protocols for the synchronization of ovulation in cattle: E2/P4-based protocol



Concepts on protocols for the synchronization of ovulation in cattle: OvSynch protocol



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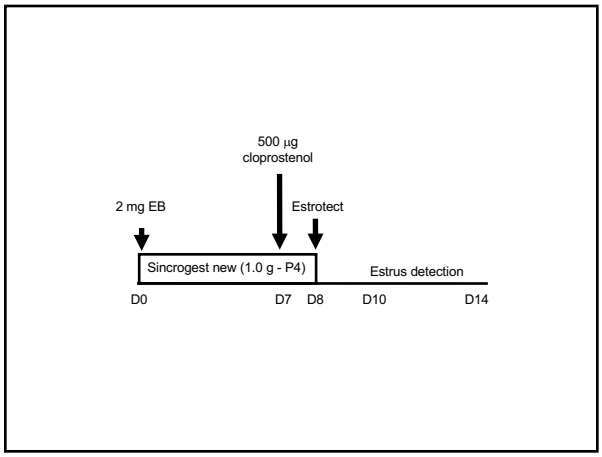
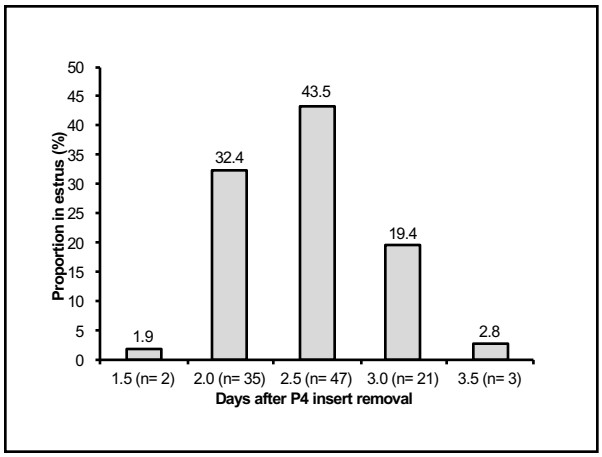
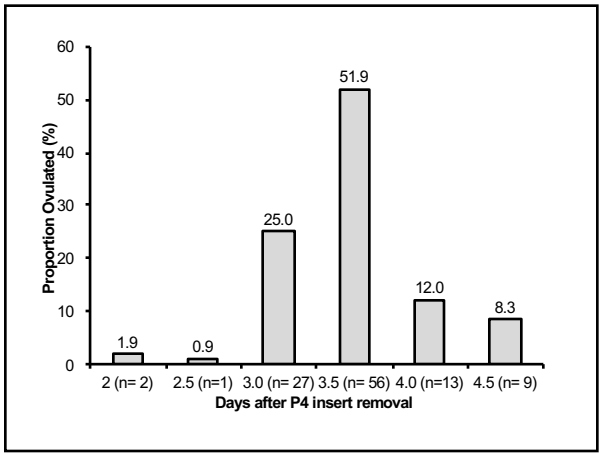
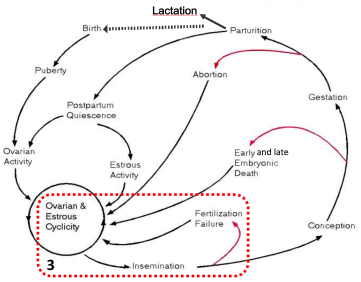

500 µg
cloprostenol
2 mg EB
Estrotect
Sincrogest new (1.0 g - P4)
Estrus detection
D0
D7
D8
D10
D14


Proportion in estrus (%)
50
45
40
35
30
25
20
15
10
5
0
1.9
32.4
43.5
19.4
2.8
1.5 (n= 2)
2.0 (n= 35)
2.5 (n= 47)
3.0 (n= 21)
3.5 (n= 3)
Days after P4 insert removal

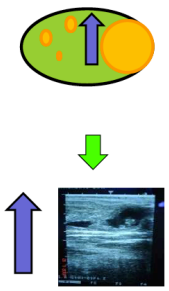

Proportion Ovulated (%)
60
50
40
30
20
10
0
1.9
0.9
25.0
51.9
12.0
8.3
2 (n= 2)
2.5 (n=1)
3.0 (n= 27)
3.5 (n= 56)
4.0 (n=13)
4.5 (n= 9)
Days after P4 insert removal

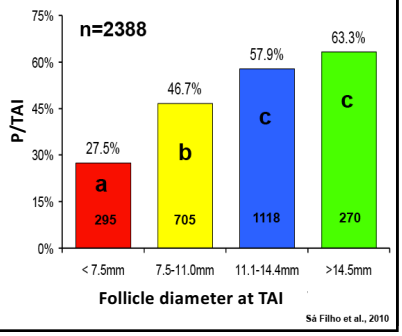
3. Poor control of follicle growth and timing of ovulation

-Limited knowledge of extent of *Bos indicus* influence
-Limited pharmacologic tools
-High labor cost
-Poor fertility caused by ovulation of small follicle (insufficient E2 exposure)
-Poor fertility caused by poorly timed ovulation
-Poor fertility caused by not-skilled inseminator
-Low availability of bulls (Brahman): good semen quality? Potential to improve breed?
-Any use in natural breeding systems?



Diameter of the pre-ovulatory follicle is associated positively with P/TAI





Sá Filho et al., 2010

Diameter of the pre-ovulatory follicle is associated positively with P/TAI of ovulated cows

Table 3
Association between follicle diameter at fixed-time artificial insemination (FTAI) on the probabilities of ovulation, estrus and pregnancy among cows evaluated for ovulation or estrus.

Variable	Diameter of the largest follicle at FTAI, mm				*P*
	<7.5	7.5–11	11.1–14.4	>14.4	
Ovulation rate, %	42.5c (34/80)	73.9b (161/218)	95.8a (407/425)	97.8a (88/90)	<0.001
Ovulated before FTAI, %	79.4a (27/34)	0.6b (1/161)	0.0b (0/407)	0.0b (0/88)	<0.001
Estrus at FTAI[a], %	54.8c (51/93)	33.6d (43/128)	68.9b (126/183)	90.2a (37/41)	0.001
P/AI in ovulated cows[b], %	32.4b (11/34)	50.3b (81/161)	60.0a (244/407)	68.2a (60/88)	0.004

The alphabets (a–c) in the same row differ ($P < 0.05$).
[a] Proportion of cows that showed estrus between the withdrawal of the progesterone device and FTAI.
[b] Pregnancy per AI only in cows that had ovulations in response to the FTAI protocol.

Sá Filho et al. (2010)

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Review article

Alternative programs for synchronizing and resynchronizing ovulation in beef cattle

Gabriel A. Bó [a,b,*], José Javier de la Mata [a,c], Pietro S. Baruselli [d], Alejo Menchaca [e]

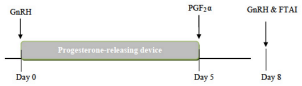
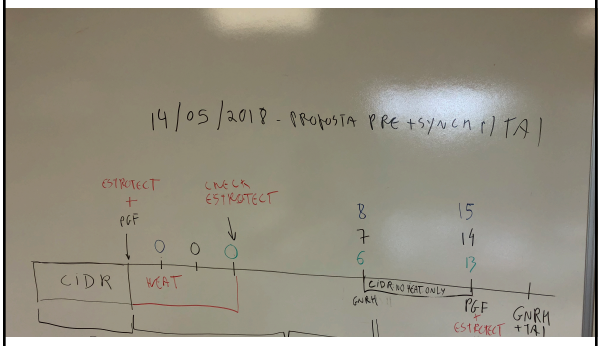


Fig. 1. Recommended 5-day CO-Synch protocol in cattle. The recommended interval from progesterone device removal and the second GnRH and FTAI is between 60 and 66 hours in heifers and 72 hours in cows. A second $PGF_{2\alpha}$ administered at the same time of the device removal or 6 to 12 hours later is recommended in cows and 400 IU of eCG may also be given in cows in postpartum anestrus or poor body condition score. FTAI, fixed-time artificial insemination.



Take home points:

1. **Focus management and nutrition to increase probability of pregnancy at the beggining of the breeding season.**
2. **Pre-breeding season exposure to progesterone increases cyclicity at the beggining of the breeding season in heifers and in cows.**
3. **Protocol: manage follicle growth for sychrony and estrus.**

Timed artificial insemination early in the breeding season improves the reproductive performance of suckled beef cows

Manoel F. Sá Filho [a,*], Luciano Penteado [b], Everton L. Reis [a], Tomás. A.N.P.S. Reis [a], Klibs N. Galvão [c], Pietro S. Baruselli [a]

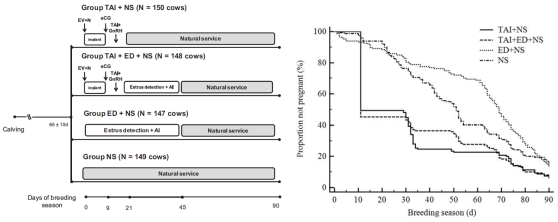
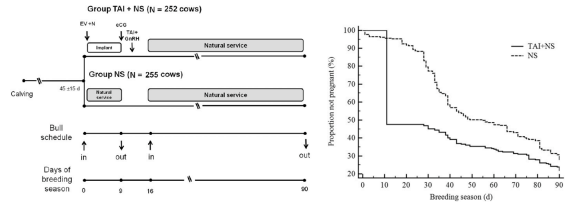


Table 1
Reproductive parameters in suckled beef cows subjected to four breeding programs during a 90-day breeding season (BS).

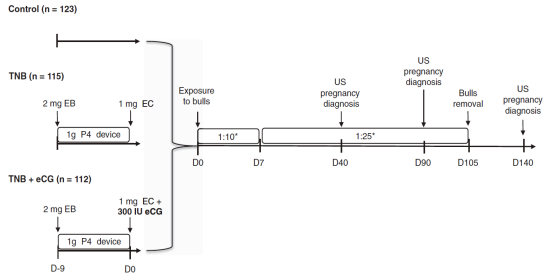
Breeding strategy[a]	First 45 days of the BS			Pregnancy during the BS	
	Pregnancy per AI, % (N)[b]	Service rate, % (N)[c]	Pregnancy per AI, % (N)[d]	45 days, % (N)	End, % (N)
TAI+NS	50.7 (150)	–	–	75.3 (150)[e]	92.7 (150)[e]
TAI+ED +NS	54.3 (148)	25.4 (67)	76.5 (17)	63.5 (148)[f]	91.9 (148)[e]
ED+NS	–	44.0 (150)	53.0 (66)	23.3 (150)[g]	85.0 (147)[f]
NS	–	–	–	44.3 (149)[h]	83.2 (149)[f]

Abbreviations: BS, breeding season; ED, estrous detection; NS, natural service; TAI, timed AI.



Review: Using artificial insemination *v.* natural service in beef herds

P. S. Baruselli[1†], R. M. Ferreira[1], M. F. Sá Filho[1] and G. A. Bó[2]



Review: Using artificial insemination *v.* natural service in beef herds

P. S. Baruselli[1†], R. M. Ferreira[1], M. F. Sá Filho[1] and G. A. Bó[2]

Table 1 *Cumulative pregnancy rate every 21 days (P21, P42, P63, P84 and P105) of treated and non-treated (control)* postpartum *primiparous beef cows exposed to bull natural breeding (NB) during a 105-day breeding season*

	Control	TNB	TNB + eCG	*P* value
P21 (% (*n*/*n*))	5.7^{c} (7/123)	30.4^{b} (35/115)	51.8^{a} (58/112)	0.001
P42 (% (*n*/*n*))	17.1^{c} (21/123)	42.6^{b} (49/115)	58.9^{a} (66/112)	0.001
P63 (% (*n*/*n*))	27.6^{c} (34/123)	52.2^{b} (60/115)	70.4^{a} (79/112)	0.001
P84 (% (*n*/*n*))	42.3^{c} (52/123)	58.3^{b} (67/115)	74.1^{a} (83/112)	0.001
P105 (% (*n*/*n*))	65.0^{b} (80/123)	68.7^{ab} (79/115)	82.1^{a} (92/112)	0.01

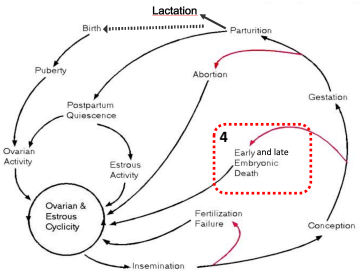
P21, P42, P63, P84 and P105 = cumulative pregnancy rates at 21, 42, 63, 84 and 105 days of the breeding season.
Control cows received no prior hormonal treatment; timed NB (TNB) and TNB + equine chorionic gonadotropin (eCG) cows received a protocol to synchronize follicular wave emergence and ovulation without and with eCG, respectively. Adapted from Ferreira *et al.* (2018).
^{a,b,c}Values within a row with different superscript letters differ significantly at the *P* value presented.

Take home points:

1. **Focus management and nutrition to increase probability of pregnancy at the beggining of the breeding season.**
2. **Pre-breeding season exposure to progesterone increases cyclicity at the beggining of the breeding season in heifers and in cows.**
3. **Protocol: manage follicle growth for sychrony and estrus.**
4. **Apply reproductive technologies to increase proportion of pregnancies early in the breeding season, even in natural service systems.**

4. Early and late embryonic mortality

-Associated with poor exposure to estradiol
-Associated with the ovulation of smaller follicles
-Associated with asynchronicity between embryo and uterus (caused by poor synchronization of ovulation of recipients)
-Possible incompatibility with a particular bull
-Opportunity for early detection, resynch and second AI before exposure to bull



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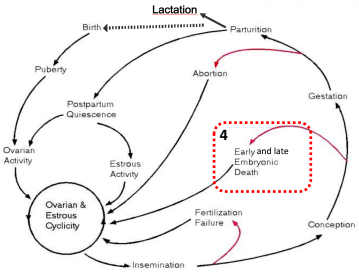


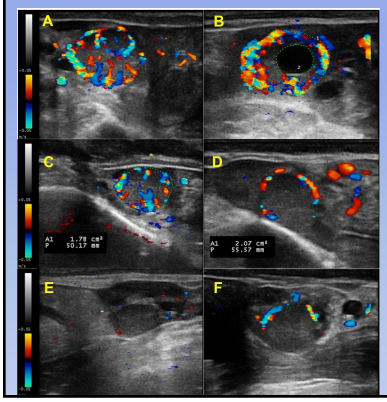
Early Gestation Diagnostic in Cattle

BIOLOGY OF REPRODUCTION (2014) **91**(4):95, 1–12
Published online before print 10 September 2014.
DOI 10.1095/biolreprod.114.121525

Conceptus-Induced Changes in the Gene Expression of Blood Immune Cells and the Ultrasound-Accessed Luteal Function in Beef Cattle: How Early Can We Detect Pregnancy?[1]

Guilherme Pugliesi,[2,3,4] Bruna T. Miagawa,[3] Yasmin N. Paiva,[3] Moana R. França,[3] Luciano A. Silva,[4] and Mario Binelli[3]

Método Doppler-US



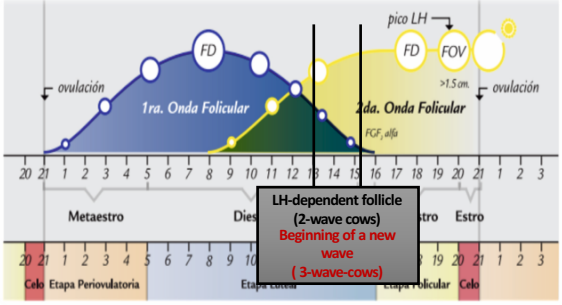
CL with area <2cm^2 and blood flow ≤25%.

Endpoint	Doppler US[a]		
	Only luteal area	Only luteal blood flow	Both
No. of cows	111	111	111
TP	41	41	42
TN	61	59	59
FP	8	10	10
FN	1	1	0
Sensitivity[d]	97.6%	97.6%	100%
Specificity[e]	88.4%	85.5%	85.5%
PPV[f]	83.7%	80.4%	80.8%
NPV[g]	98.4%	98.4%	100%
Accuracy[h]	92%	90.1%	91%

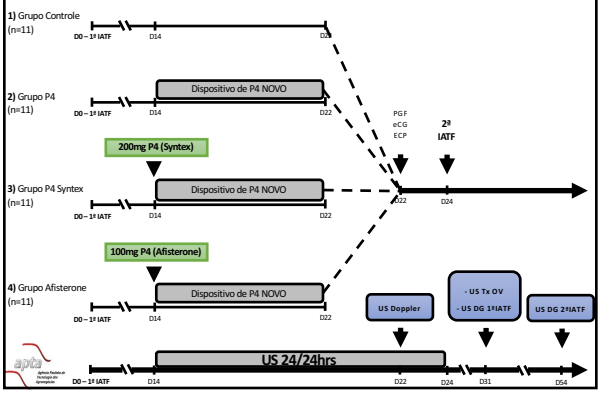
Use of Early Gestation Diagnostic in re-synchronization strategies

Follicular dynamics of Nelore cows in response to different methods to synchronize the emergence of a new wave of follicle development 14 days post TAI

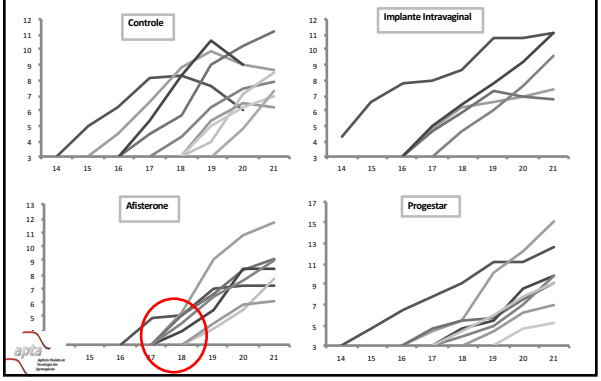
MV. MSc. Dr. Manoel Francisco de Sá Filho
MV. MSc. Romulo Germano de Rezende
MV. MSc Bruno Gonzales de Freitas
Prof. Dr. Pietro Sampaio Baruselli



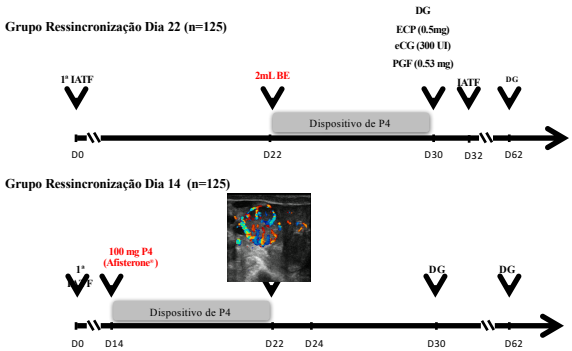
Experimental design



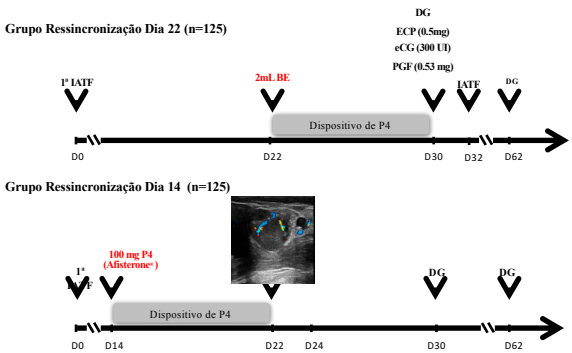
Dispersion of wave emergence (Rezende et al., 2016, SBTE)



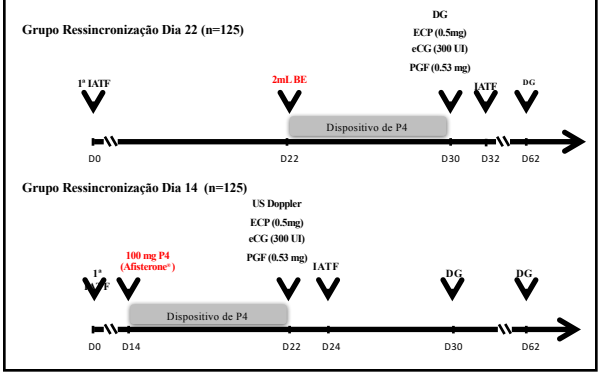
14 and 22 day resynch programs



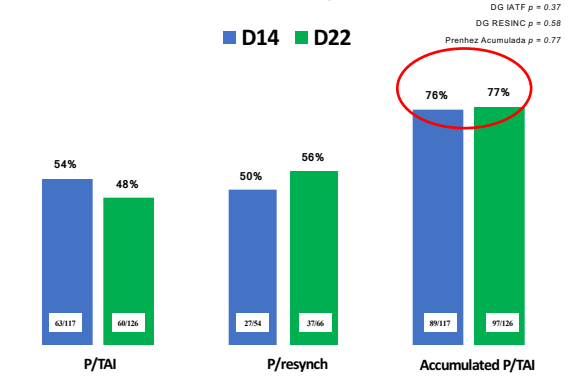
14 and 22 day resynch programs

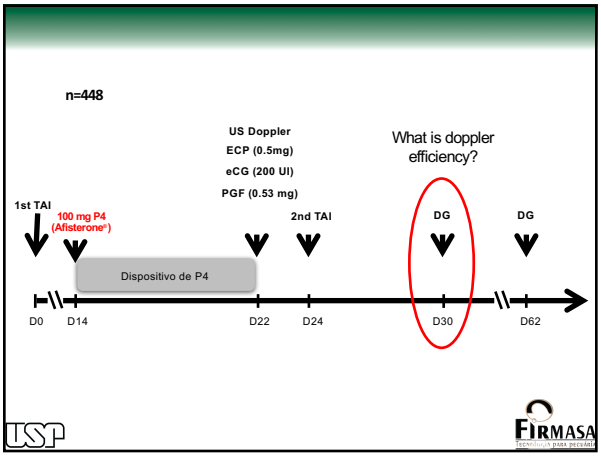


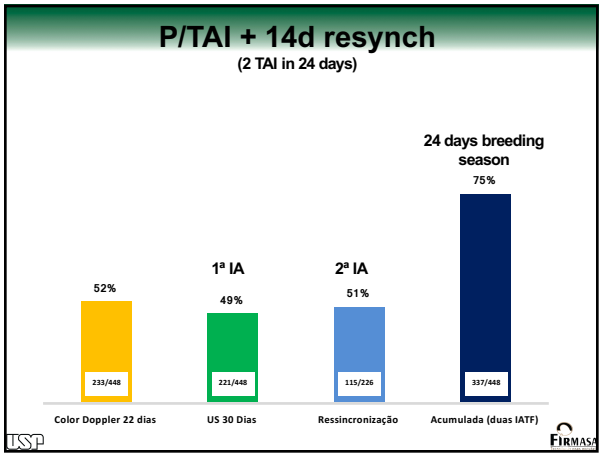
14 and 22 day resynch programs

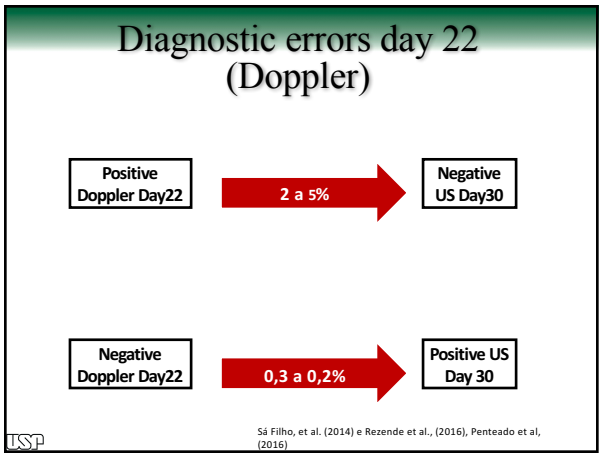


P/TAI, P/resynch AI, accumulated P/TAI (Penteado et al, 2016, SBTE)









Take home points:

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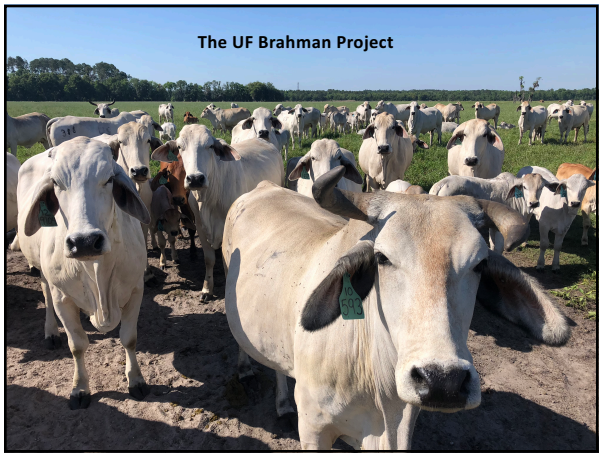
3. **Protocol: manage follicle growth for sychrony and estrus.**
4. **Apply reproductive technologies to increase proportion of pregnancies early in the breeding season, even in natural service systems.**
5. **Early preg check + resynch is a novel tool for increasing AI pregnancies early in the breeding season.**



Decreasing from 9 to 7 days the permanence of progesterone inserts make possible their use up to 5 folds in suckled Nellore cows

Marcelo H. Santos [a], Marcos Vinicius C. Ferraz Junior [a, b], Daniel M. Polizel [a, b], José Paulo R. Barroso [a], Alexandre A. Miszura [a], André S. Martins [a], Analisa V. Bertoloni [a], Gabriela B. Oliveira [a], Alexandre V. Pires [a, b, *]

Table 2
Reproductive parameters of suckled Nellore cows using either a new P4 insert (CIRD1) or a P4 insert used previously for 7 (CIDR2), 14 (CIDR3), 21 (CIDR4) or 28 (CIDR5) days during timed-AI.

Variables	Treatments (Treat)					P value		
	CIDR1	CIDR2	CIDR3	CIDR4	CIDR5	Treat	S	Treat × S
Breeding season (S) 1								
Follicular diameter at P4 removal,[a] mm	8.70 ± 0.21^{f}	9.26 ± 0.14^{ef}	9.15 ± 0.18^{ef}	9.43 ± 0.17^{e}	9.84 ± 0.27^{e}	0.01	.	.
Follicular diameter at AI,[a] mm	11.60 ± 0.19^{ef}	11.81 ± 0.13^{e}	11.08 ± 0.21^{f}	12.09 ± 0.15^{e}	11.79 ± 0.23^{ef}	<.01	.	.
Follicular growth,[b] mm/day	1.35 ± 0.07	1.30 ± 0.05	1.11 ± 0.08	1.32 ± 0.06	1.23 ± 0.10	0.24	.	.
P4 concentration at insert removal,[c] ng/mL	2.37 ± 0.11^{a}	2.30 ± 0.10^{a}	2.11 ± 0.14^{ab}	1.95 ± 0.10^{bc}	1.63 ± 0.13^{d}	<.01	.	.
Estrus detection,[d] %	80.2[a] (73/91)	79.0[a] (132/167)	74.5[a] (117/157)	79.1[a] (91/115)	53.7[d] (36/67)	<.01	.	.
P/AI,[e] %	44.0 (40/91)	44.3 (74/167)	44.6 (70/157)	48.7 (56/115)	47.7 (32/67)	0.88	.	.
Loss of CIDR	2.2 (2/91)	3.6 (6/167)	2.6 (5/157)	2.6 (3/115)	3.0 (2/67)	0.95	.	.
Breeding season 2								
Estrus detection, %	58.0[f] (47/81)	73.6[a] (81/110)	77.5[a] (31/40)	77.9[a] (85/109)	77.4[a] (48/62)	0.02	.	.
P/AI, %	51.2 (41/80)	52.3 (57/109)	45.0 (18/40)	55.1 (59/107)	50.0 (30/60)	0.85	.	.
Overall								
Estrus detection, %	69.8 (112/172)	76.9 (213/277)	75.1 (148/197)	78.5 (176/224)	65.1 (84/129)	0.03	0.88	<.01
P/AI, %	47.4 (81/171)	47.8 (132/276)	44.7 (88/197)	54.0 (120/222)	48.8 (62/127)	0.72	0.16	0.95