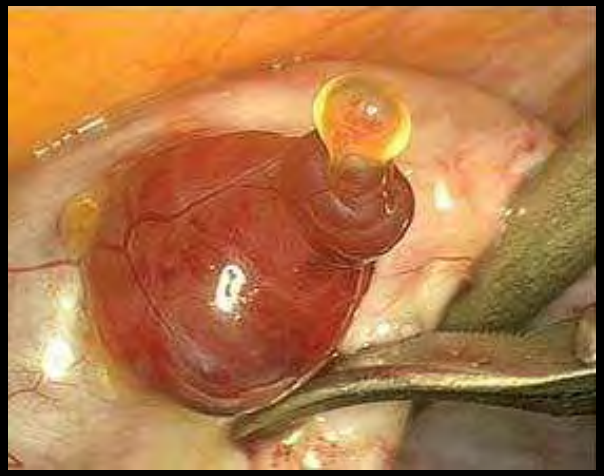
UF IFAS
UNIVERSITY of FLORIDA

68th Florida Beef Cattle Short Course
May 10th 2019

Reproductive Challenges in Cow-calf Operations

Mario Binelli, PhD
Department of Animal Sciences
(mario.binelli@ufl.edu)

She is in estrus.



This is an Ovulation: release of an oocyte (egg) to be fertilized.

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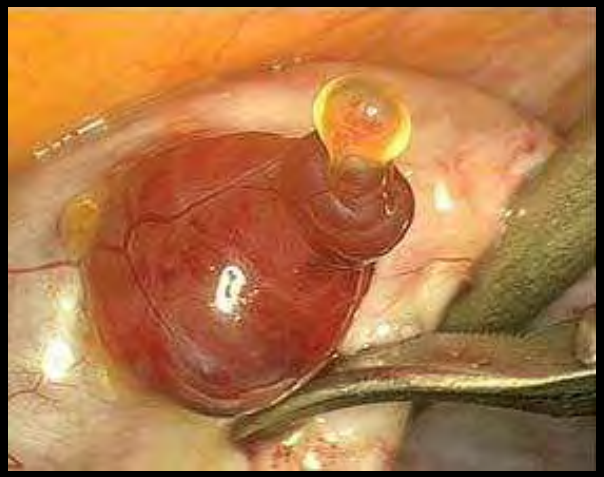
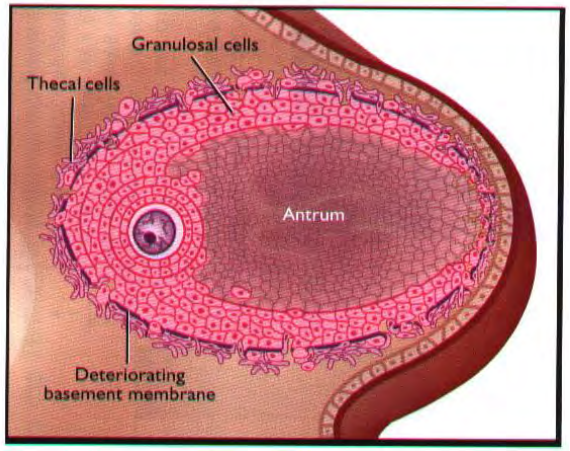
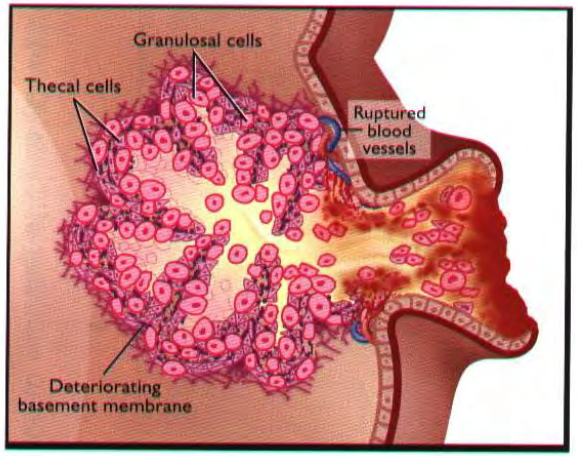


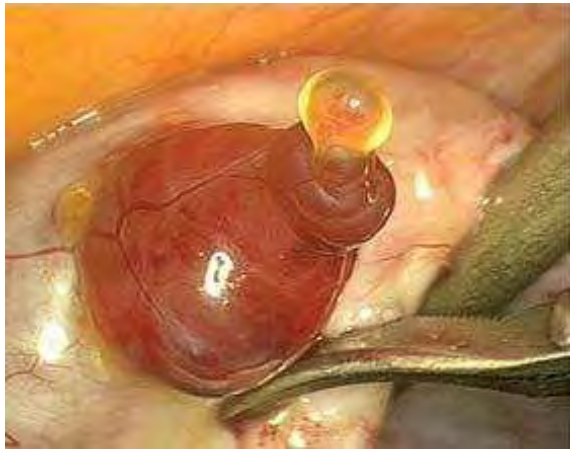
Oocyte + sperm = embryo → fetus → calf → MEAT

Pre-ovulatory follicle

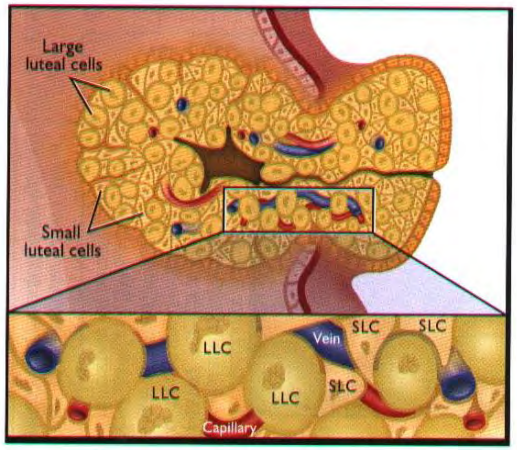


Ovulation

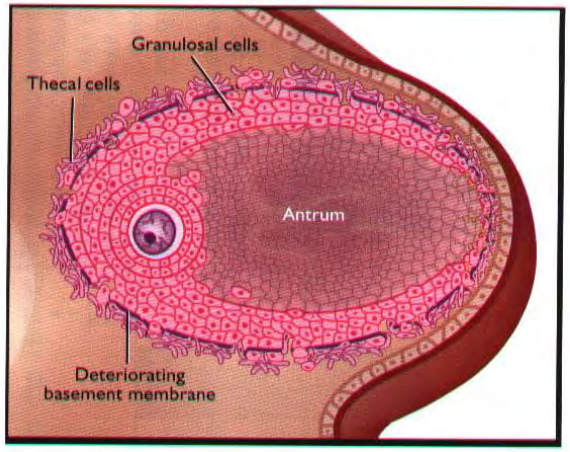




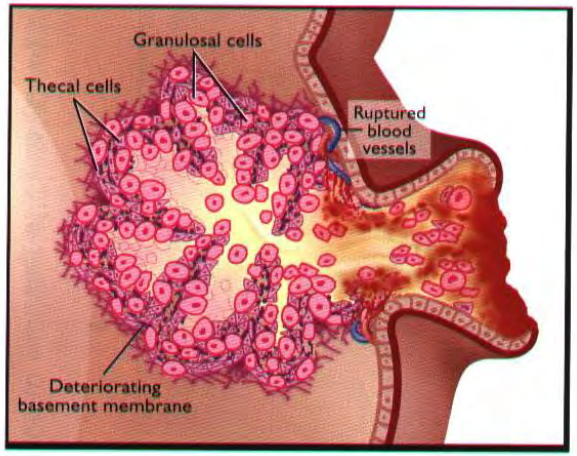
Formation of corpus luteum

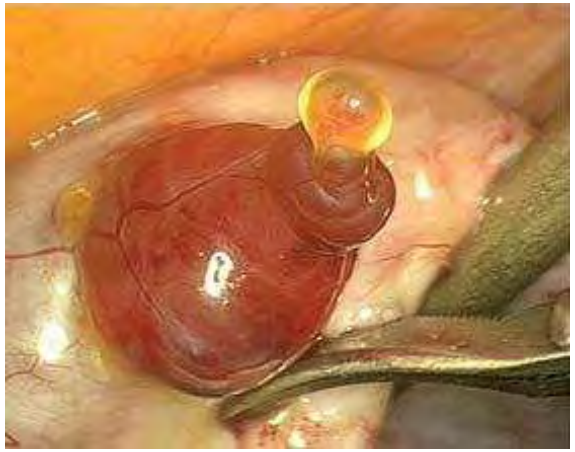


Pre-ovulatory follicle



Ovulation





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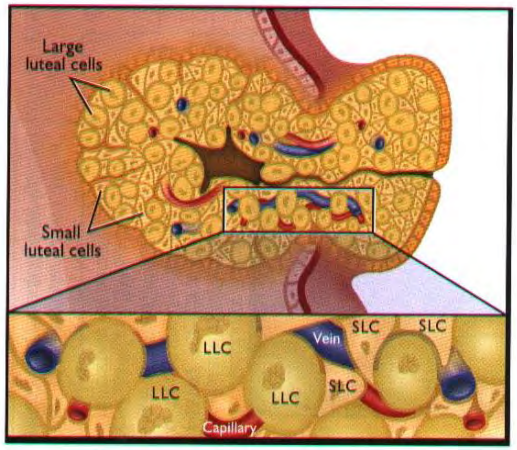

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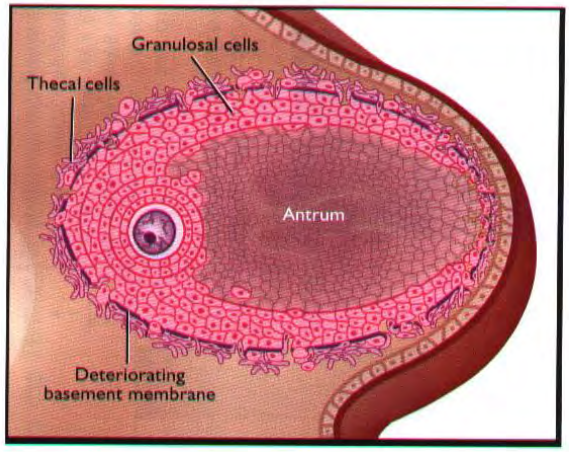

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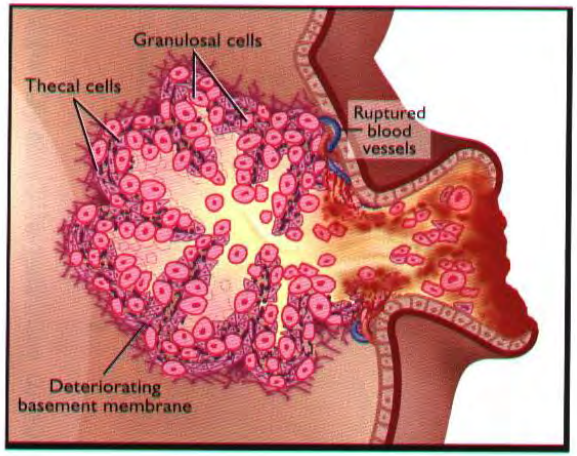
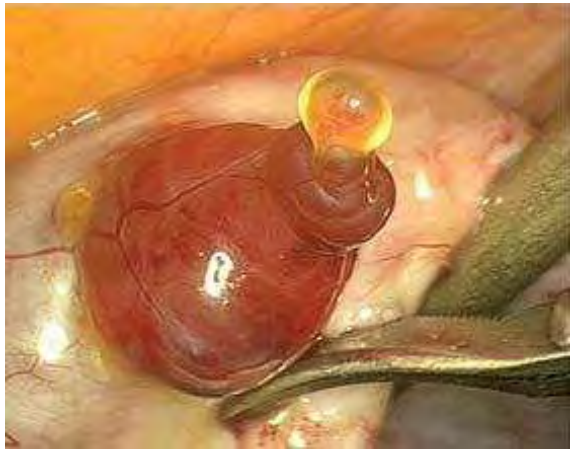


28-30 h after the beginning of estrus



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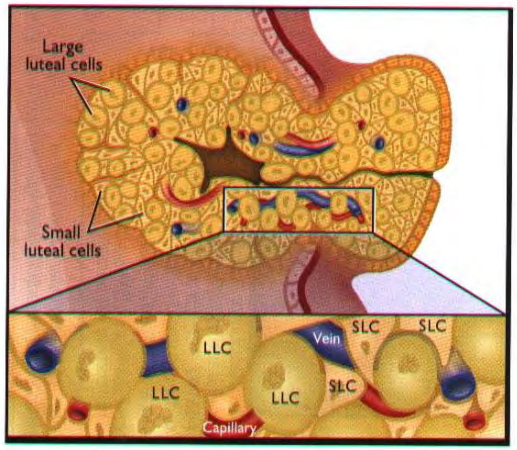

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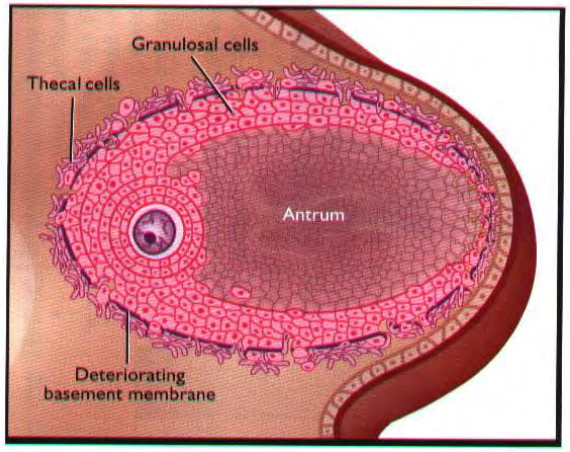

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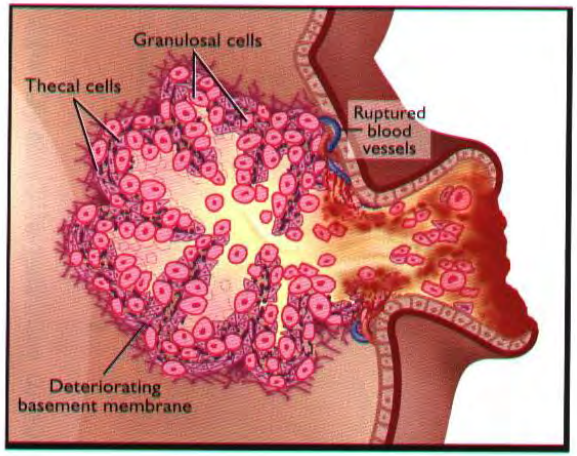

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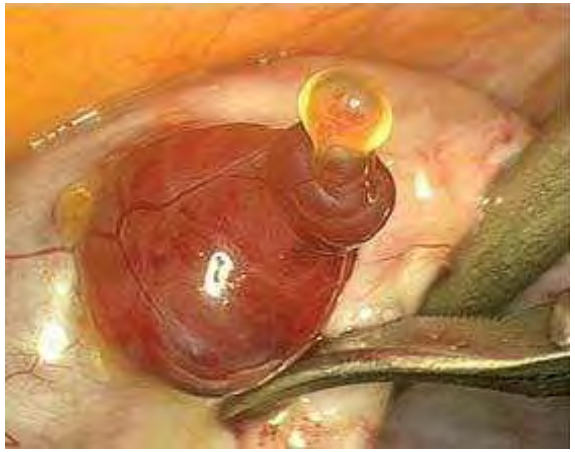

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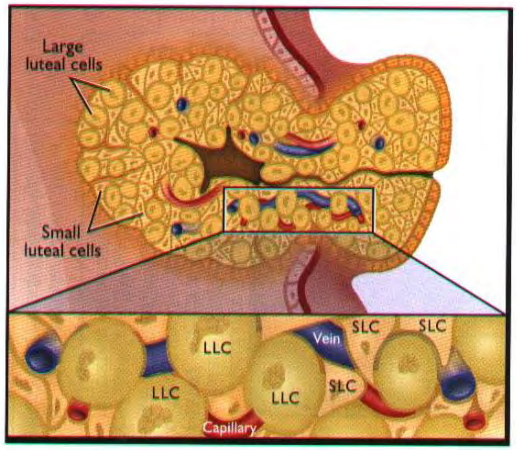
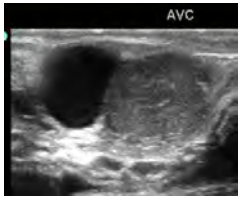
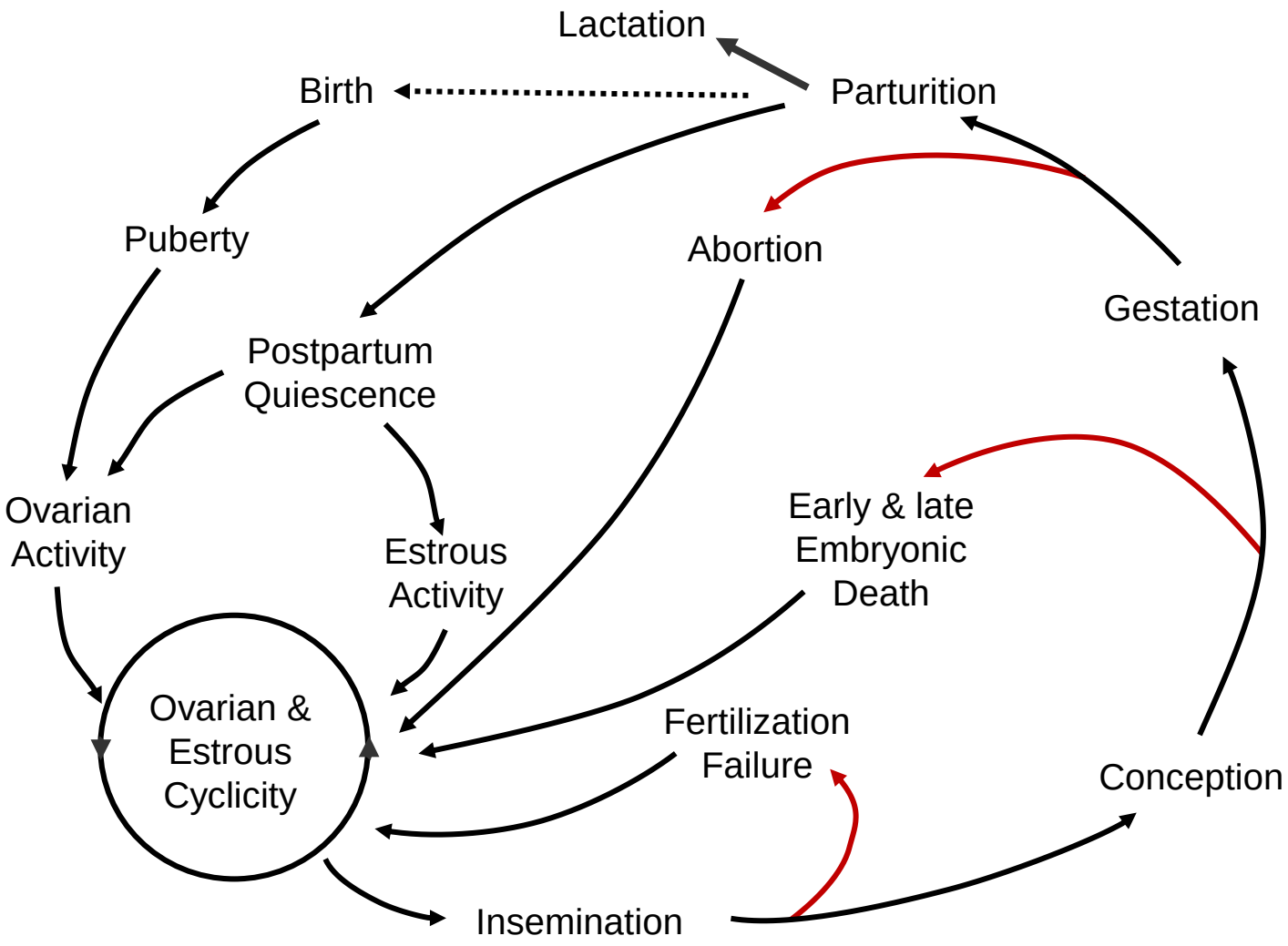
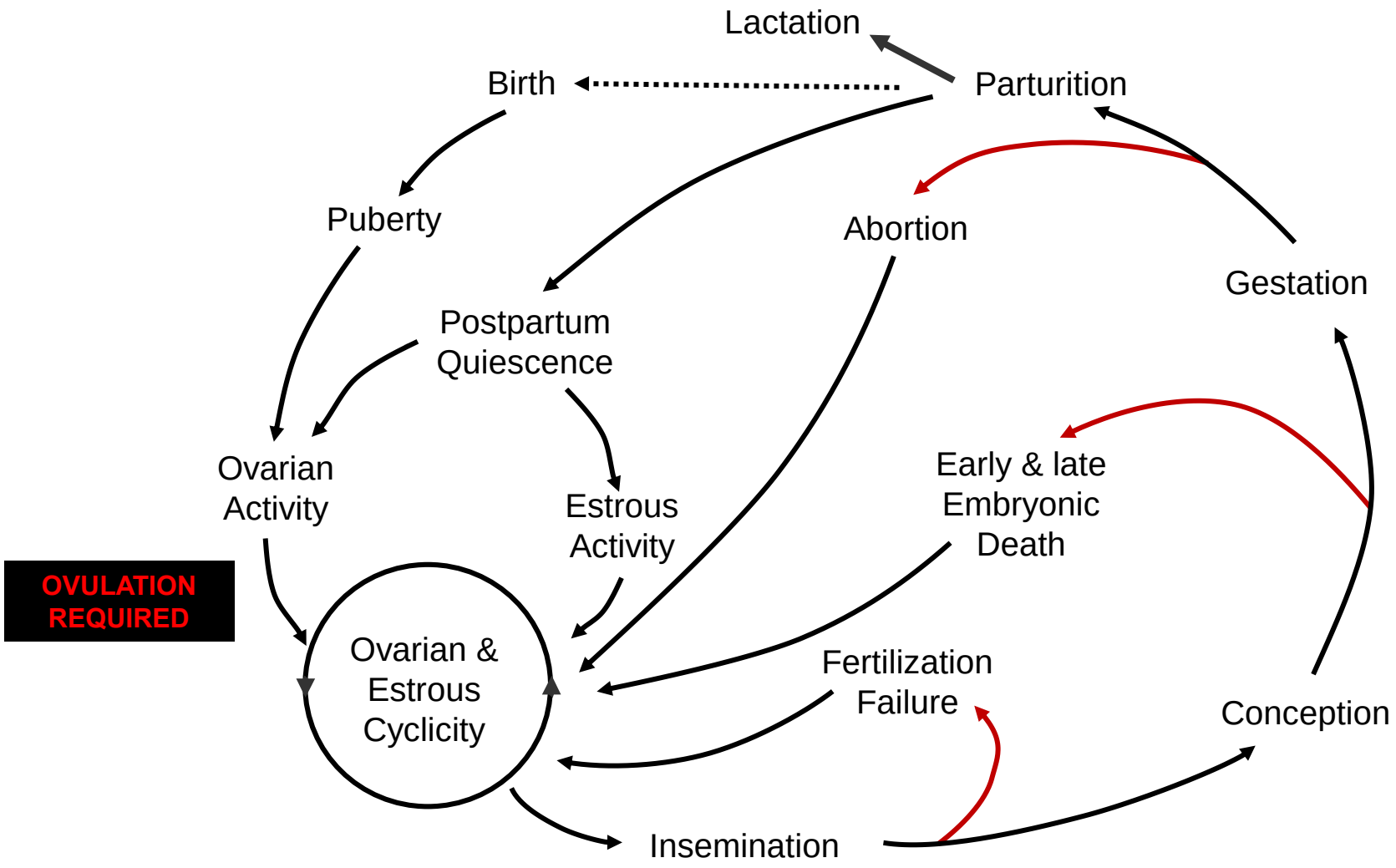




Schematic of Bovine Reproductive Cycle (Female)



Schematic of Bovine Reproductive Cycle (Female)



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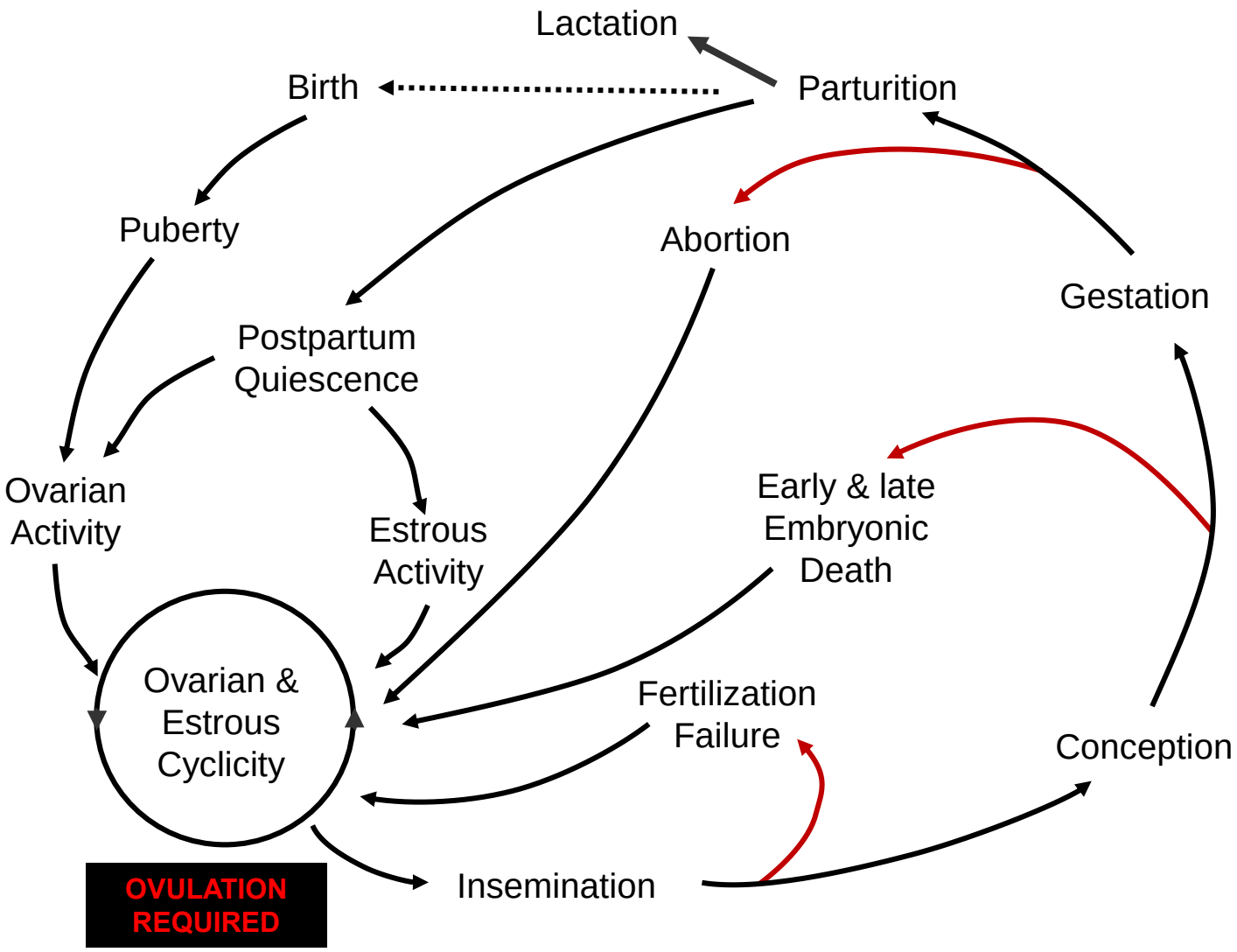
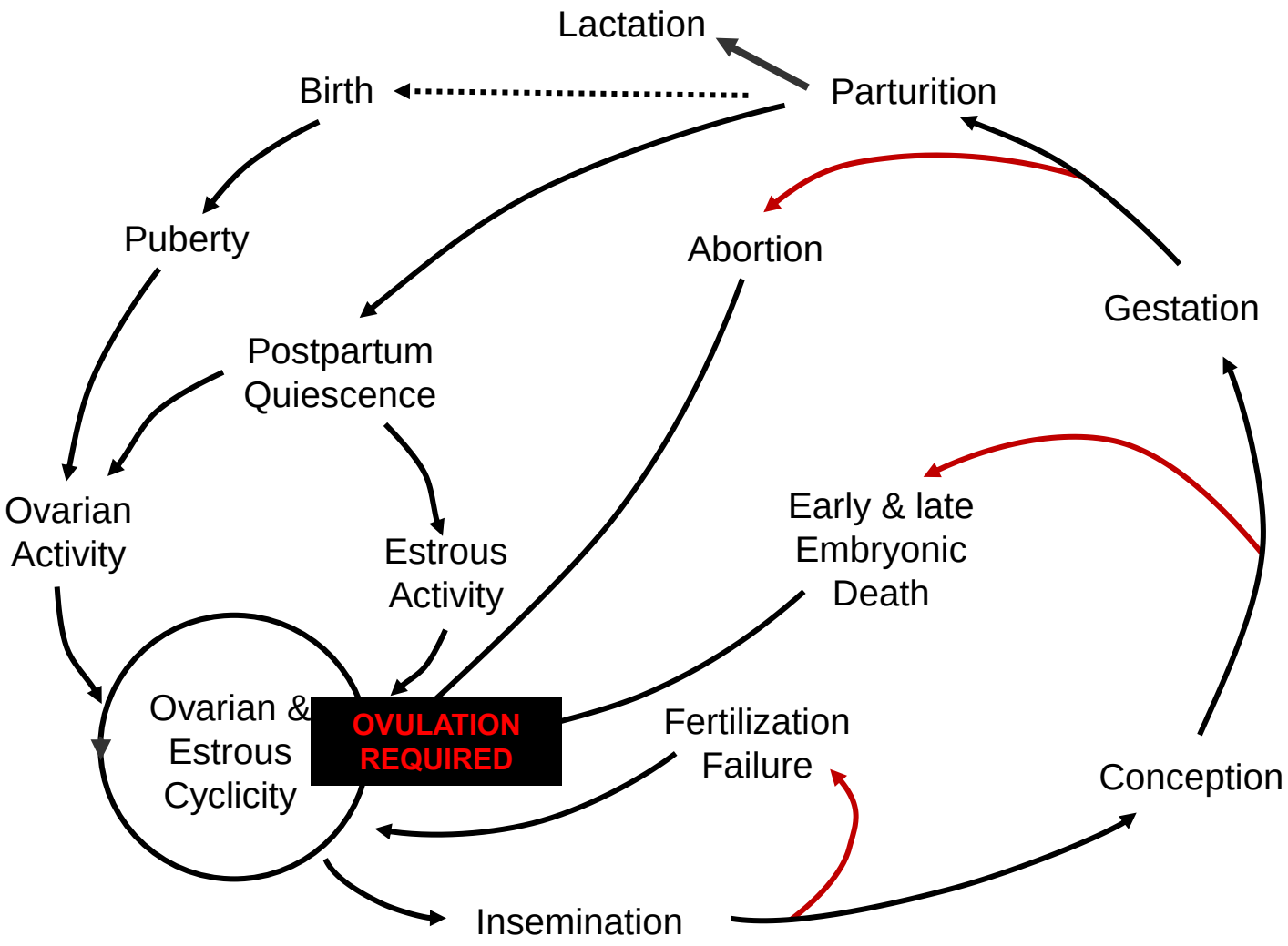


Schematic of Bovine Reproductive Cycle (Female)



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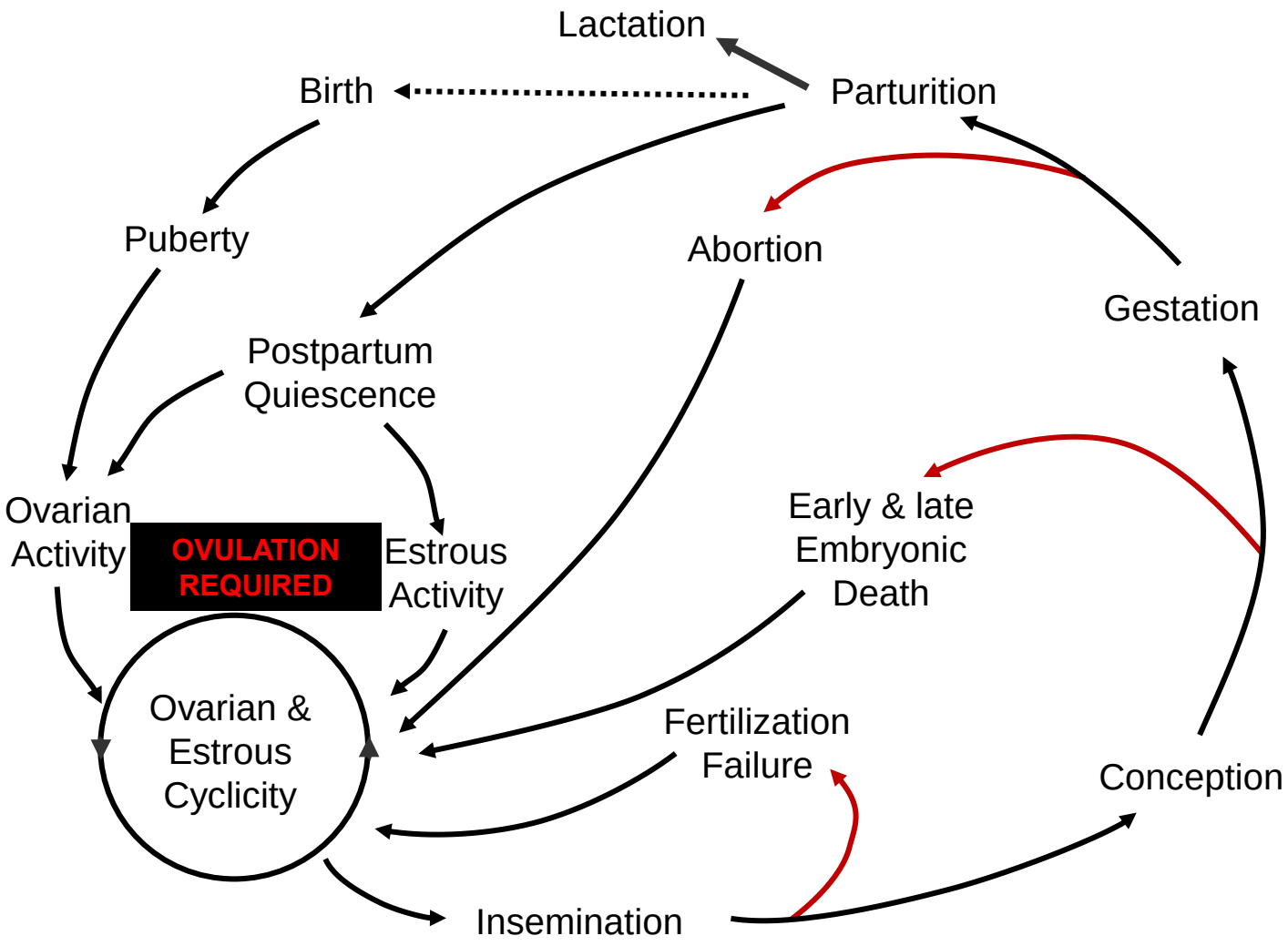

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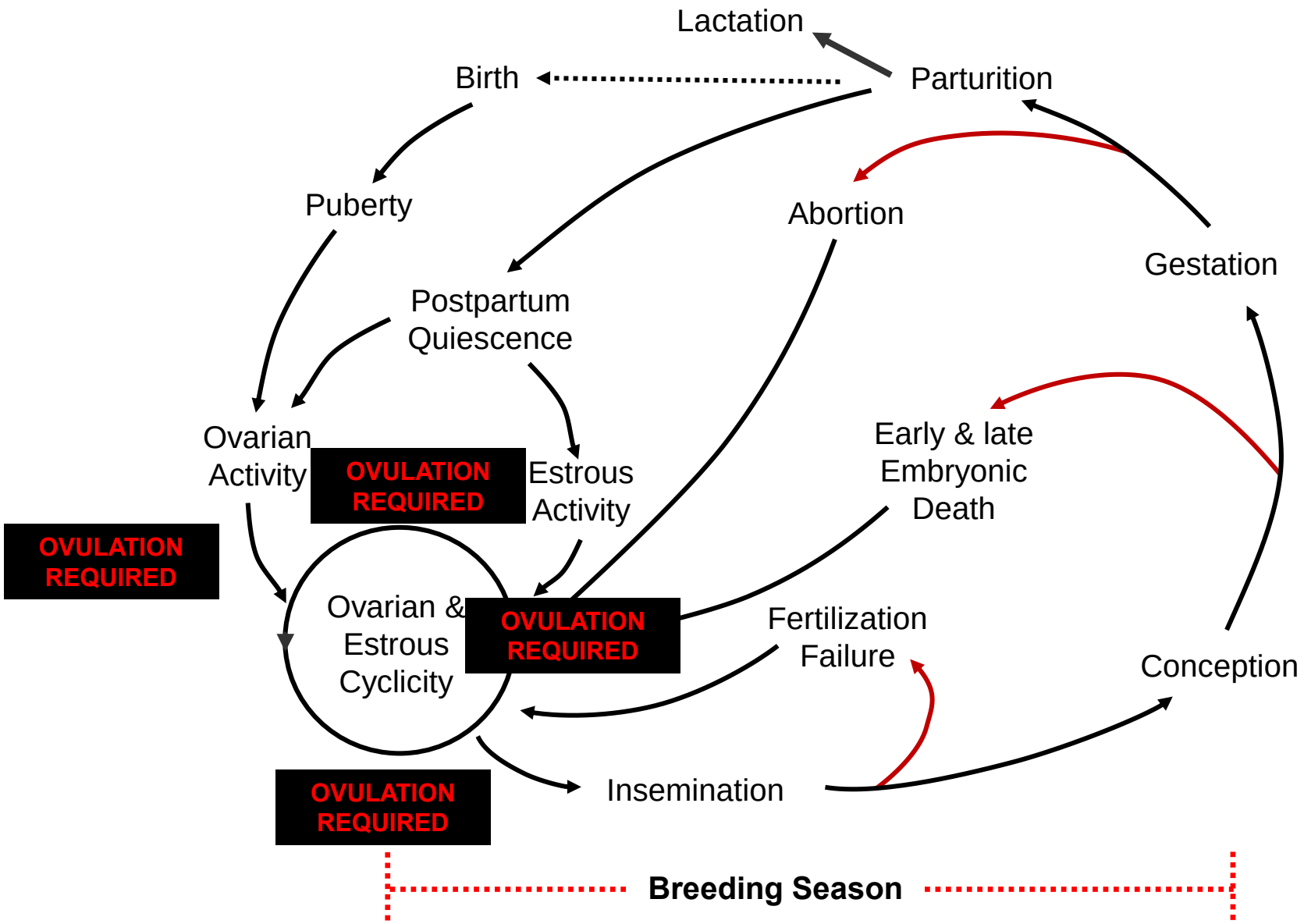
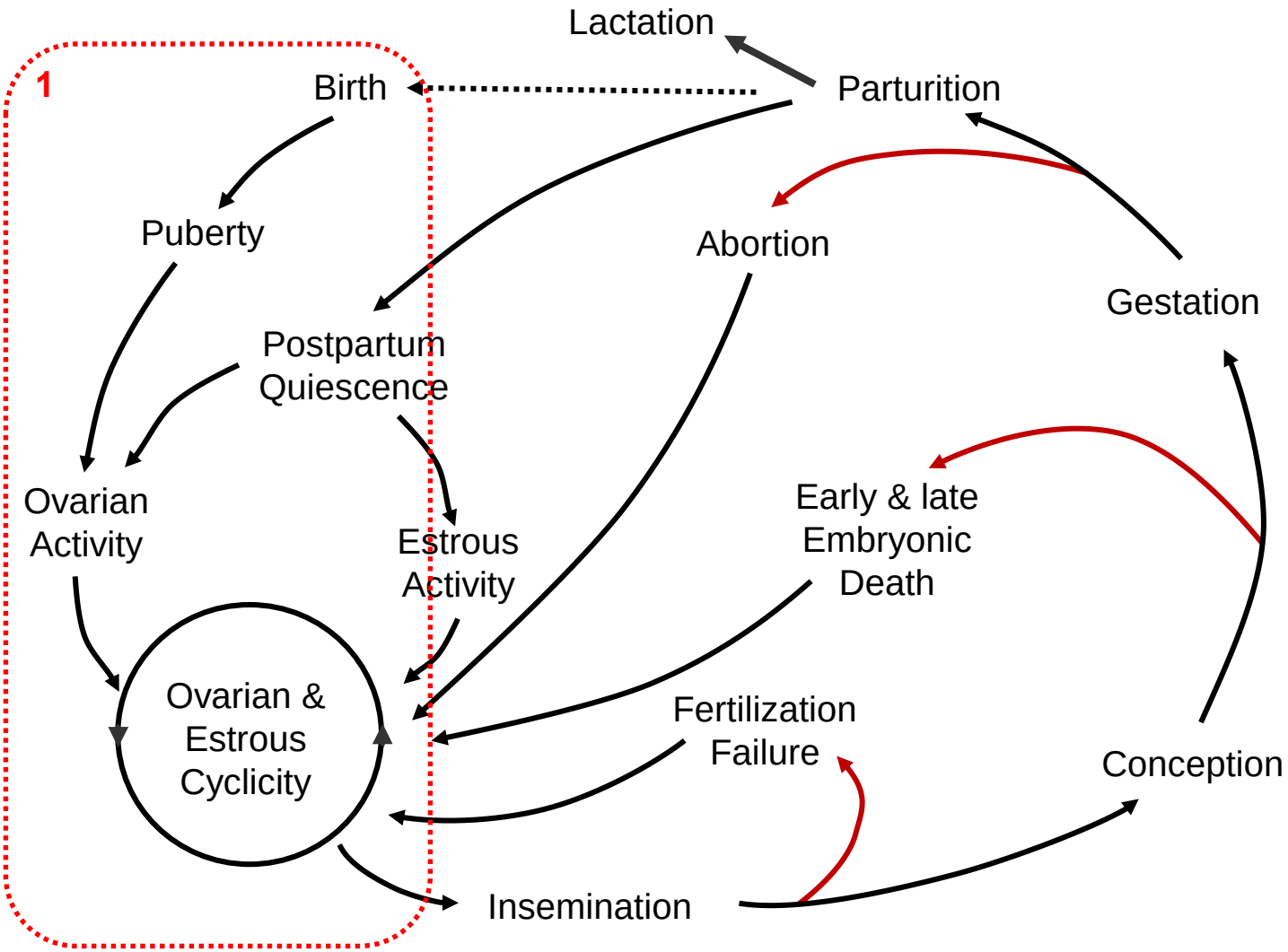


Take home points:

1. **Estrus – ovulation – embryo – fetus – calf – meat.**

1. The challenge: the yearling heifer has +/- one year from birth to first conception.

The evaluation: ultrasonography, reproductive tract score (RTS).



Reproductive Tract Score

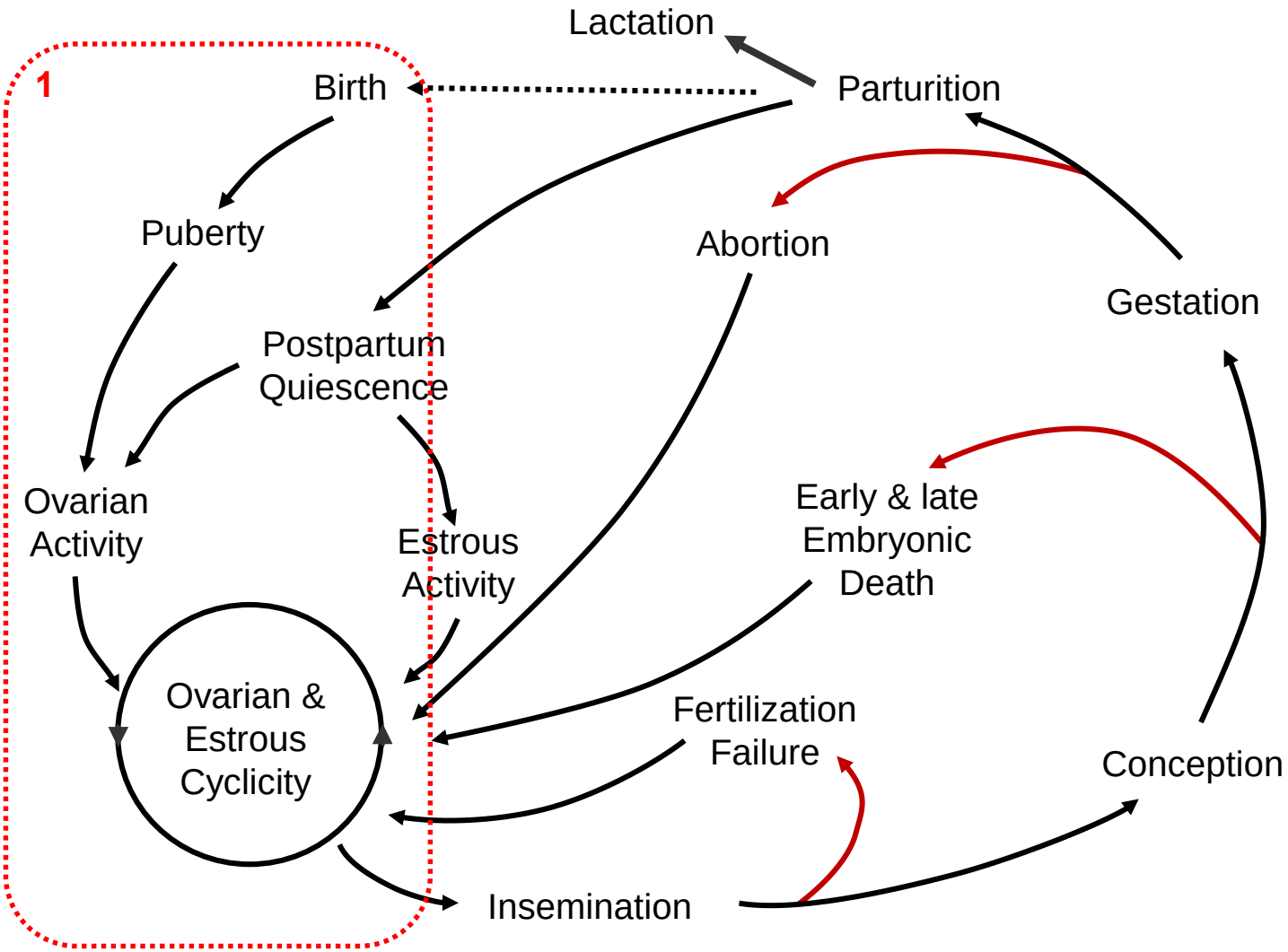
Table 1. Reproductive tract score (RTS) system (Anderson et al., 1991)

		Ovary			
RTS	Uterine horn	Length, mm	Height, mm	Width, mm	Ovarian structures
1	Immature <20-mm diameter, no tone	15	10	8	No palpable structures
2	20- to 25-mm diameter, no tone	18	12	10	8-mm follicles
3	25- to 30-mm diameter, slight tone	22	15	10	8- to 10-mm follicles
4	30-mm diameter, good tone	30	16	12	>10-mm follicles, corpus luteum possible
5	>30-mm diameter, good tone, erect	>32	20	15	>10-mm follicles, corpus luteum present

1. The challenge: the yearling heifer has +/- one year from birth to first conception.

The evaluation: ultrasonography, reproductive tract score (RTS).

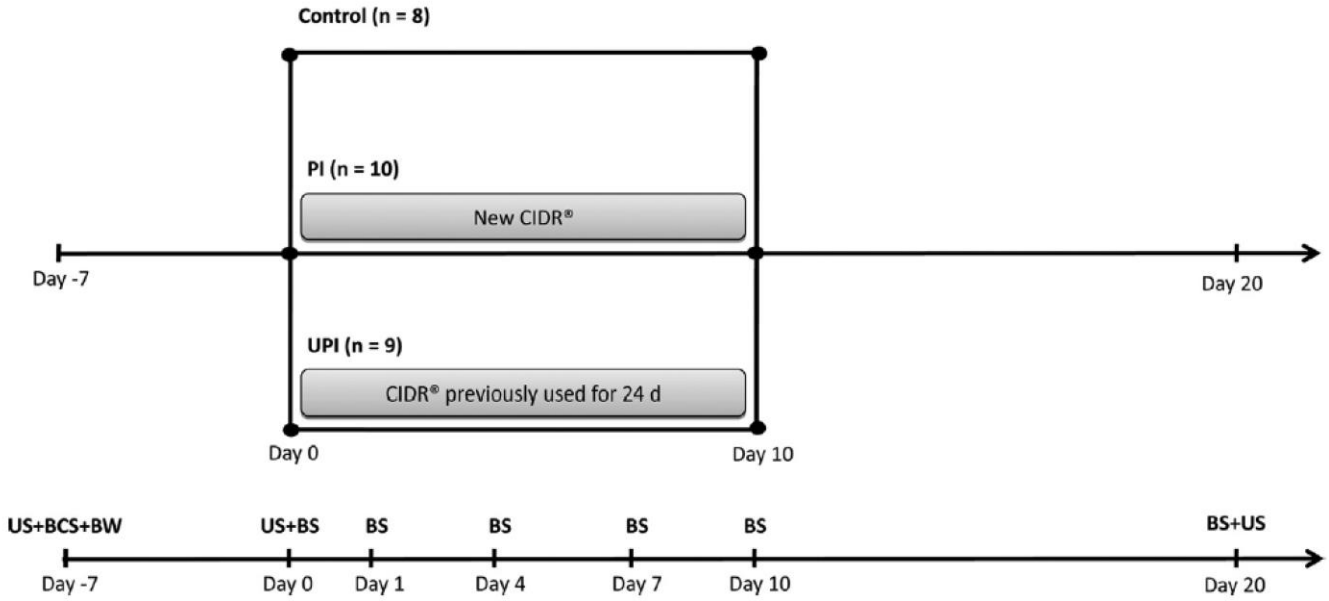
The strategy: induction of cyclicity using progesterone (CIDR, MGA).



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[e], P.S. Baruselli[a,*]

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



CL on D20:

Control: 0/8 (0%)

PI: 3/10 (30%)

UPI: 5/9 (55%)

Scenario 1: San Marino Ranch, Okeechobee, FL (2018-2019)

Yearling Brangus heifers, n=65

RTS: 3.4 + Estrotect + PGF2α

Bulls in (1:10)

Bulls out (1:25)

CIDR®

Heat

7d

5d

14d

90 d

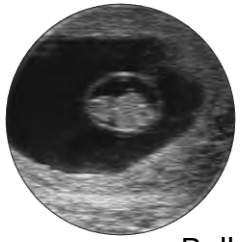
15 d

34d

Induction

105 d

Scenario 1: San Marino Ranch, Okeechobee, FL (2018-2019)



PGF2α

CIDR®

Heat

Bulls in (1:10)

Bulls out (1:25)

7d

5d

14d

90 d

15 d

34d

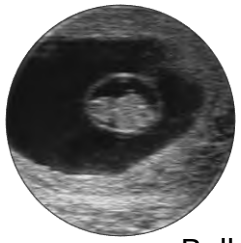
Induction

105 d

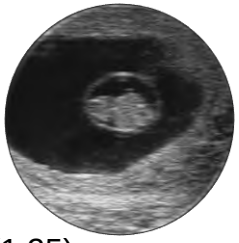
Heat: 88.9% (56/63)

Scenario 1: San Marino Ranch, Okeechobee, FL (2018-2019)

Preg at 60d of BS
78.5% (51/65)



Preg at 105d of BS
92.3% (60/65)



PGF2α

Bulls in (1:10)

Bulls out (1:25)

CIDR®

Heat

7d

5d

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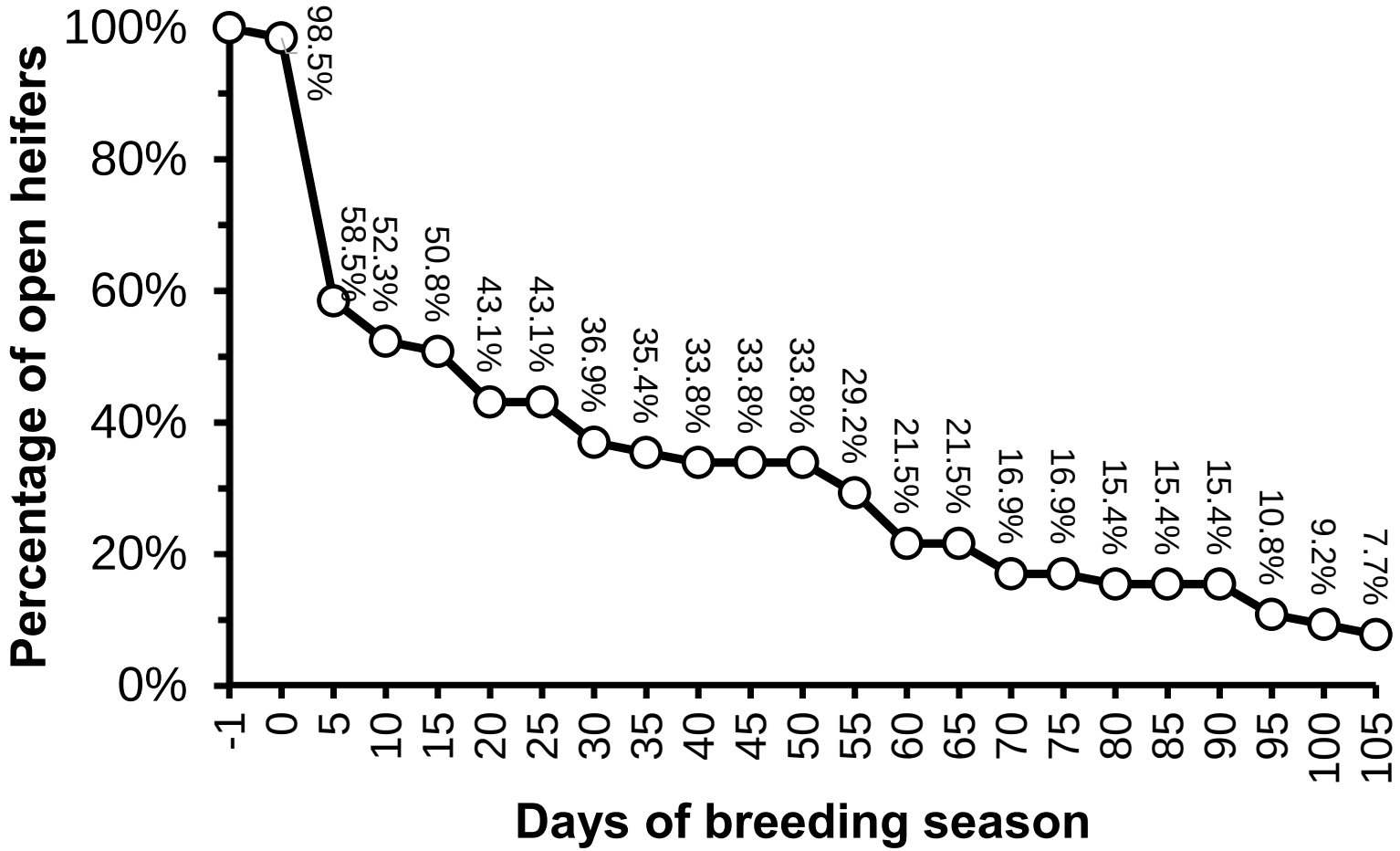
Induction

105 d

Heat: 88.9% (56/63)

Scenario 1: San Marino Ranch, Okeechobee, FL (2018-2019)



UF Puberty induction protocol (under testing)

Estrotect + PGF2α

GnRH

RTS + PGF2α

CIDR®

CIDR®

TAI

Preg. Check

RTS — 7 - 10d — RTS — 10d — 4d — 6d — 3.5d

Evaluation

Induction

Synchron

AI at heat + TAI + bulls

Table 1. Reproductive tract score (RTS) system (Anderson et al., 1991)

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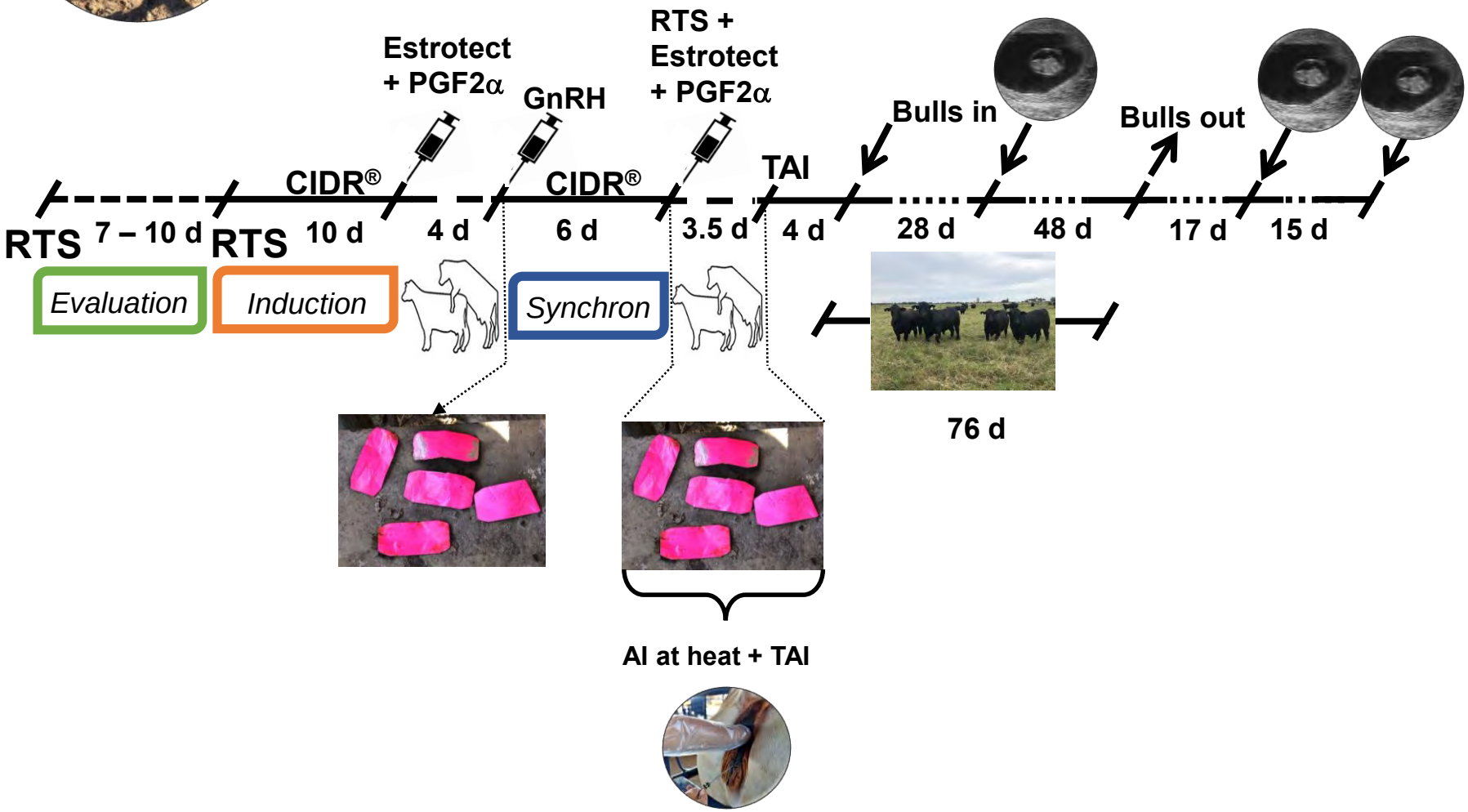
Scenario 2: Pelaez and Sons Ranch, Okeechobee, FL (2018-2019)

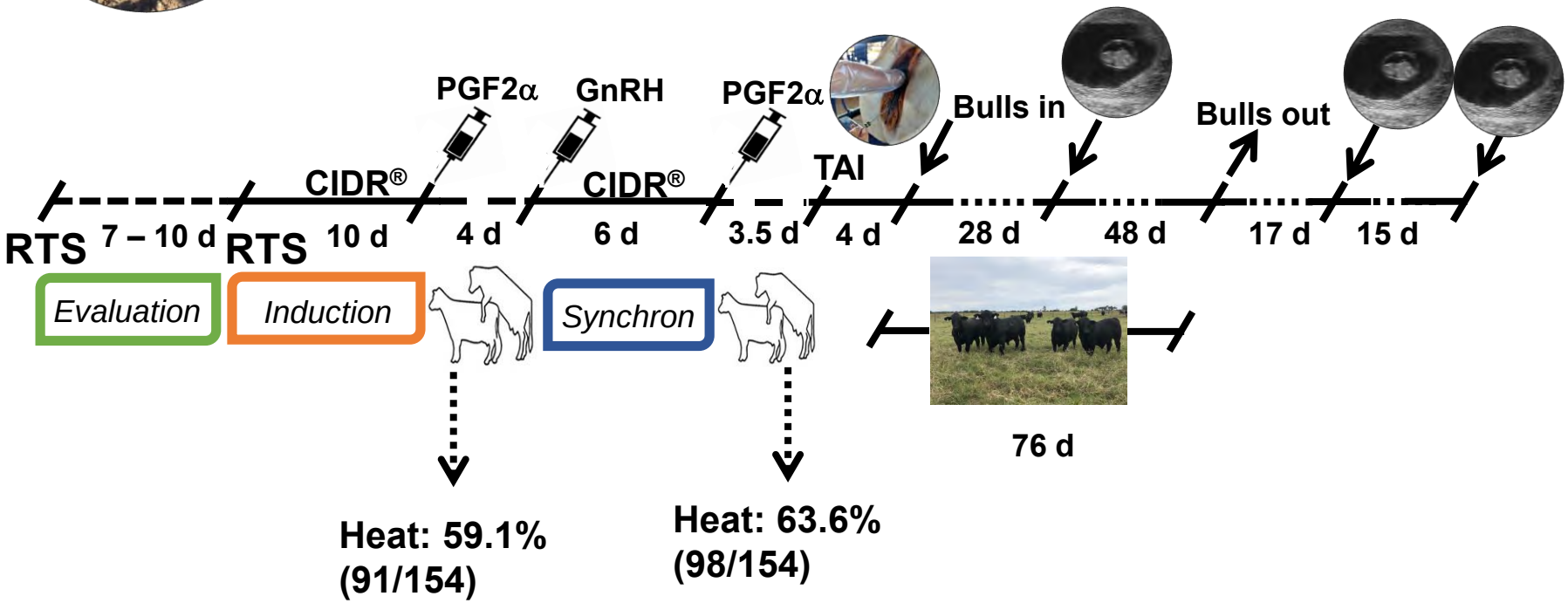
Yearling Brangus heifers, n=152



Variable	Pubertal		Prepubertal	
	Non-CIDR	CIDR	Non-CIDR	CIDR
Mean of RTS1	3.54	3.68	2.27	2.18
	3.61		2.23	
Mean of RTS2	3.61	3.58	2.91	2.27
	3.60		2.59	
Mean of RTS3	3.73	3.64	3.60	3.70
	3.69		3.68	
Increase from RTS1 to RTS3	2%		65%	

Scenario 2: Pelaez and Sons Ranch, Okeechobee, FL (2018-2019)

Yearling Brangus heifers, n=152



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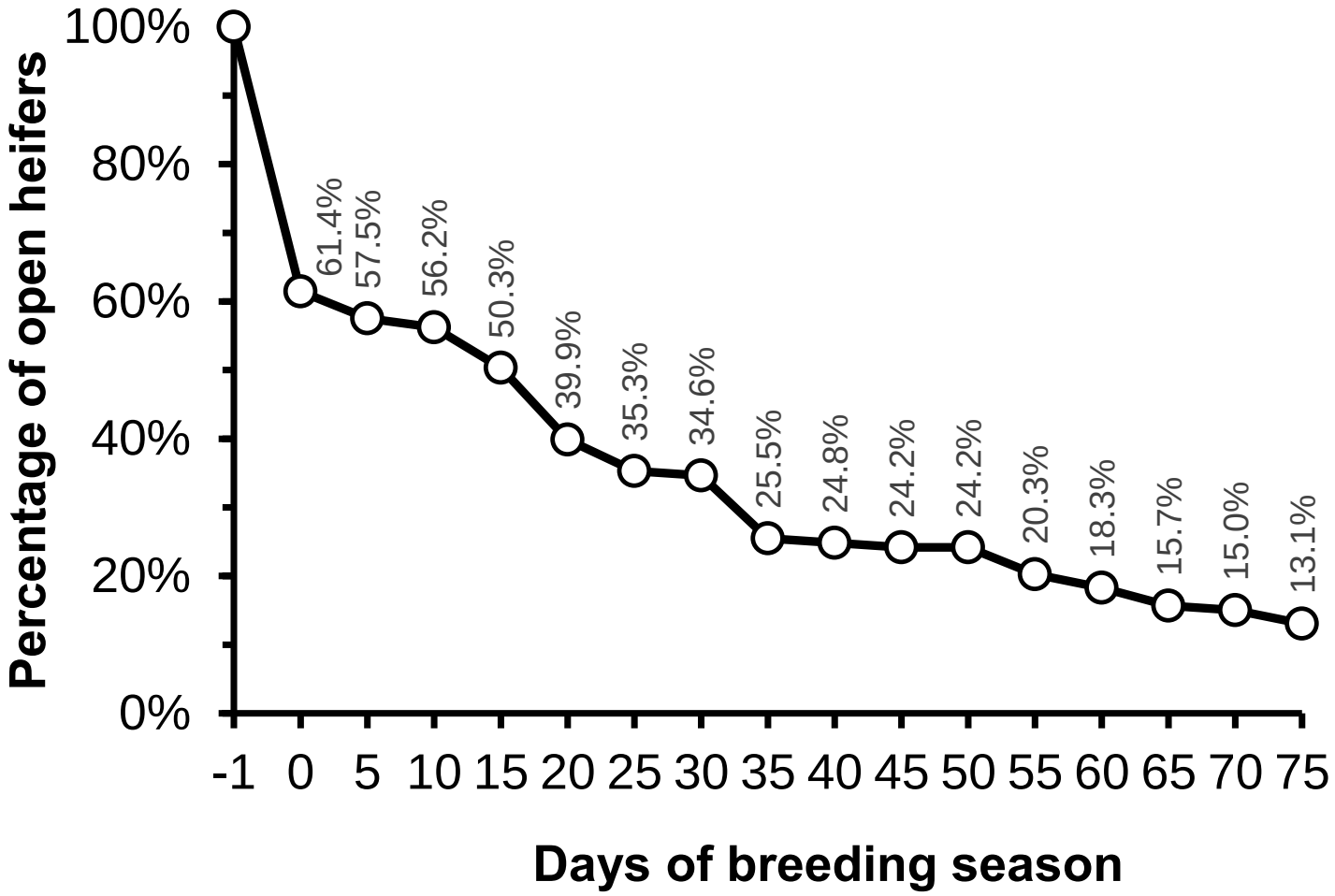

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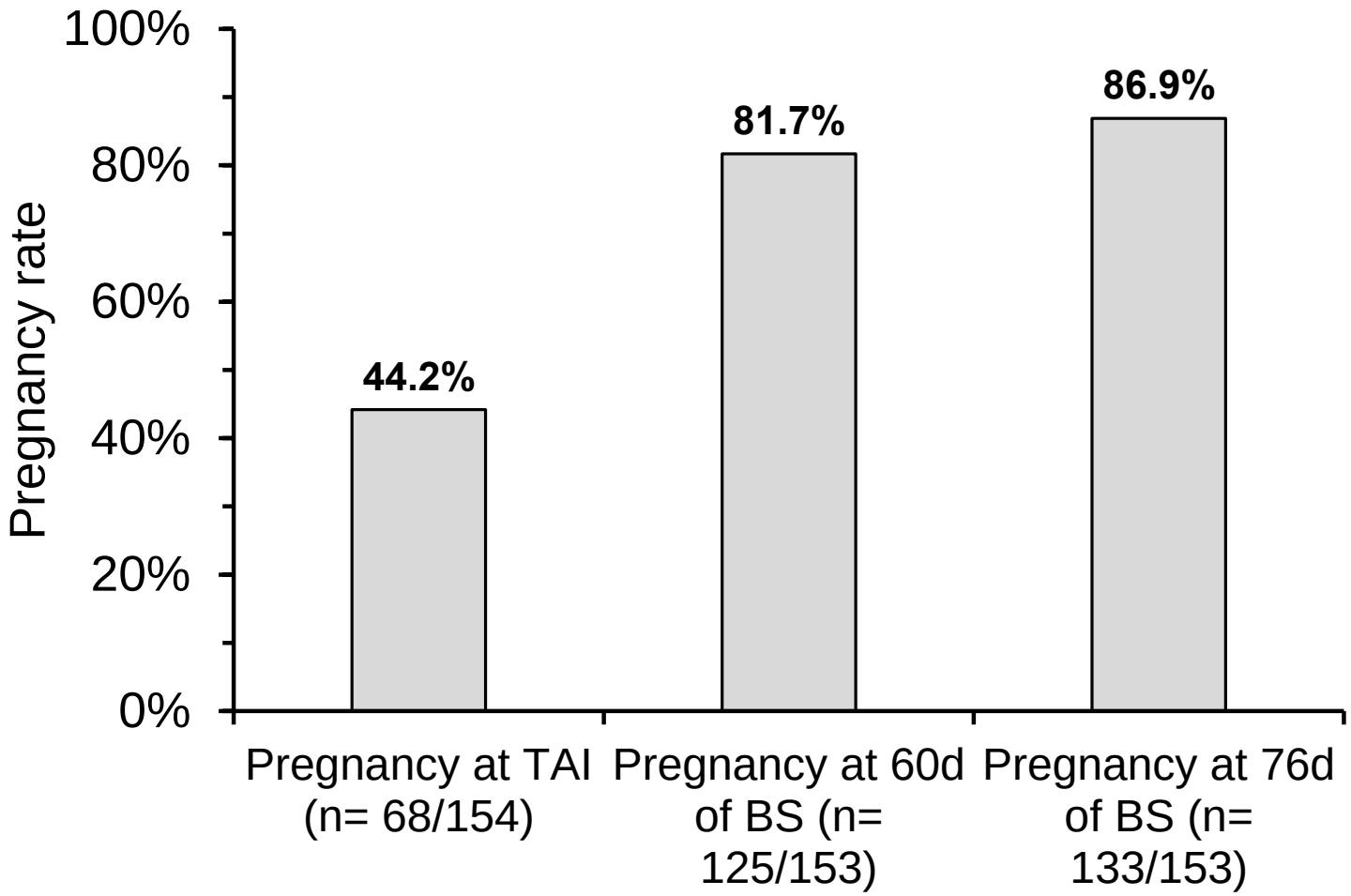


Take home points:

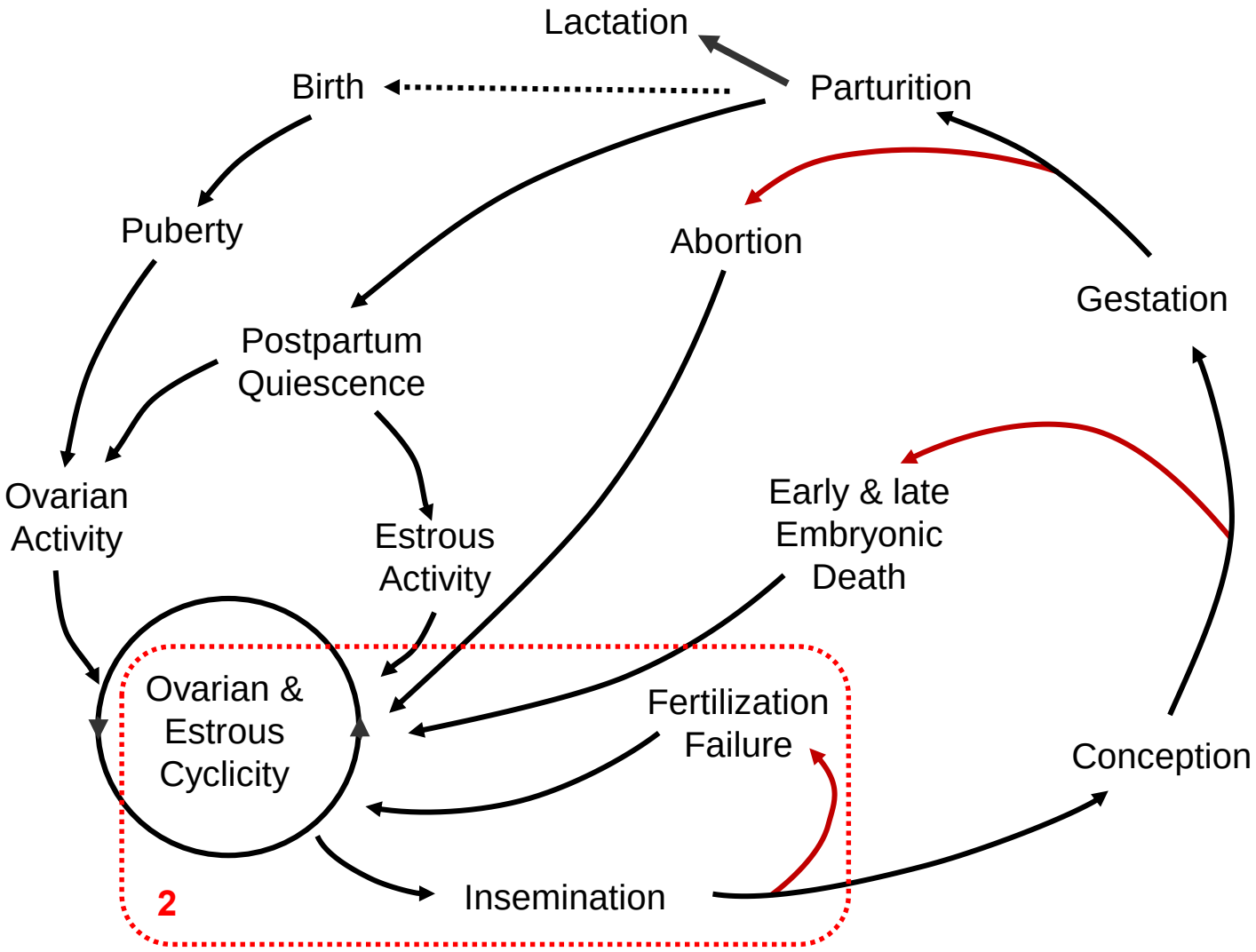
1. **Estrus – ovulation – embryo – fetus – calf – meat.**

2. **Reproductive management of heifers should aim to maximize pregnancies early in the breeding season.**

2. The challenge: poor control of timing of ovulation.

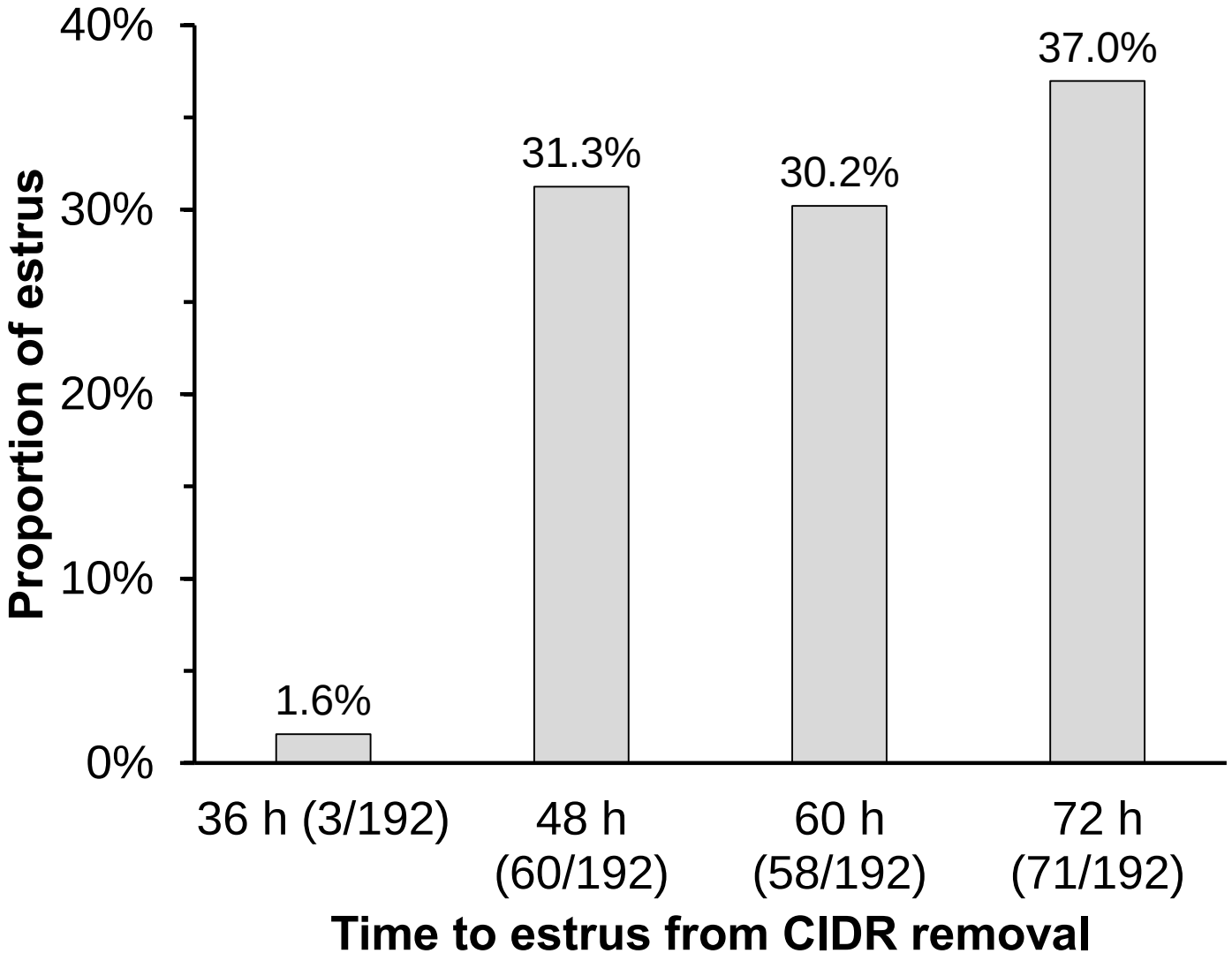
The evaluation: heat detection.

The strategy: a synchronization protocol + AI based on heat



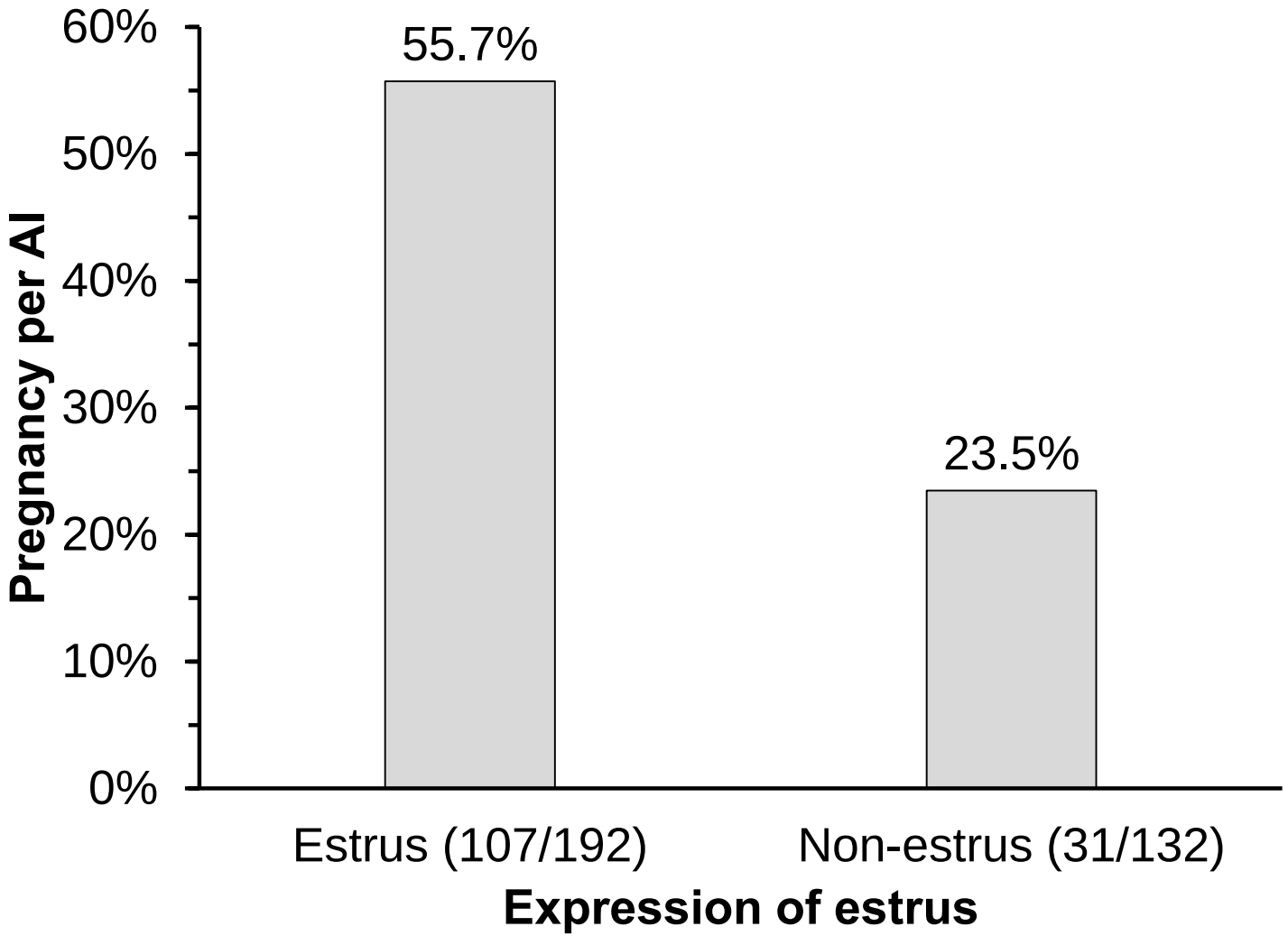
Estrus distribution in heifers (Pelaez & Sons, Marianna and BRU)

- Proportion of estrus by TAI (59.3% [192/324])

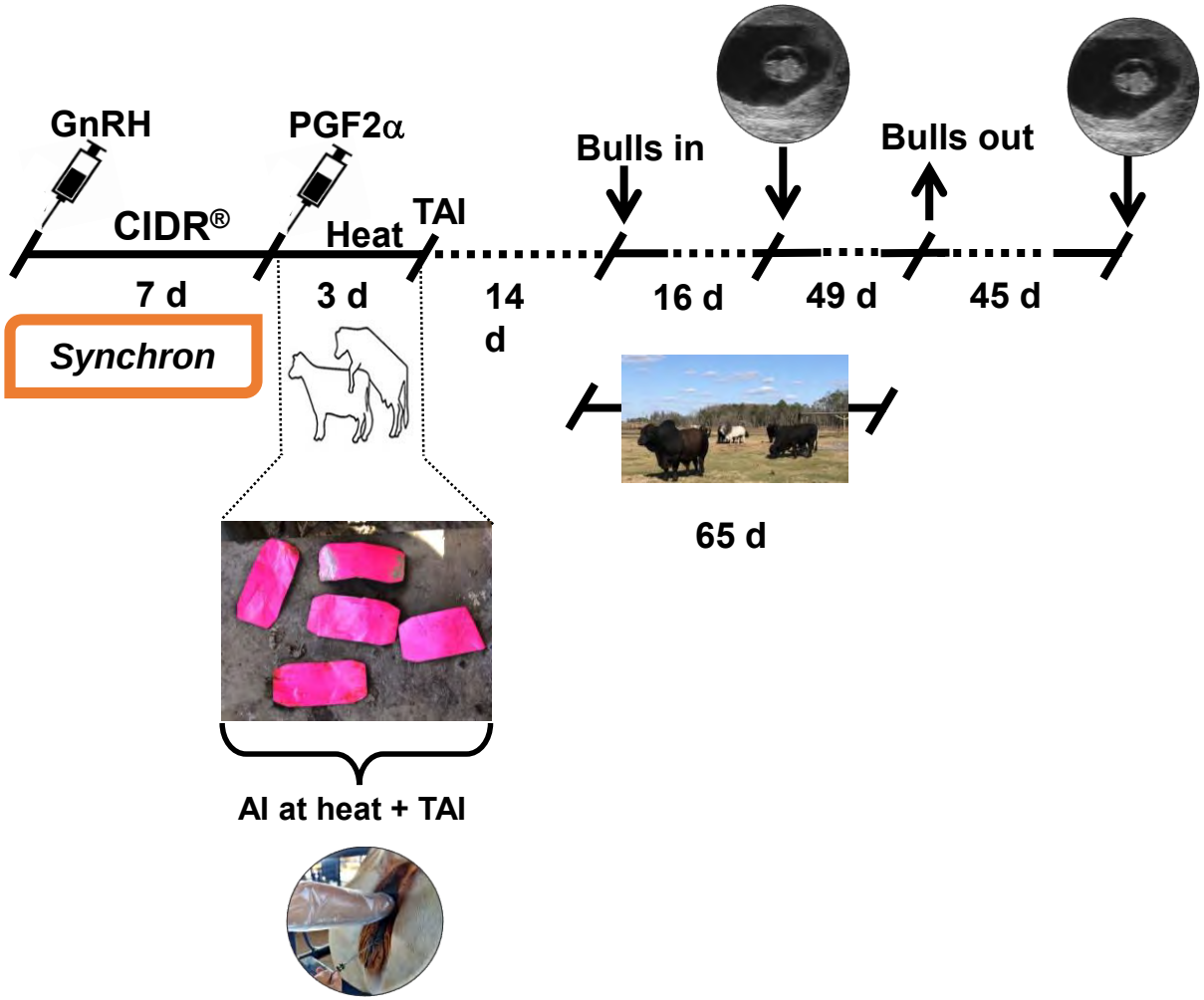


Pregnancy rates to AI in heifers (heat vs. non-heat)

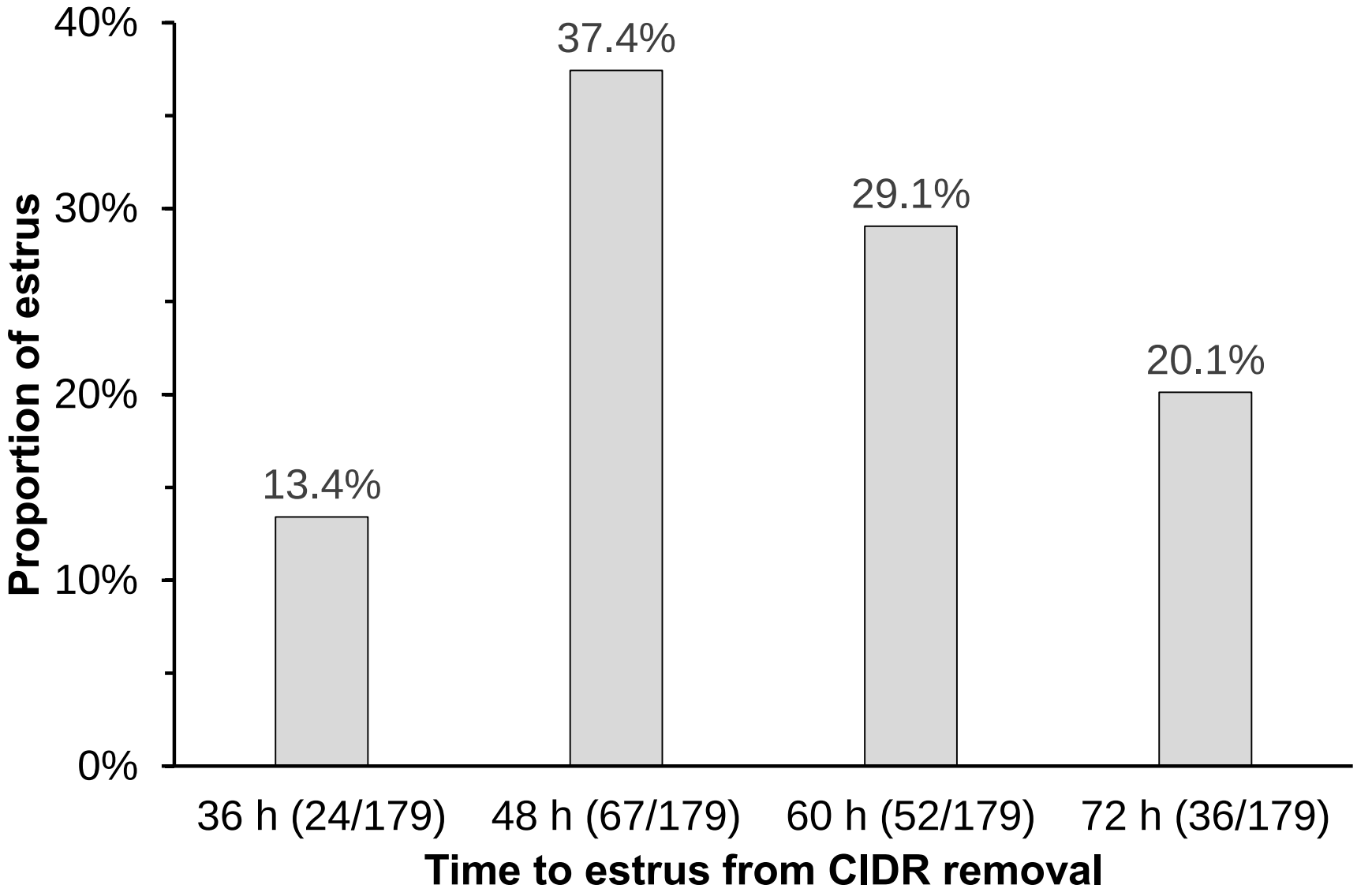
- Pelaez & Sons, Marianna and BRU



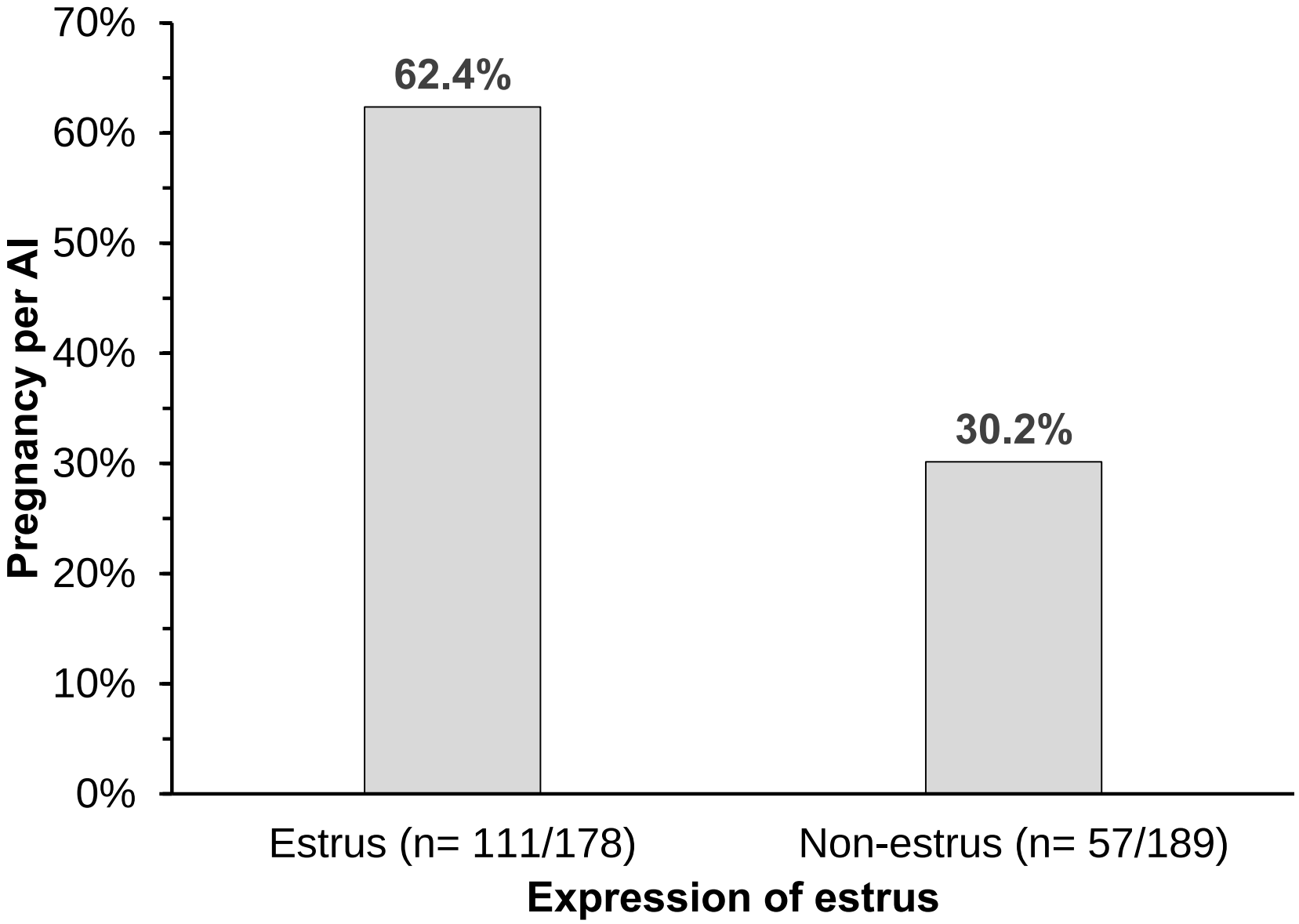
Scenario 3: UF – Beef Research Unit, Gainesville, FL (2018-2019)



Estrus distribution in cows from BRU



Pregnancy rates to AI in cows from BRU (heat vs. non-heat)



Take home points:

1. **Estrus – ovulation – embryo – fetus – calf – meat.**

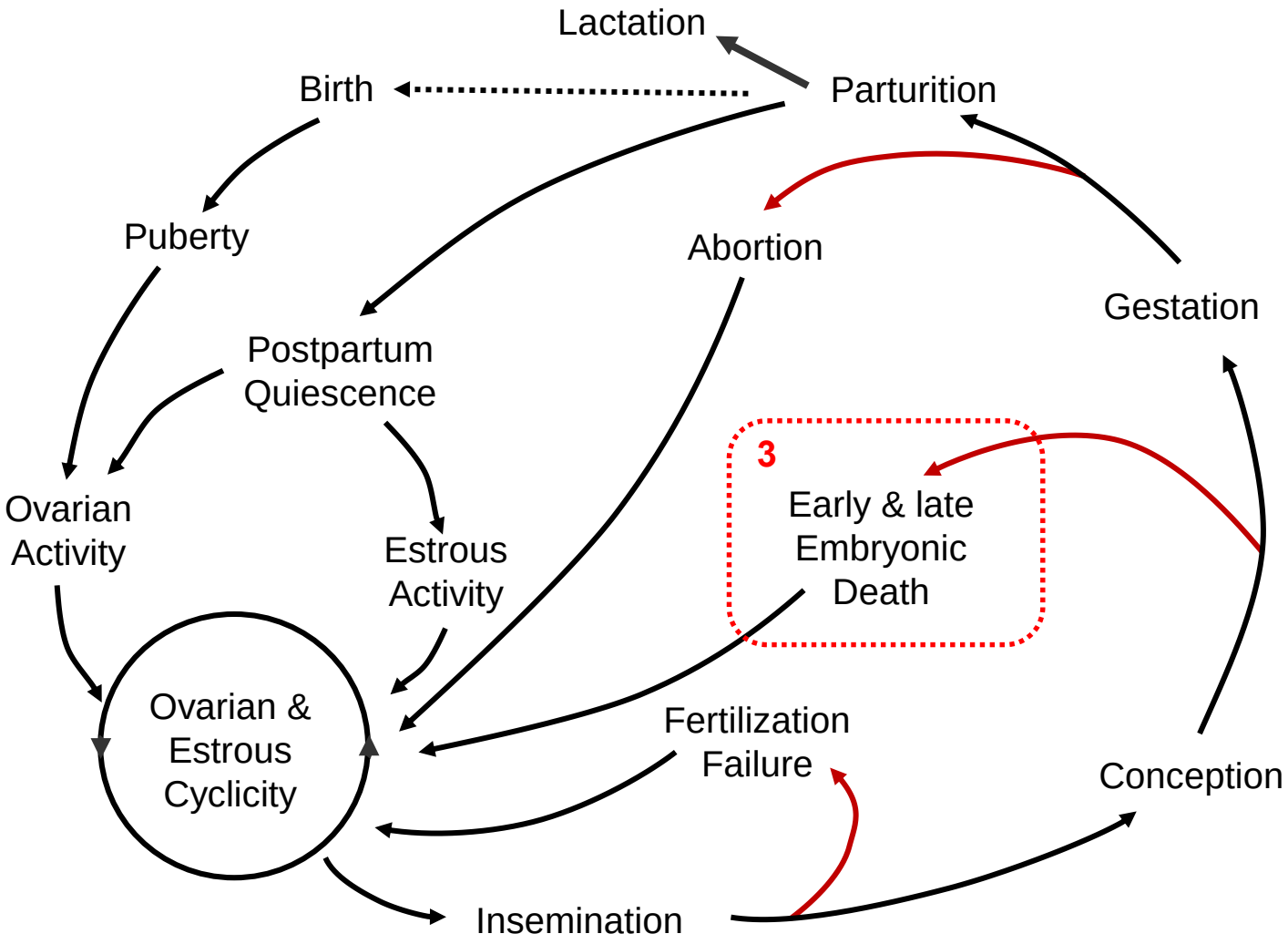
2. **Reproductive management of heifers should aim to maximize pregnancies early in the breeding season.**

3. **Use of a protocol + AI at estrus maximizes chances of pregnancy.**

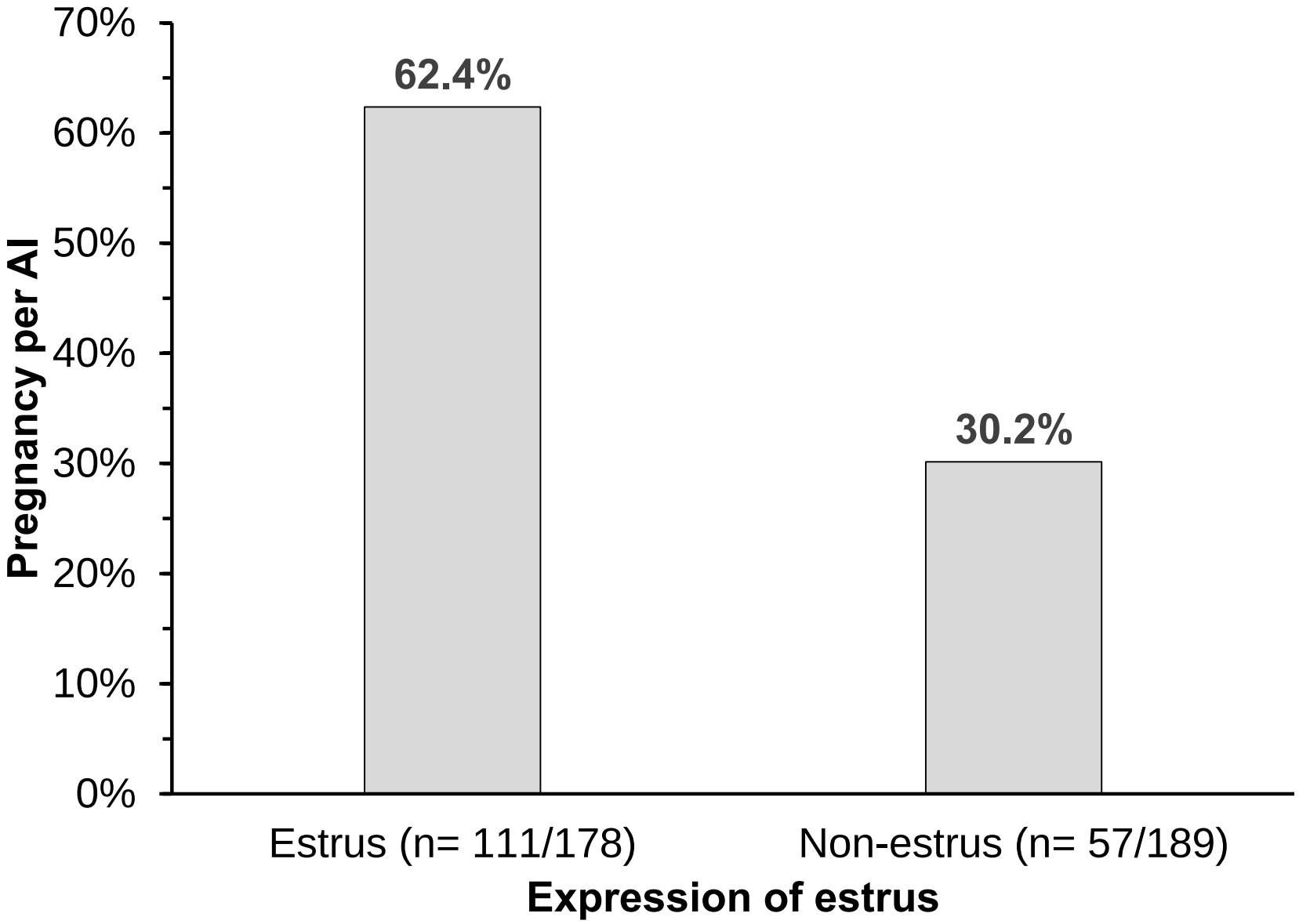
3. The challenge: 40-50% embryonic mortality during the first 30 days after AI.

The evaluation: preg check 30 days after AI and 30 days after end of the breeding season.

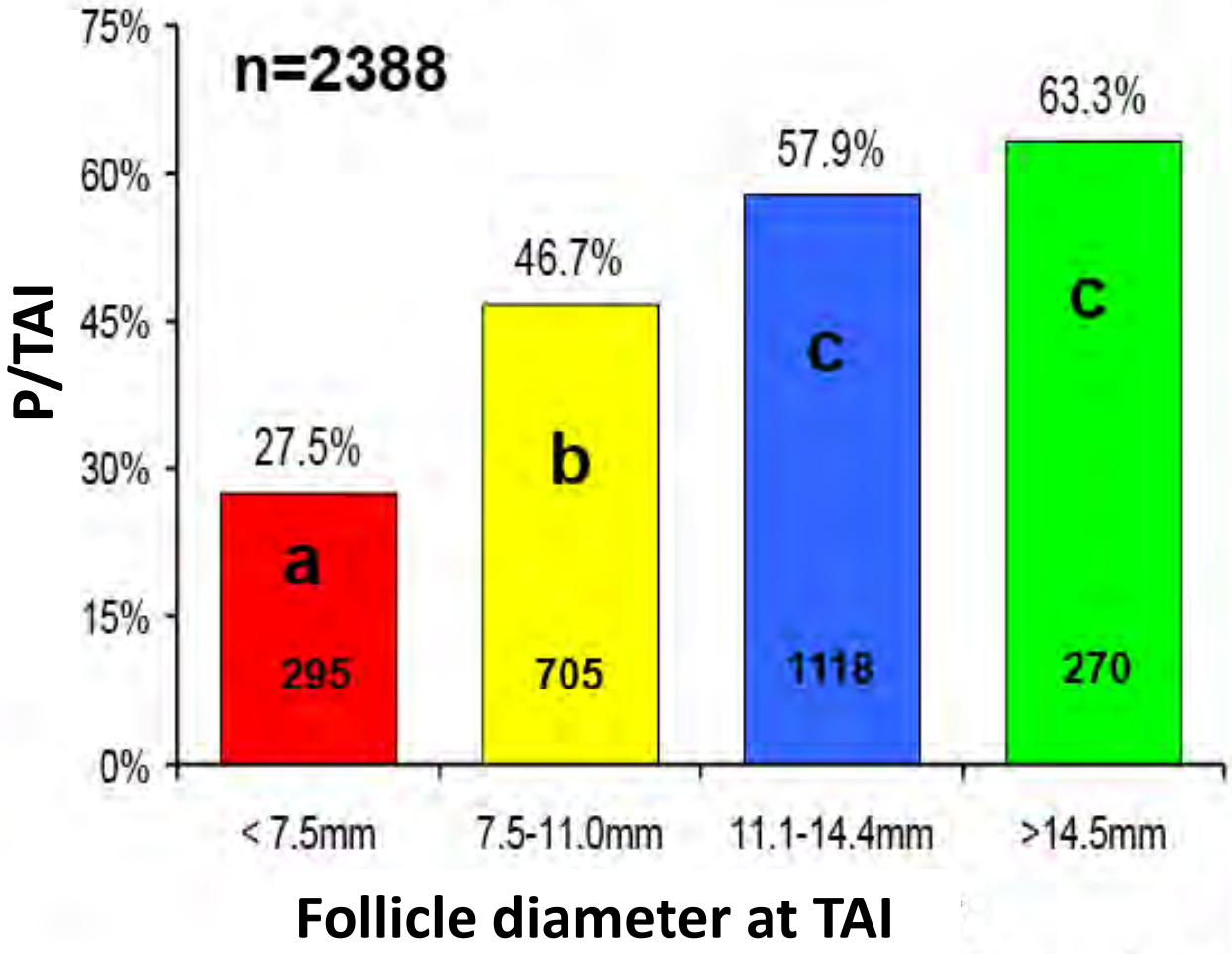
The strategy: a synchronization protocol + AI based on heat



Pregnancy rates to AI in cows from BRU (heat vs. non-heat)



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)

Take home points:

1. **Estrus – ovulation – embryo – fetus – calf – meat.**

2. **Reproductive management of heifers should aim to maximize pregnancies early in the breeding season.**

3. **Use of a protocol + AI at estrus maximizes chances of pregnancy (because of a synchronous ovulation).**

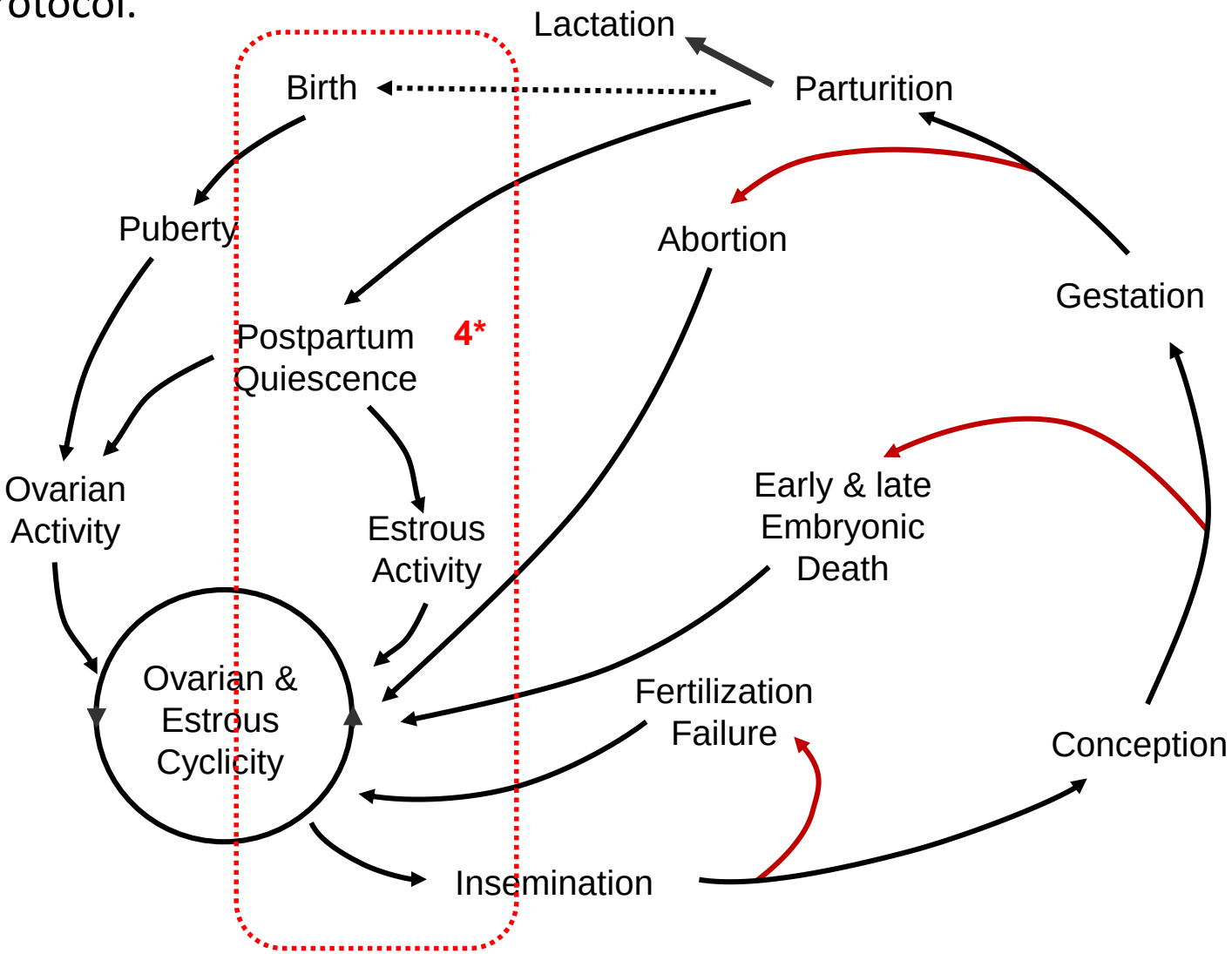
4. **Use of a protocol + AI at estrus maximizes chances of pregnancy (because of lower embryonic loss).**

4. The challenge: the post-partum cow has 75 days to get pregnant again.

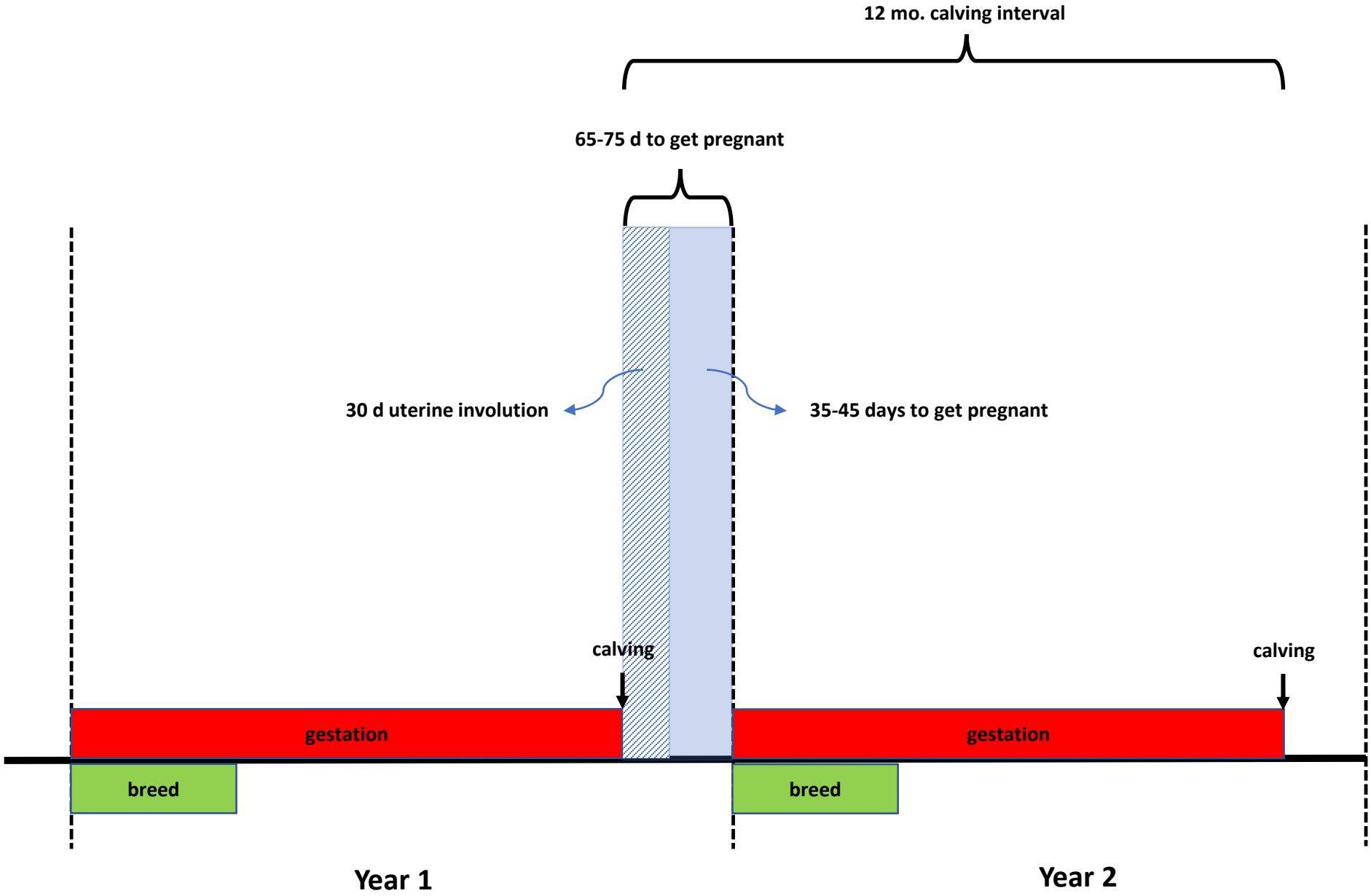
(This challenge is accentuated for primiparous heifers)

The evaluation: ultrasonography.

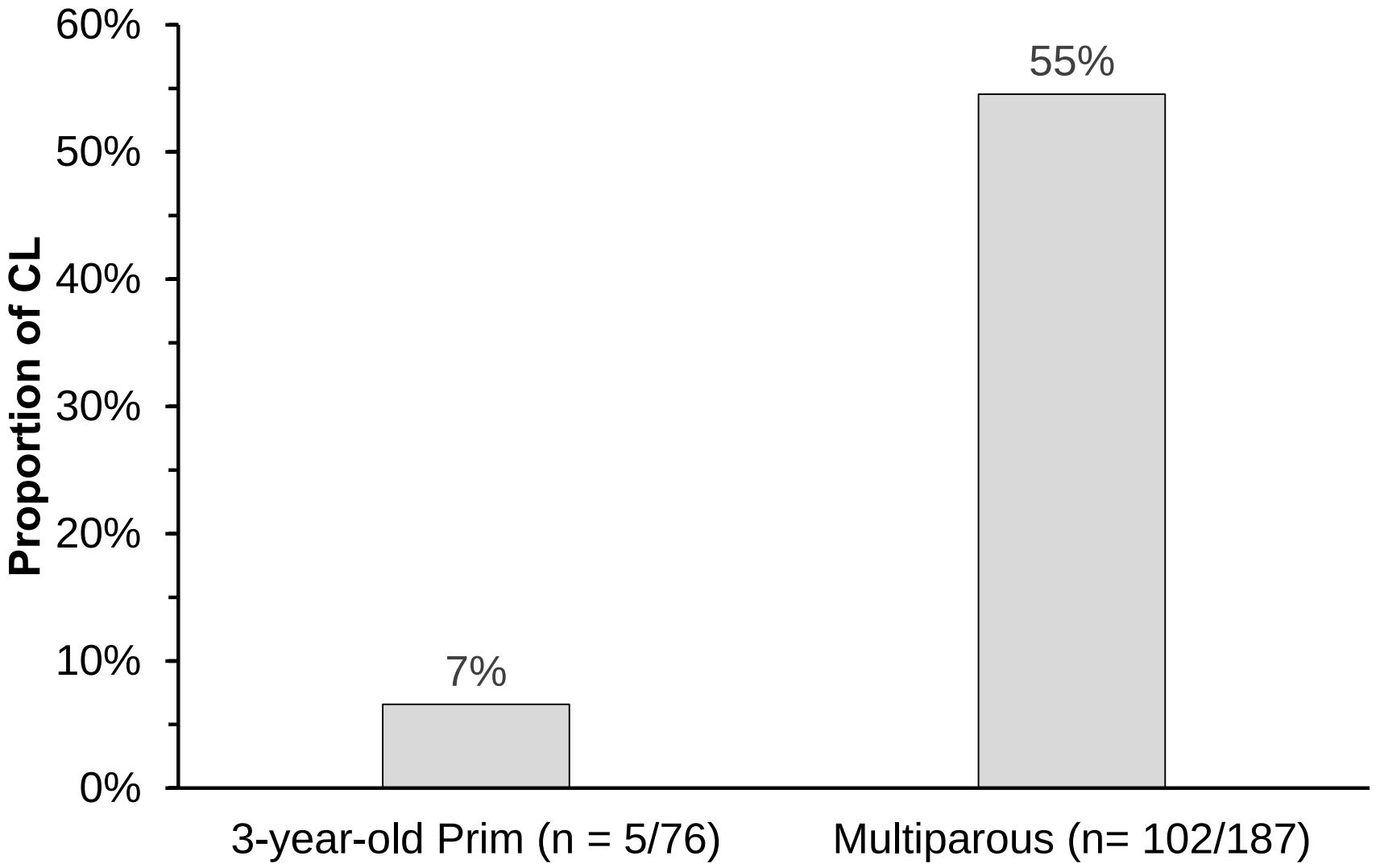
The strategy: induction of cyclicity using progesterone (CIDR, MGA), associated with a protocol.



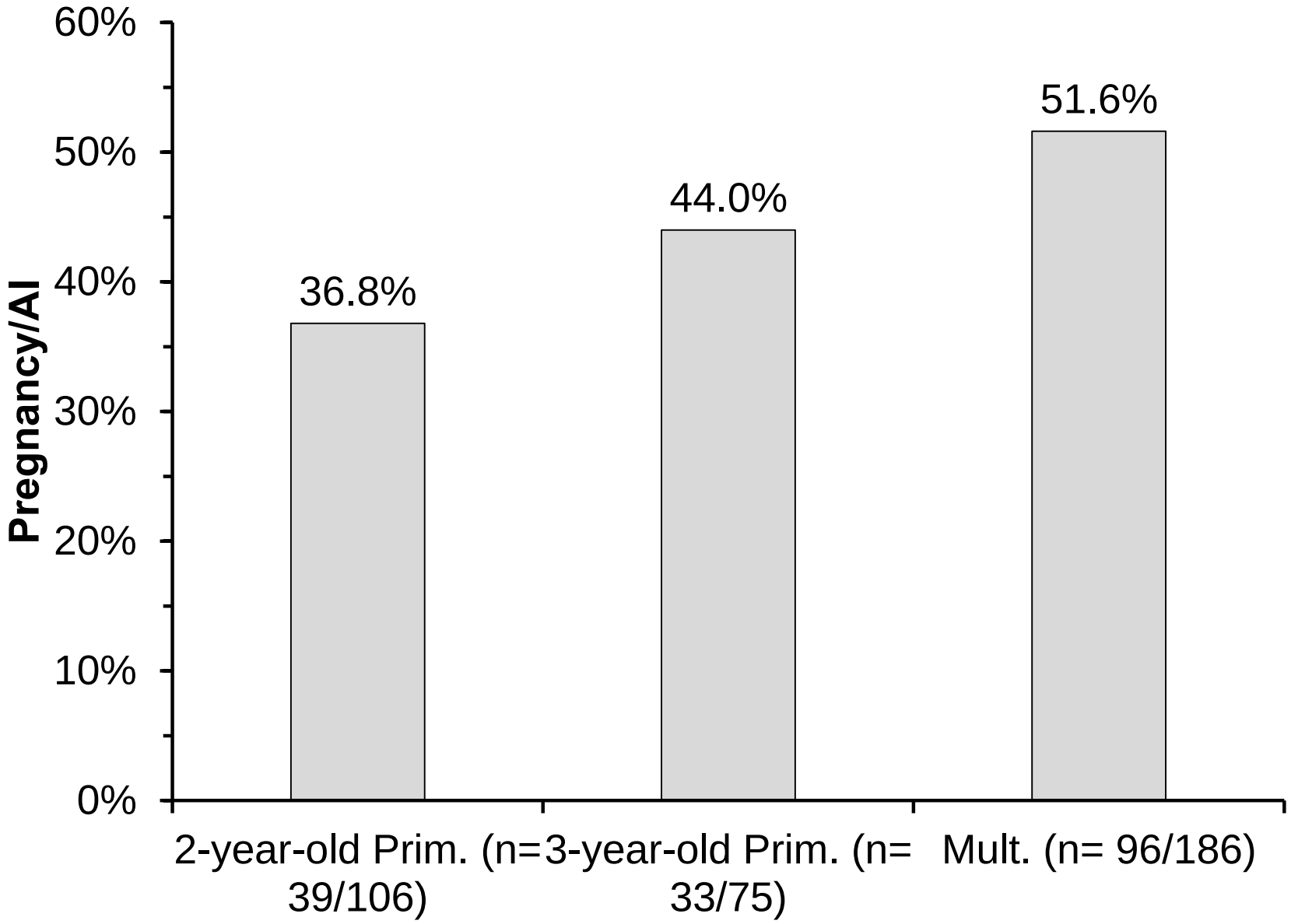
There is a 30-45 days window to get a cow pregnant in a 90-day breeding season, to keep a 12 mo. calving interval

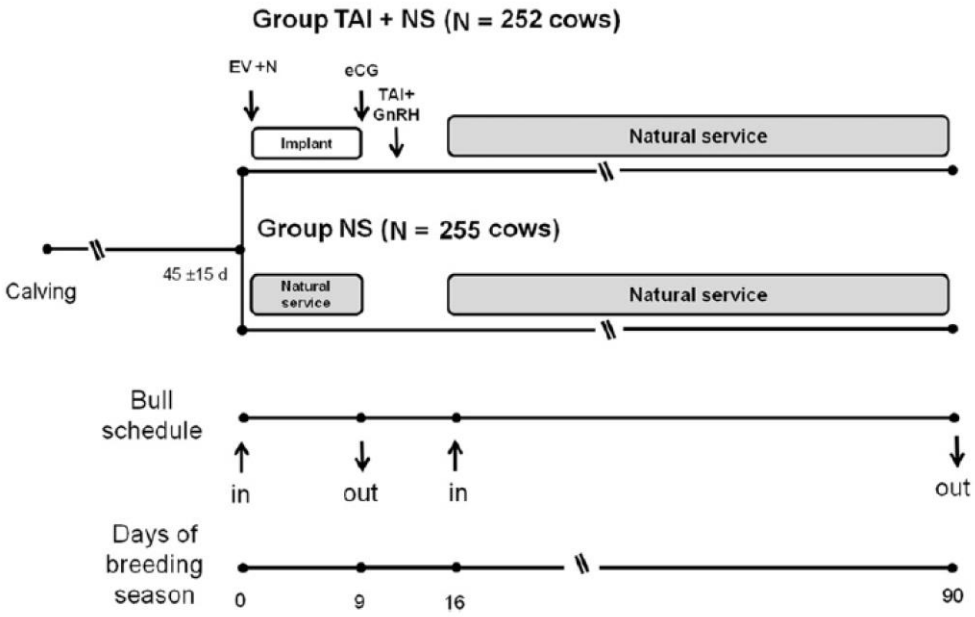


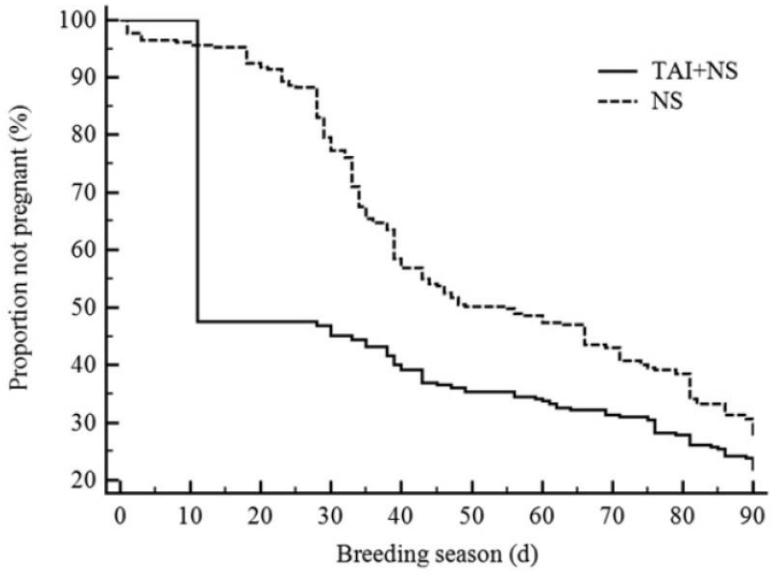
Proportion of cows with a corpus luteum at the beginning of the synchronization protocol (>45 days post-partum; BRU)



Pregnancy rates to AI in cows from BRU (according to category)

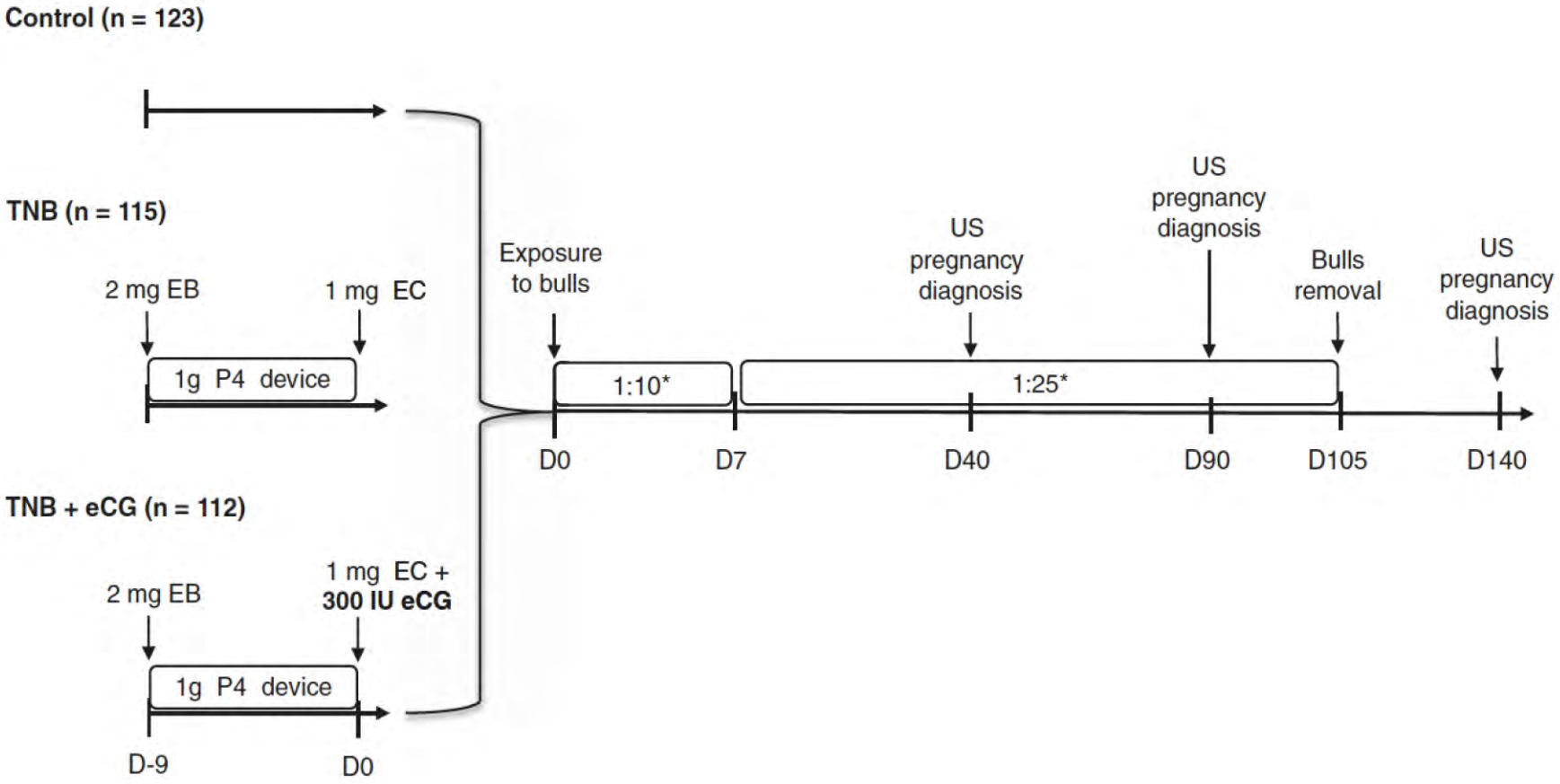



Group TAI + NS (N = 252 cows)
EV +N
eCG
TAI+
GnRH
Implant
Natural service
Group NS (N = 255 cows)
Calving
45 ±15 d
Natural service
Natural service
Bull schedule
in
out
in
out
Days of breeding season
0
9
16
90


Proportion not pregnant (%)
100
90
80
70
60
50
40
30
20
0
10
20
30
40
50
60
70
80
90
Breeding season (d)
TAI+NS
NS

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. **Estrus – ovulation – embryo – fetus – calf – meat.**

2. **Reproductive management of heifers should aim to maximize pregnancies early in the breeding season.**

3. **Use of a protocol + AI at estrus maximizes chances of pregnancy (because of a synchronous ovulation).**

4. **Use of a protocol + AI at estrus maximizes chances of pregnancy (because of lower embryonic loss).**

5. **Use of a protocol (+ AI at estrus) maximizes chances of pregnancy (because of induction of cyclicity).**

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