The Estrous Cycle and Estrus Synchronization

Katie Pfeiffer

UW-Extension

2013 Cow/Calf Meetings

Estrus Synchronization

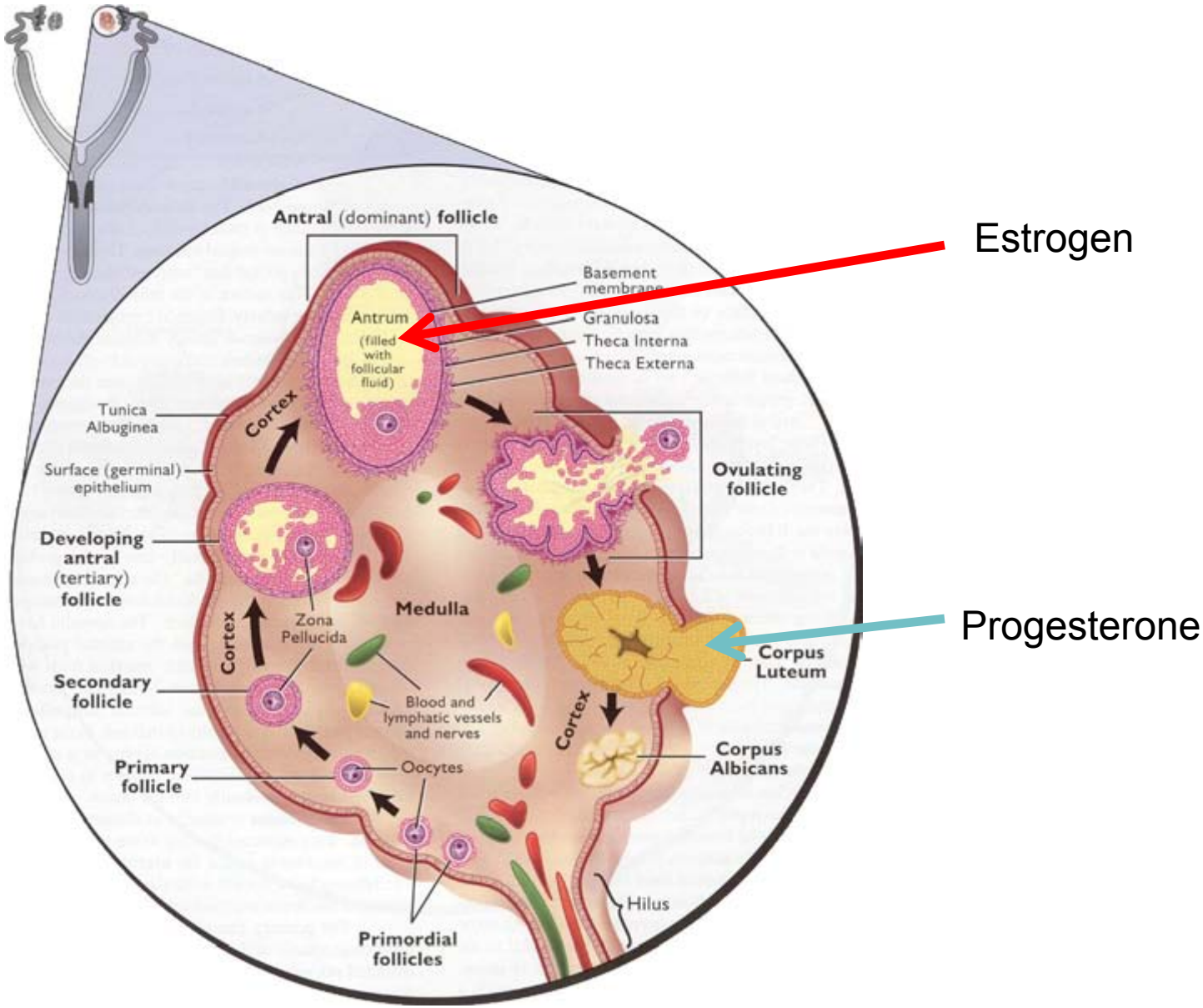
- Controlling the estrous cycle so that a group of females express estrus at approximately the same time.
  - Most often used as part of an AI/ET program to reduce labor.
  - Can also be used to advance breeding date of late calving cows and manipulate marketing scenarios.

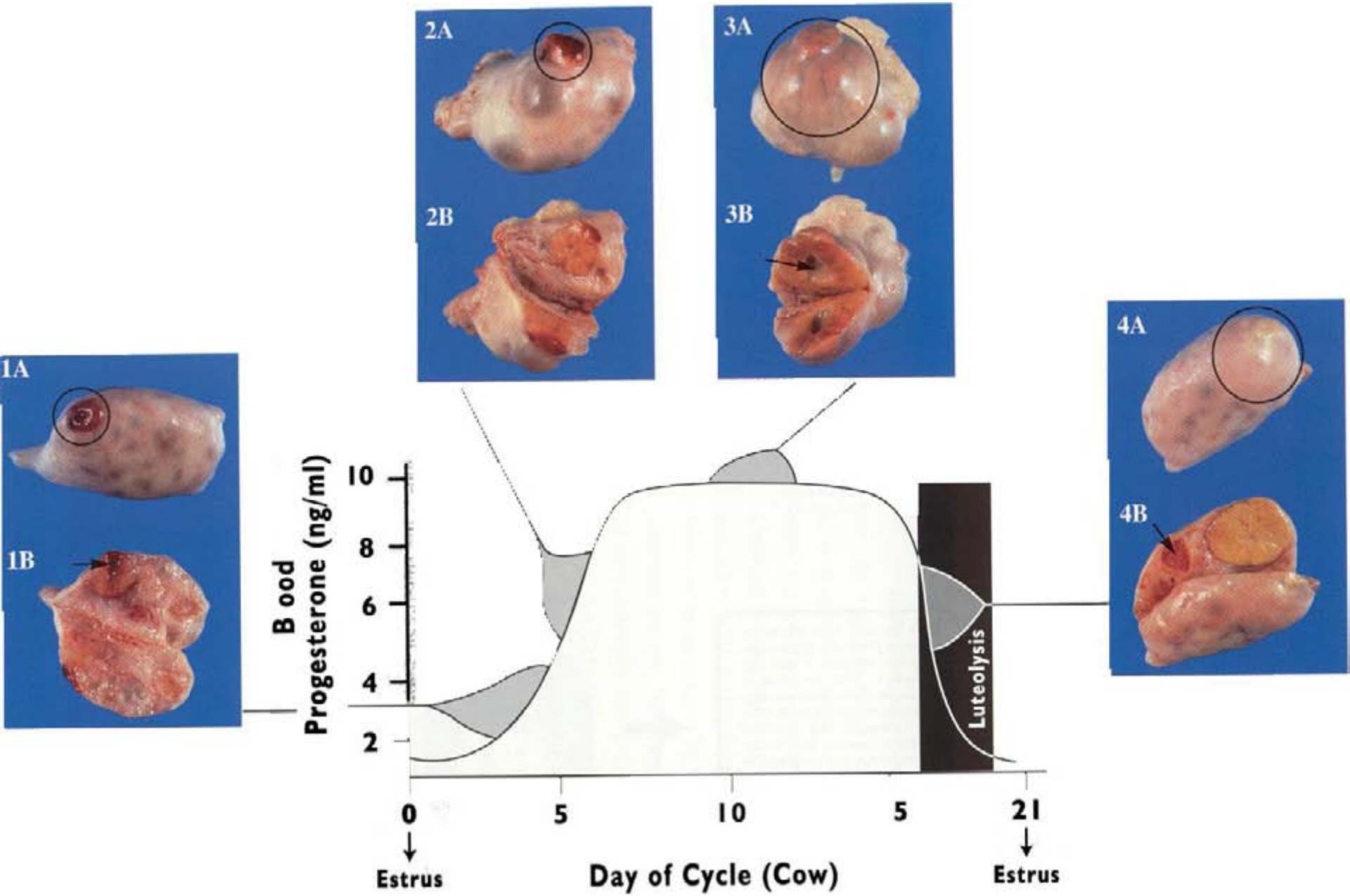
Estrus synchronization – Why?

- Opportunity to establish pregnancy in all females on the 1st day of the breeding season.
- Increase the number of opportunities to inseminate.

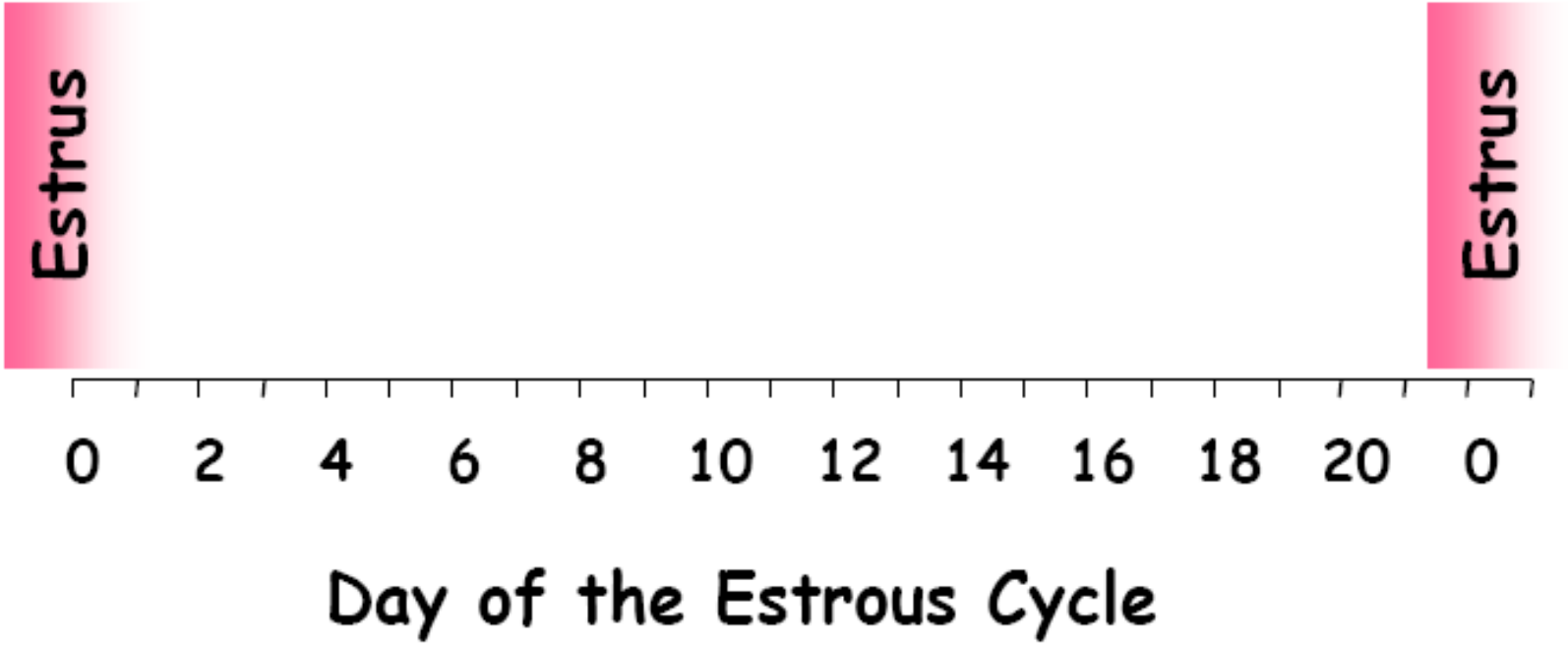
  *63 d breeding season = 4 chances
- Advances the calving season and increases days postpartum at the next breeding.
- Uniform calf crop
- Facilitate AI

Ovarian Cycle

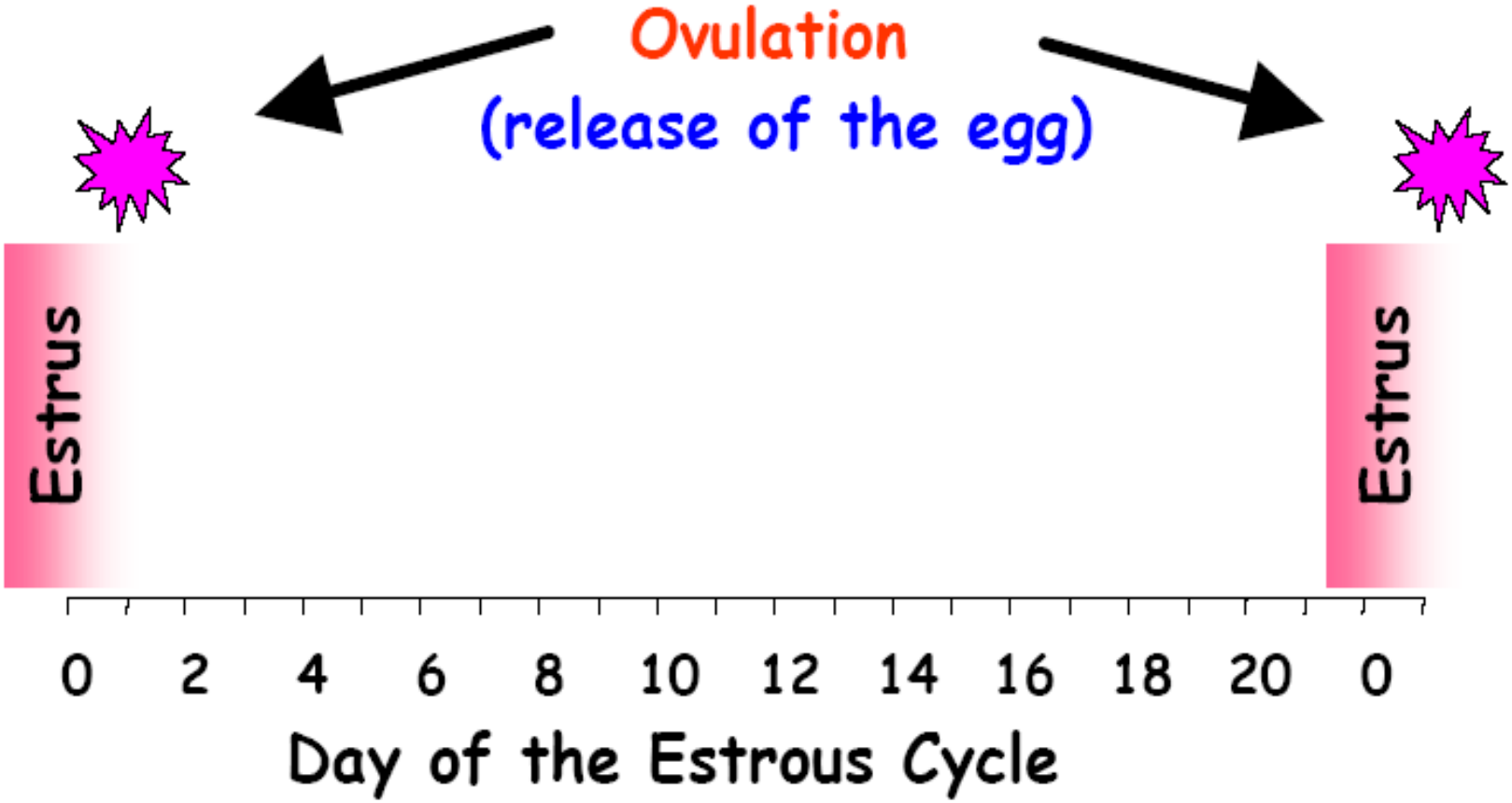



2A
2B
3A
3B
1A
1B
4A
4B
B ood
Progesterone (ng/ml)
10
8
6
4
2
Luteolysis
0
5
10
5
21
Estrus
Day of Cycle (Cow)
Estrus

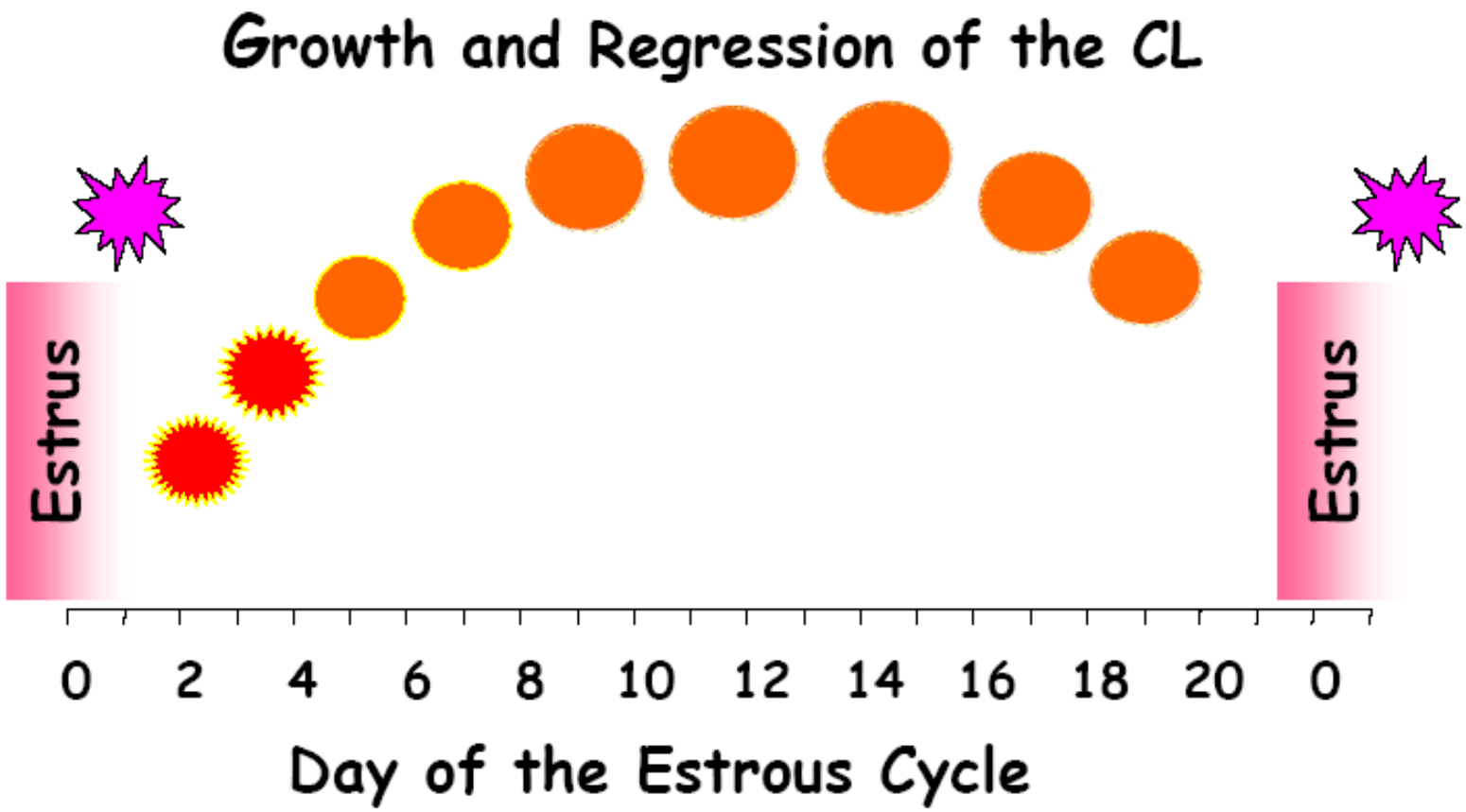
Estrous Cycle



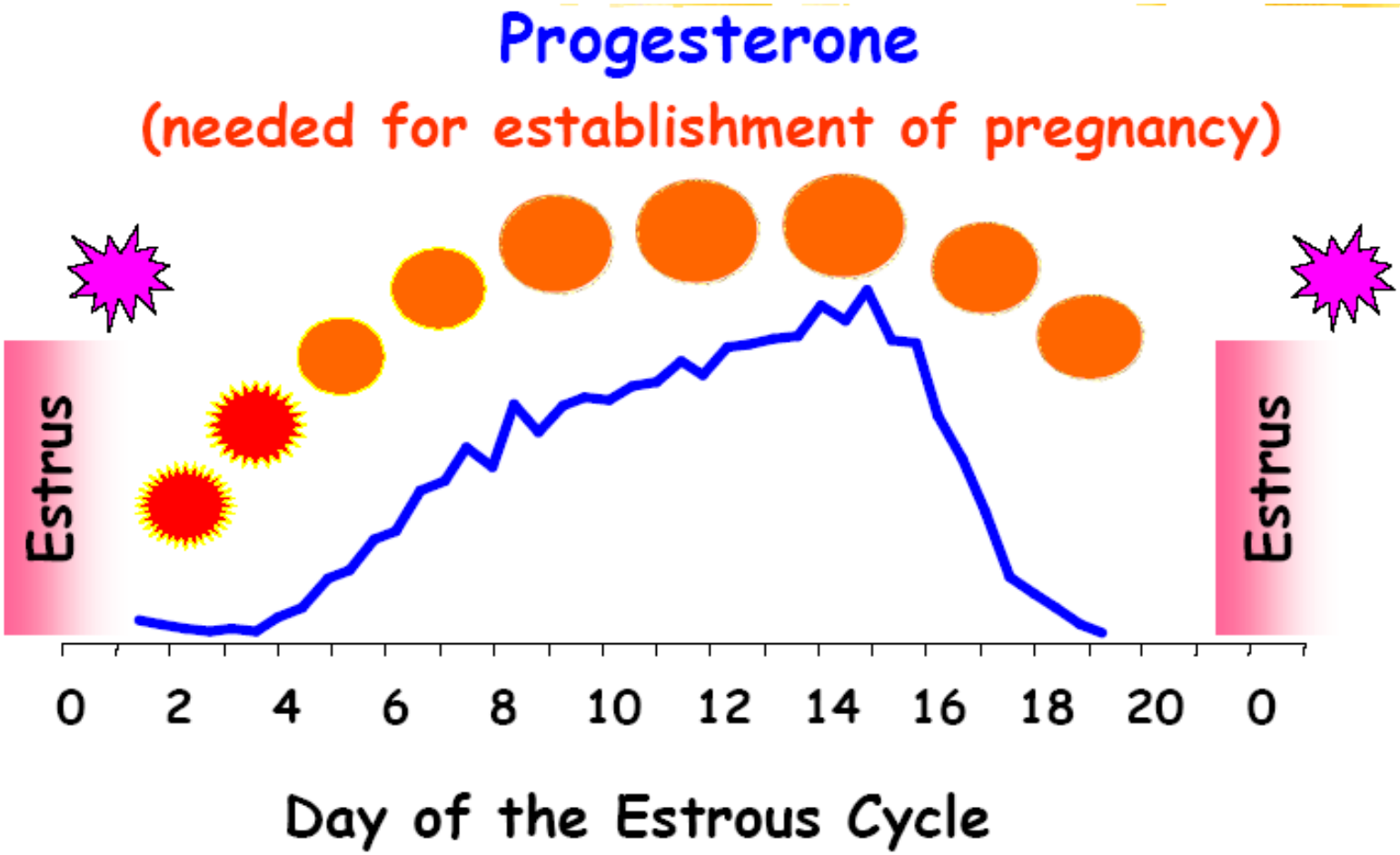
Estrous Cycle



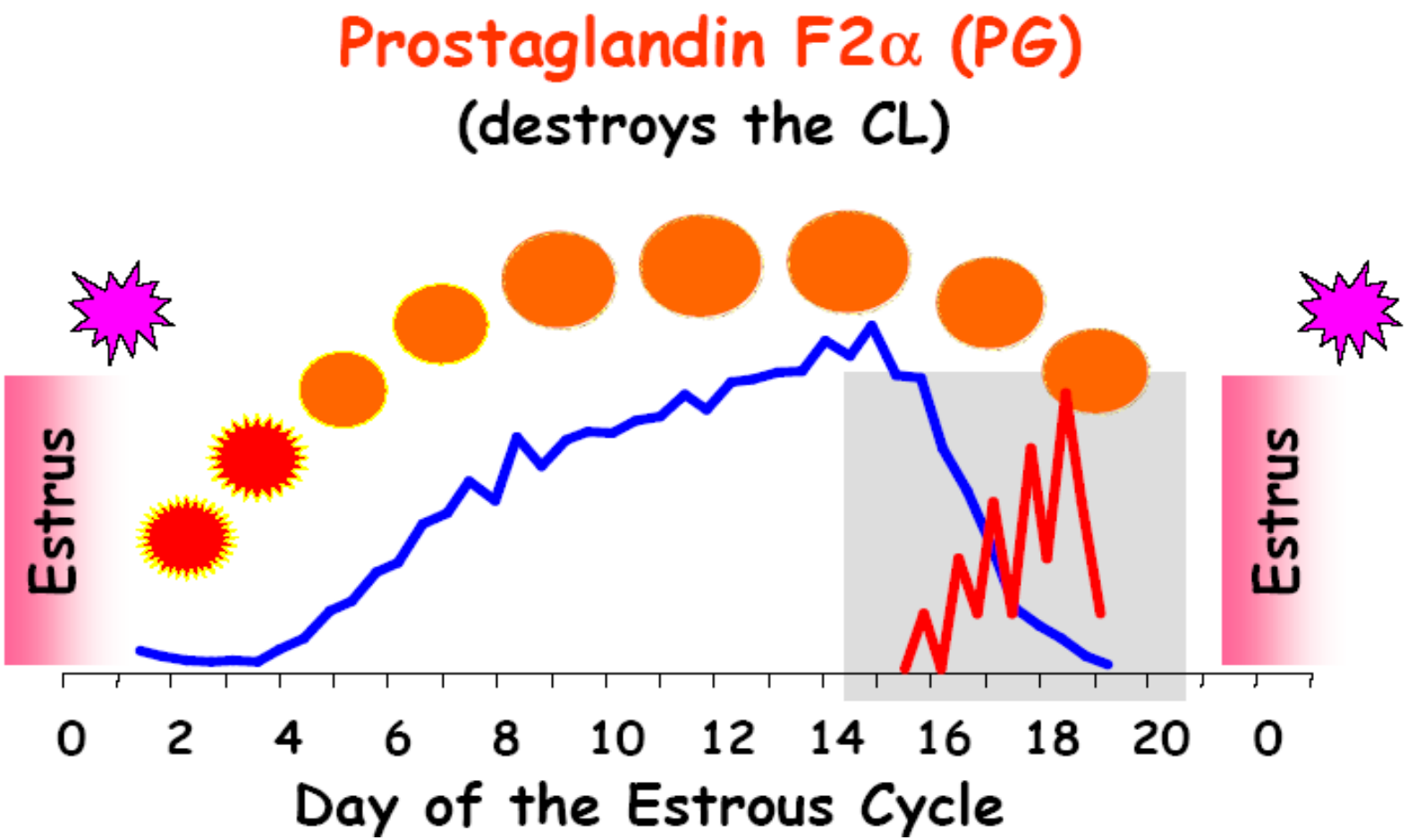
Corpus Luteum (CL)



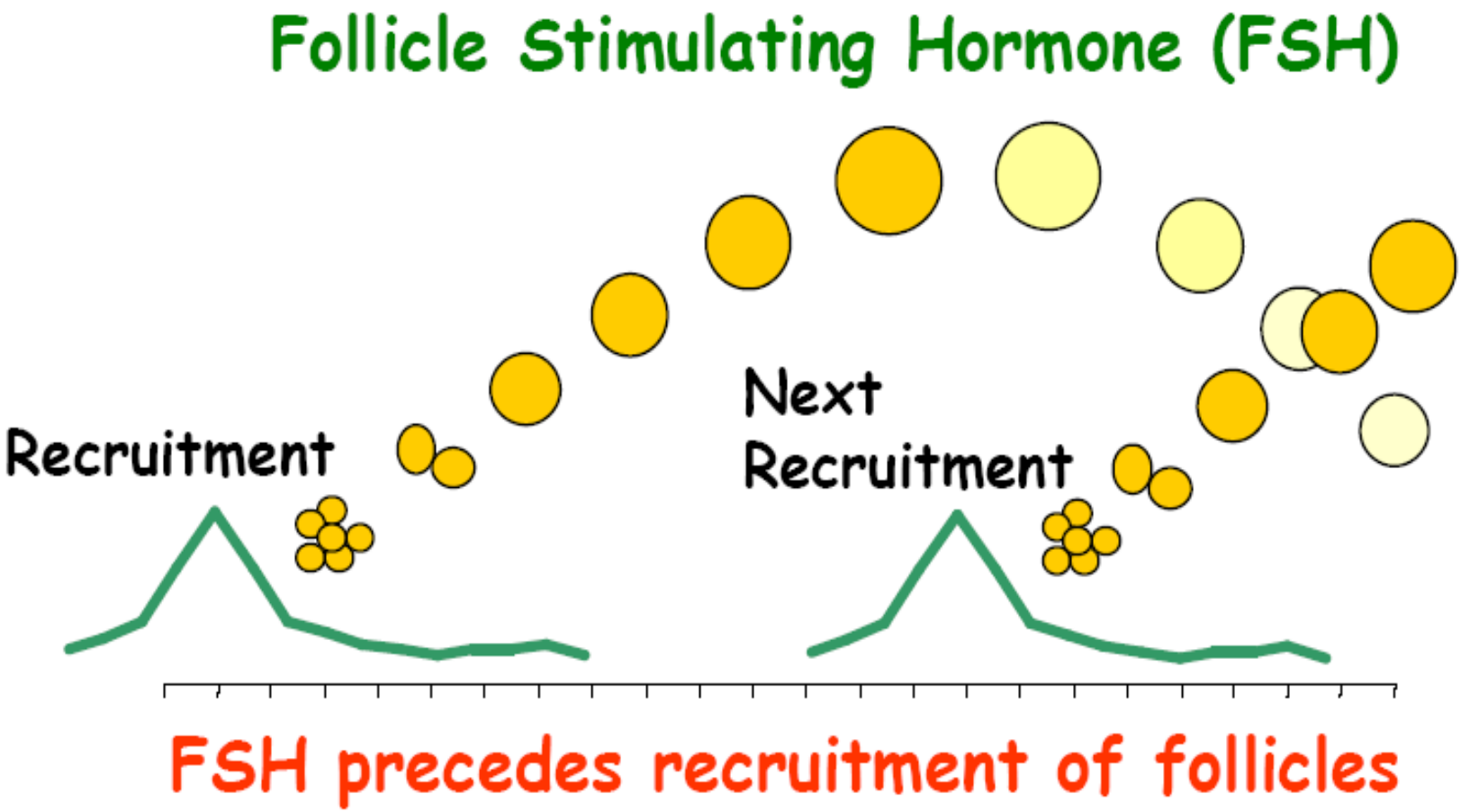
Corpus Luteum (CL)



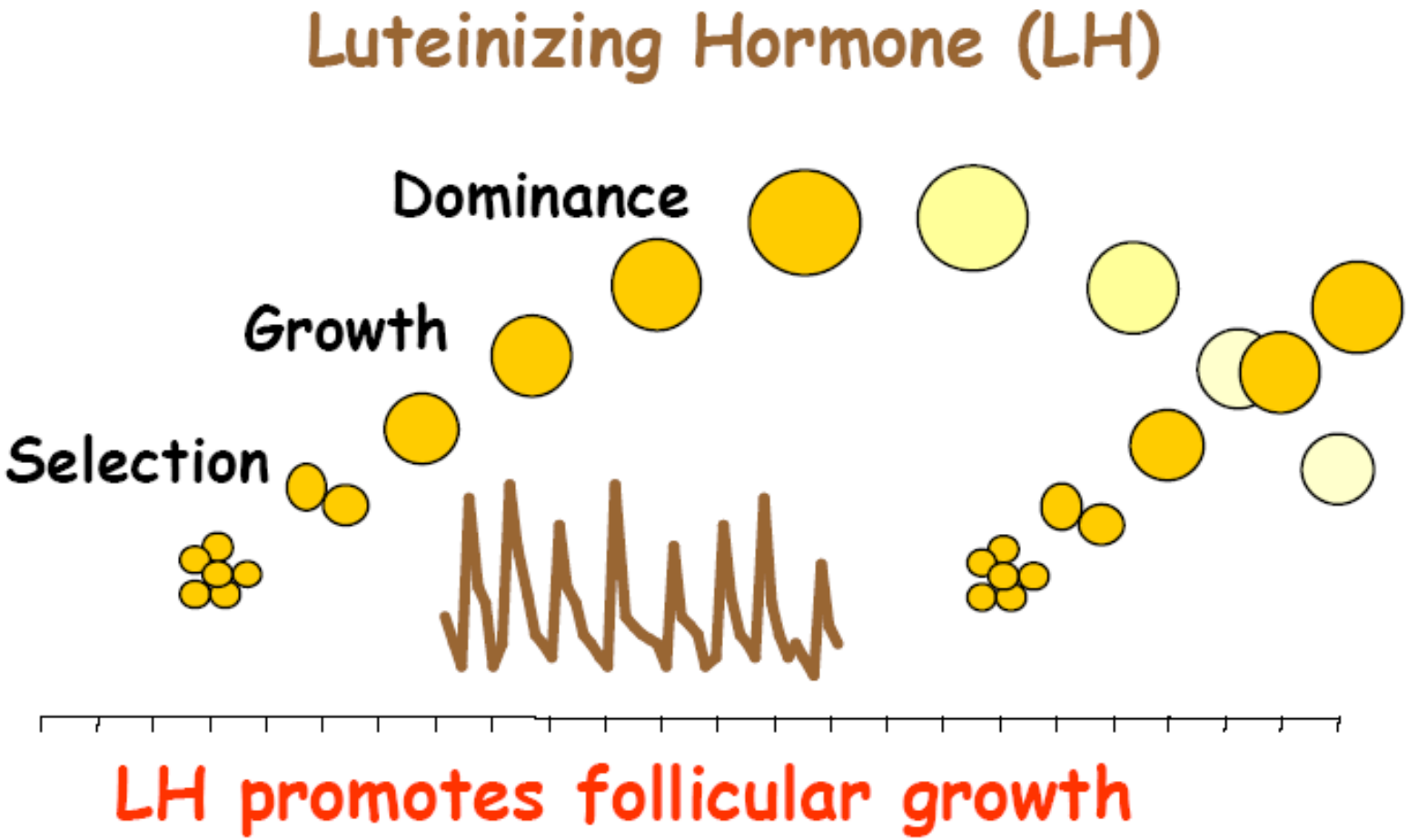
Corpus Luteum (CL) Regression



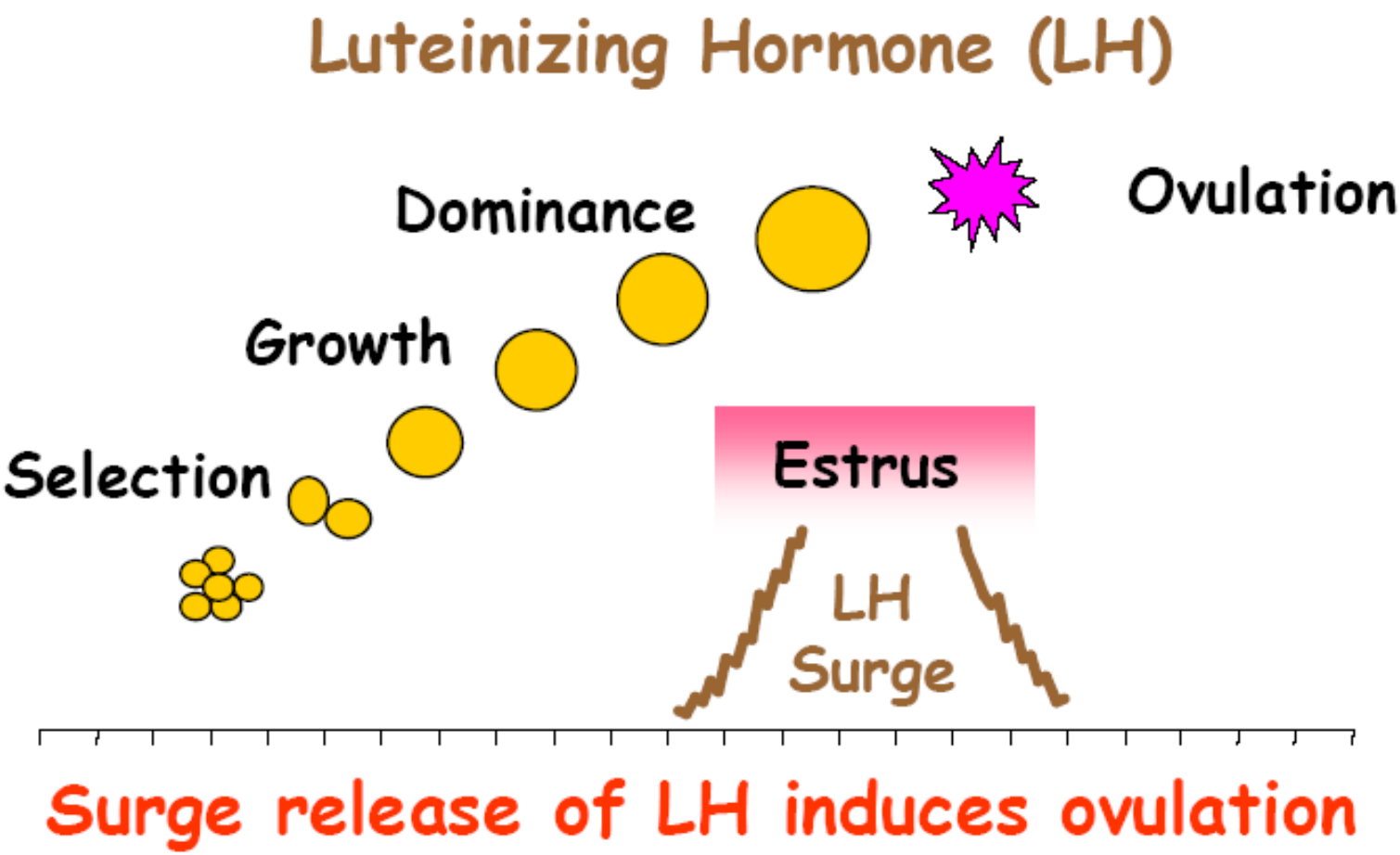
Follicle Development



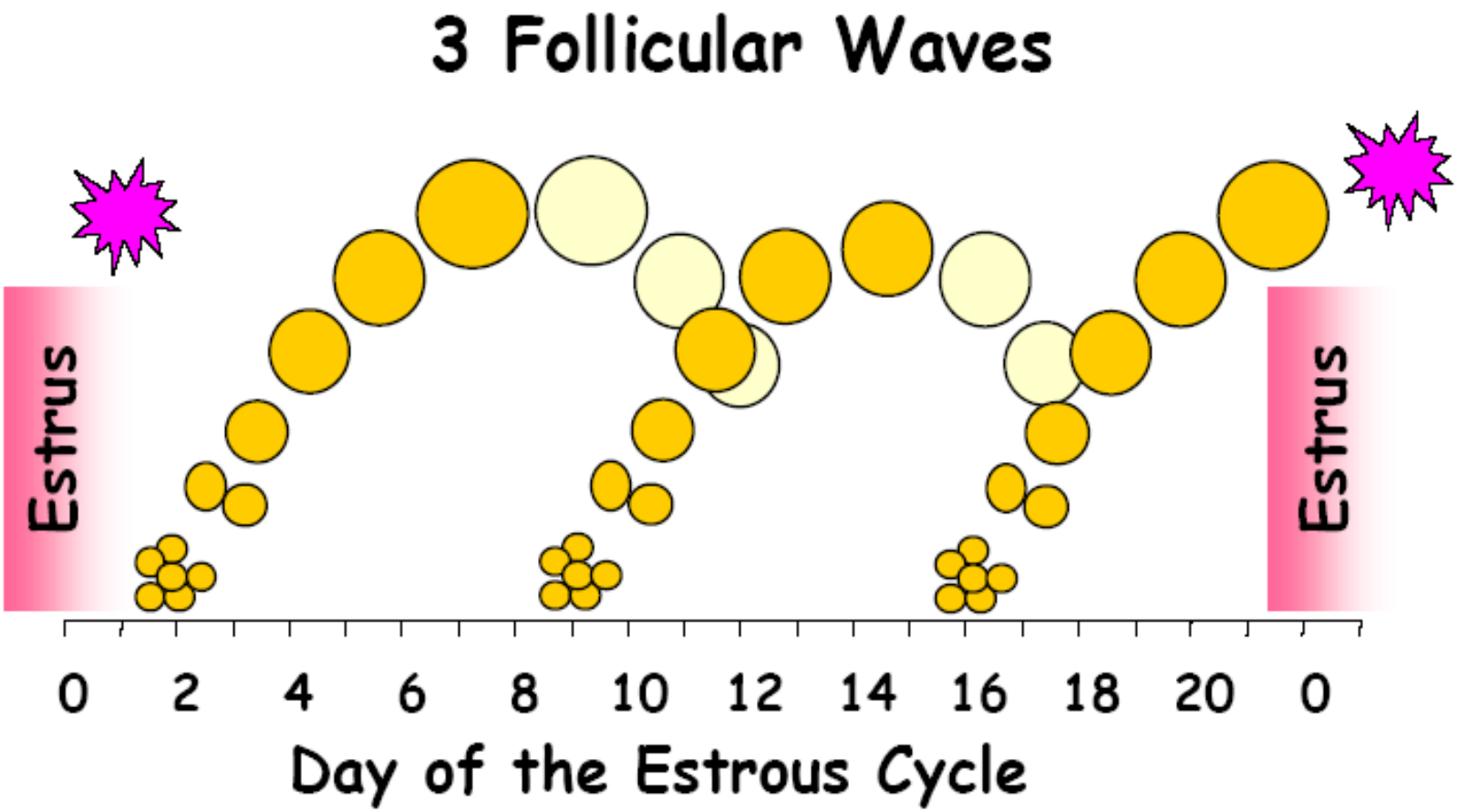
Follicle Development



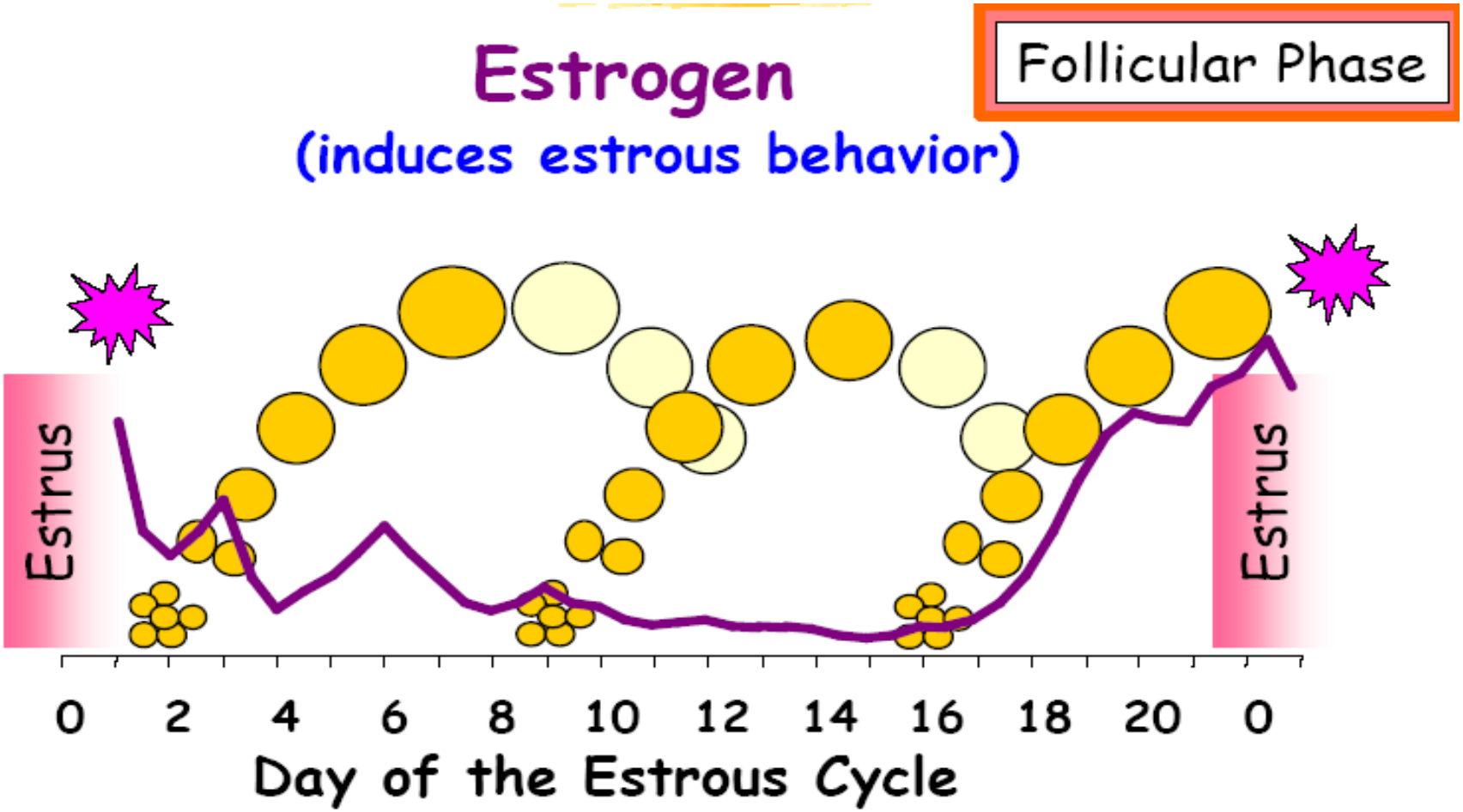
Follicle Development



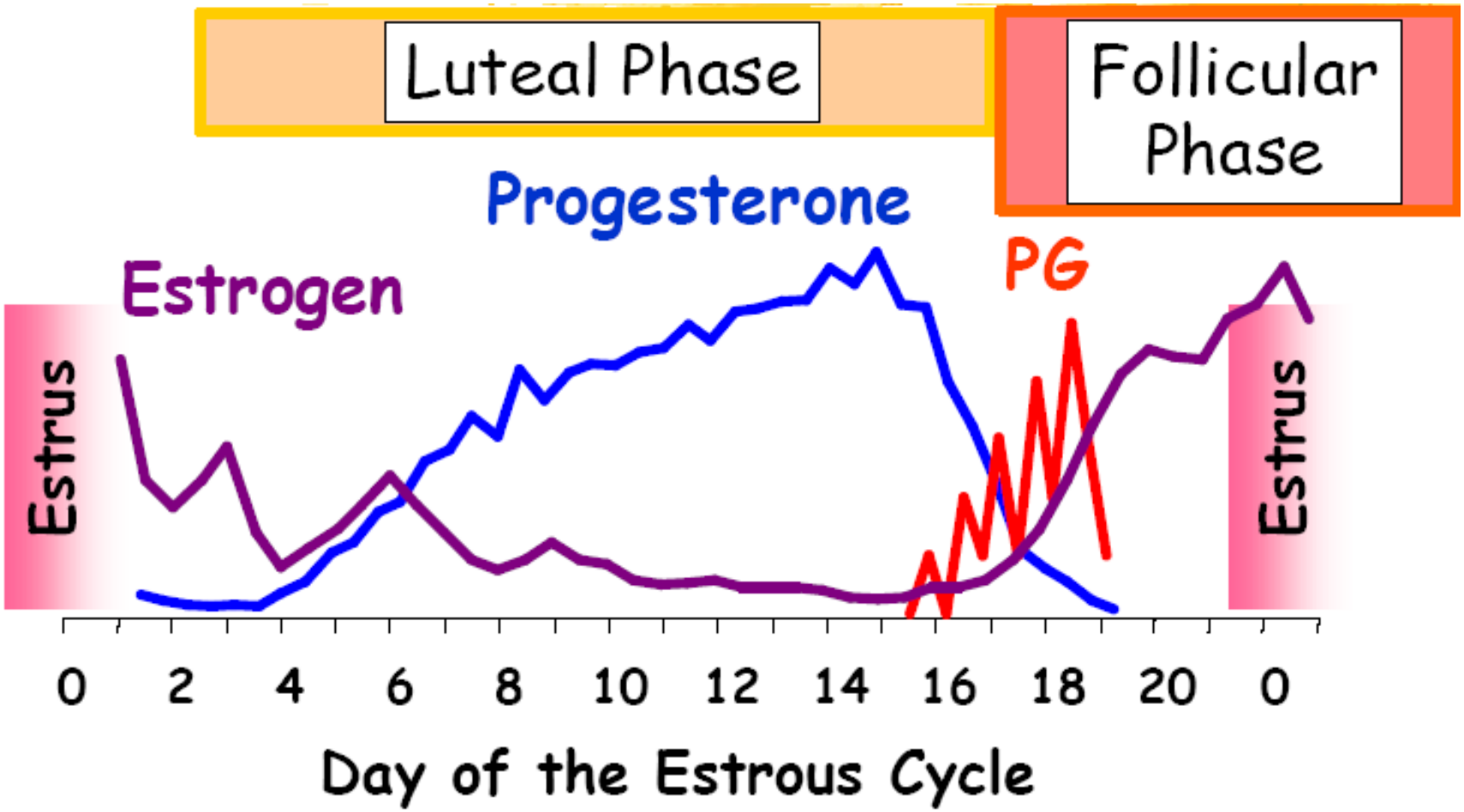
Follicle Development



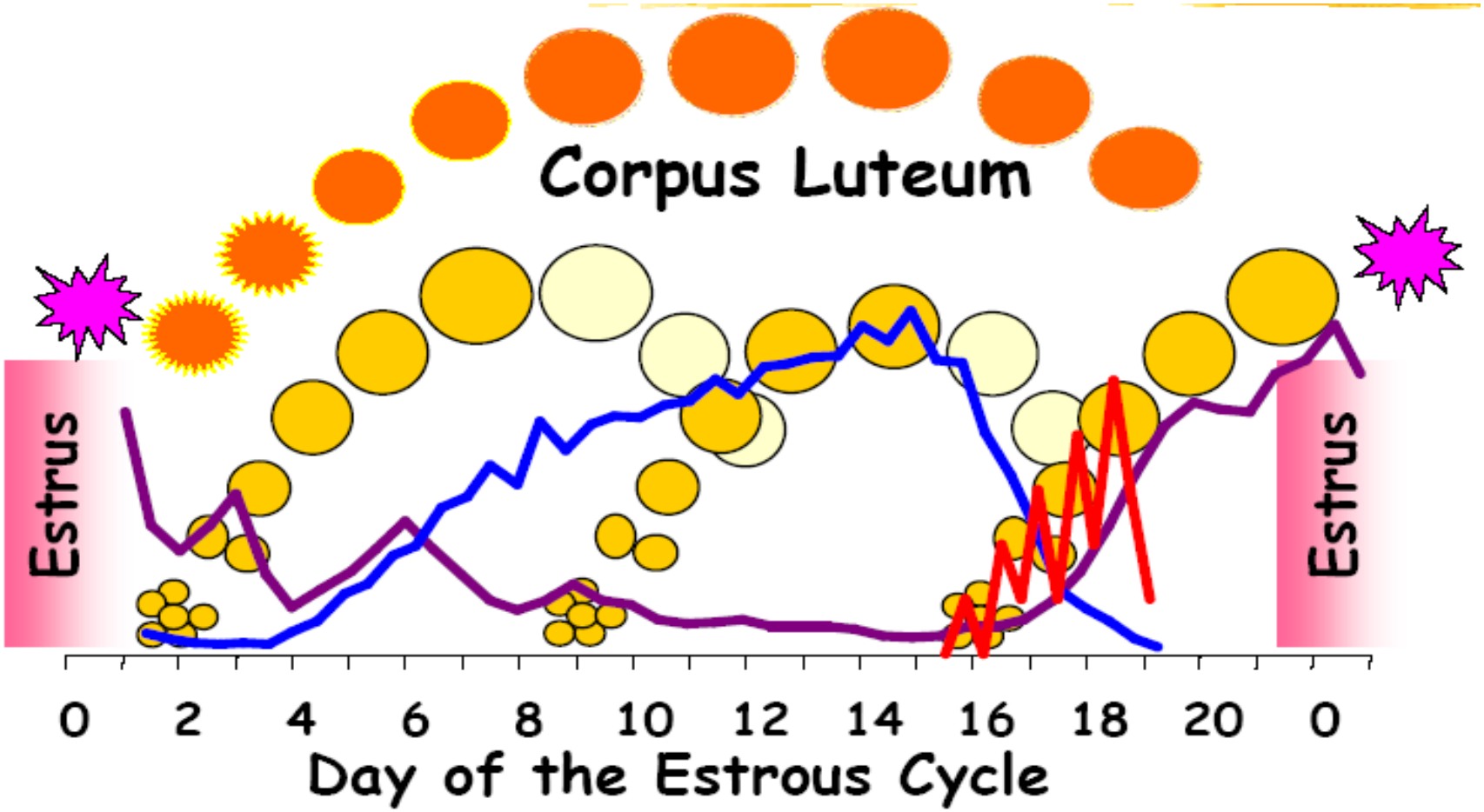
Follicle Development



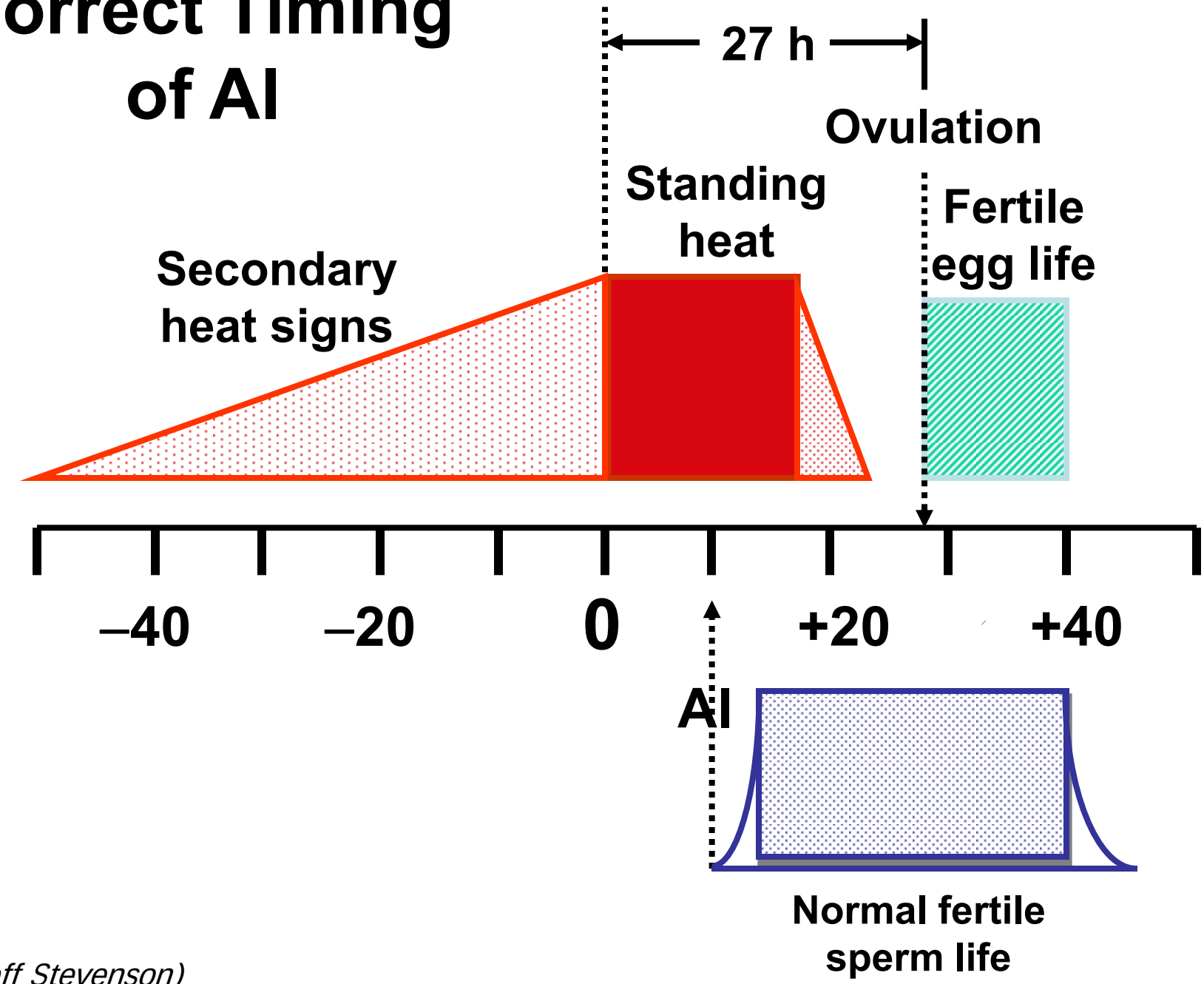
Endocrinology of the Estrous Cycle



Physiology of the Estrous Cycle



Correct Timing of AI



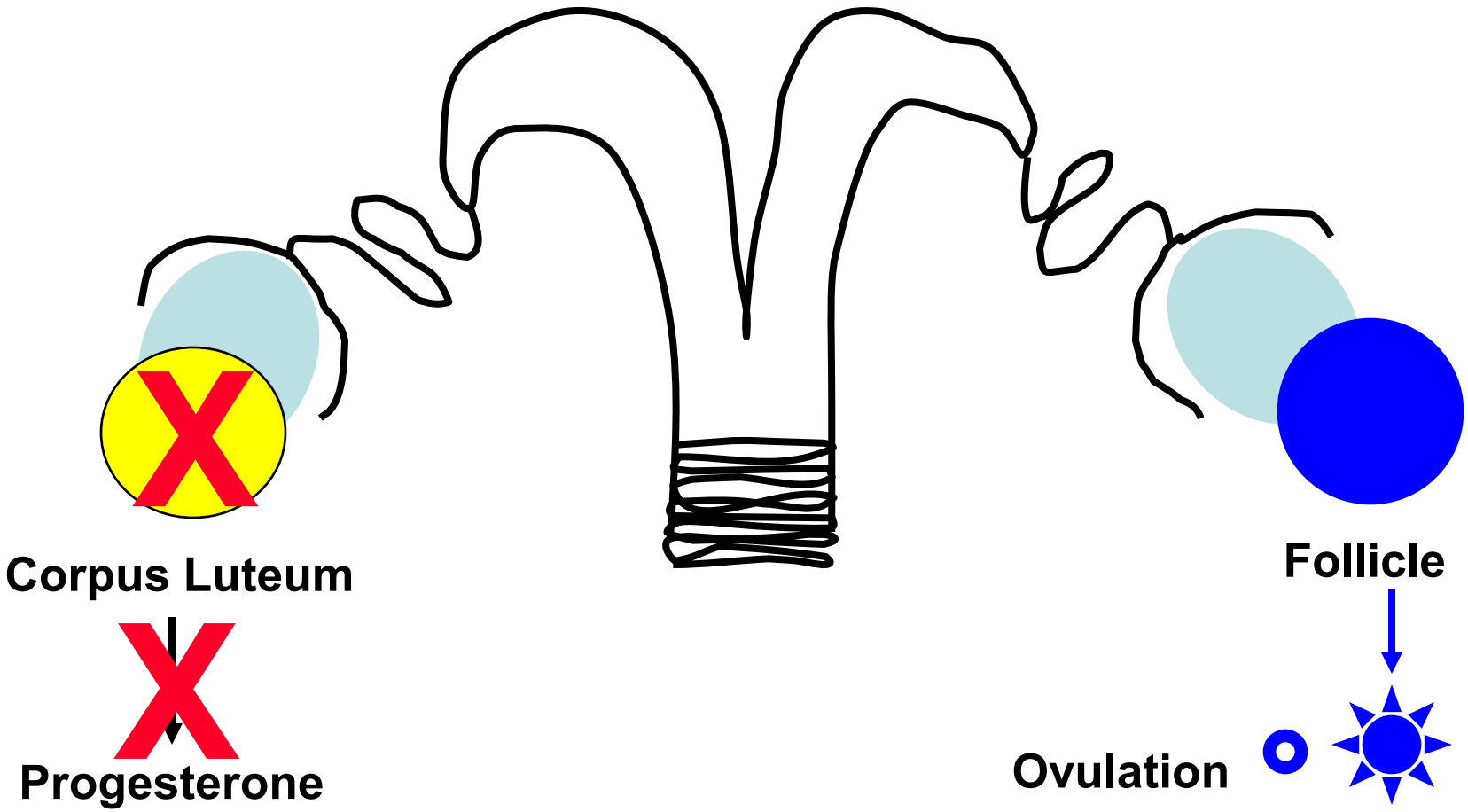
(Dr. Jeff Stevenson)

Prostaglandin $F_{2\alpha}$

- Injection to regress the CL, thus a functional CL must be present to have any effect
- In cattle, PGF2α will affect a CL from d 5 of cycle to d 17
- Brand names
  - Lutalyse
  - Estrumate
  - ProstaMate
  - estroPLAN
  - In-Synch

Hormones for Estrus Synchronization

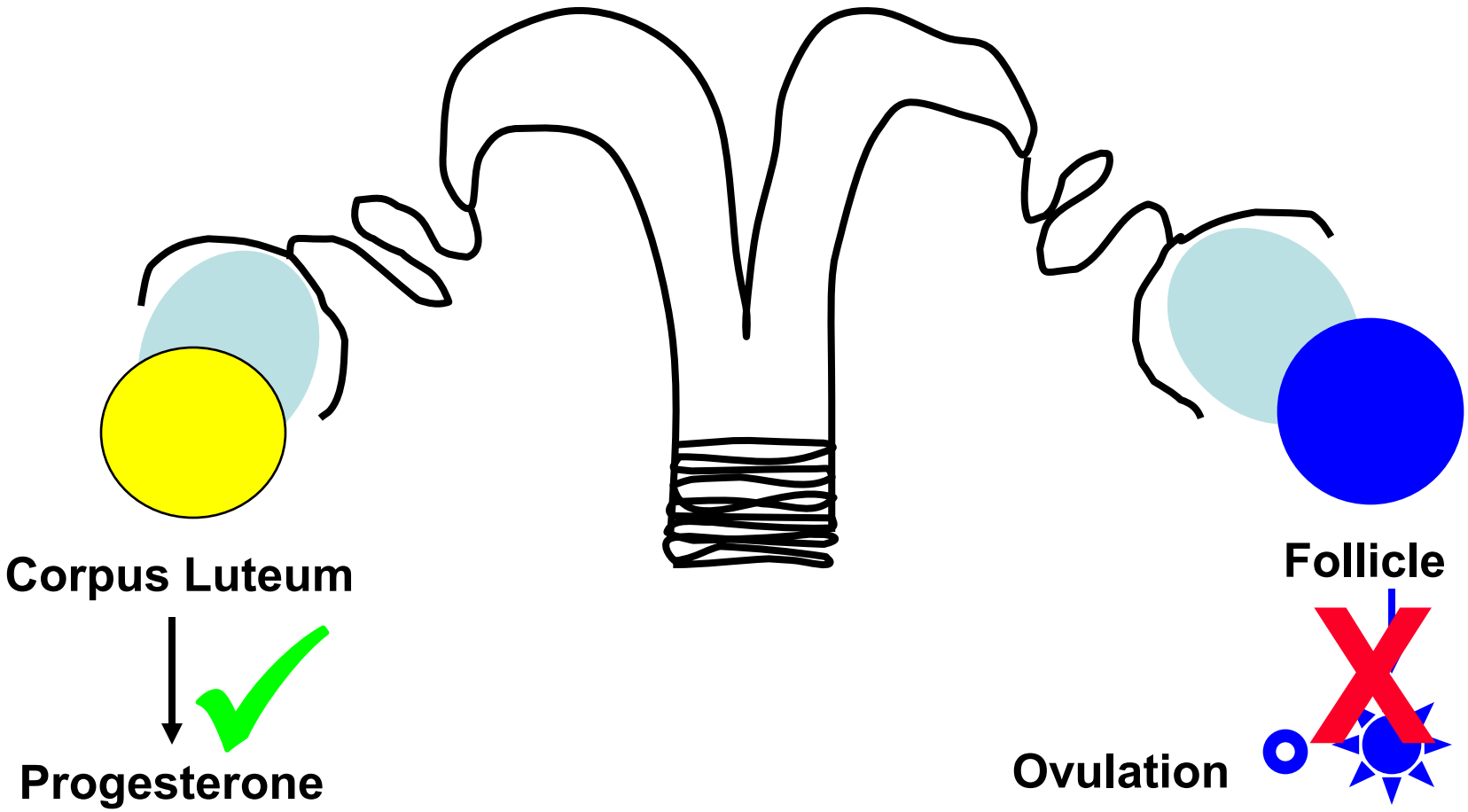
$PGF_{2\alpha}$



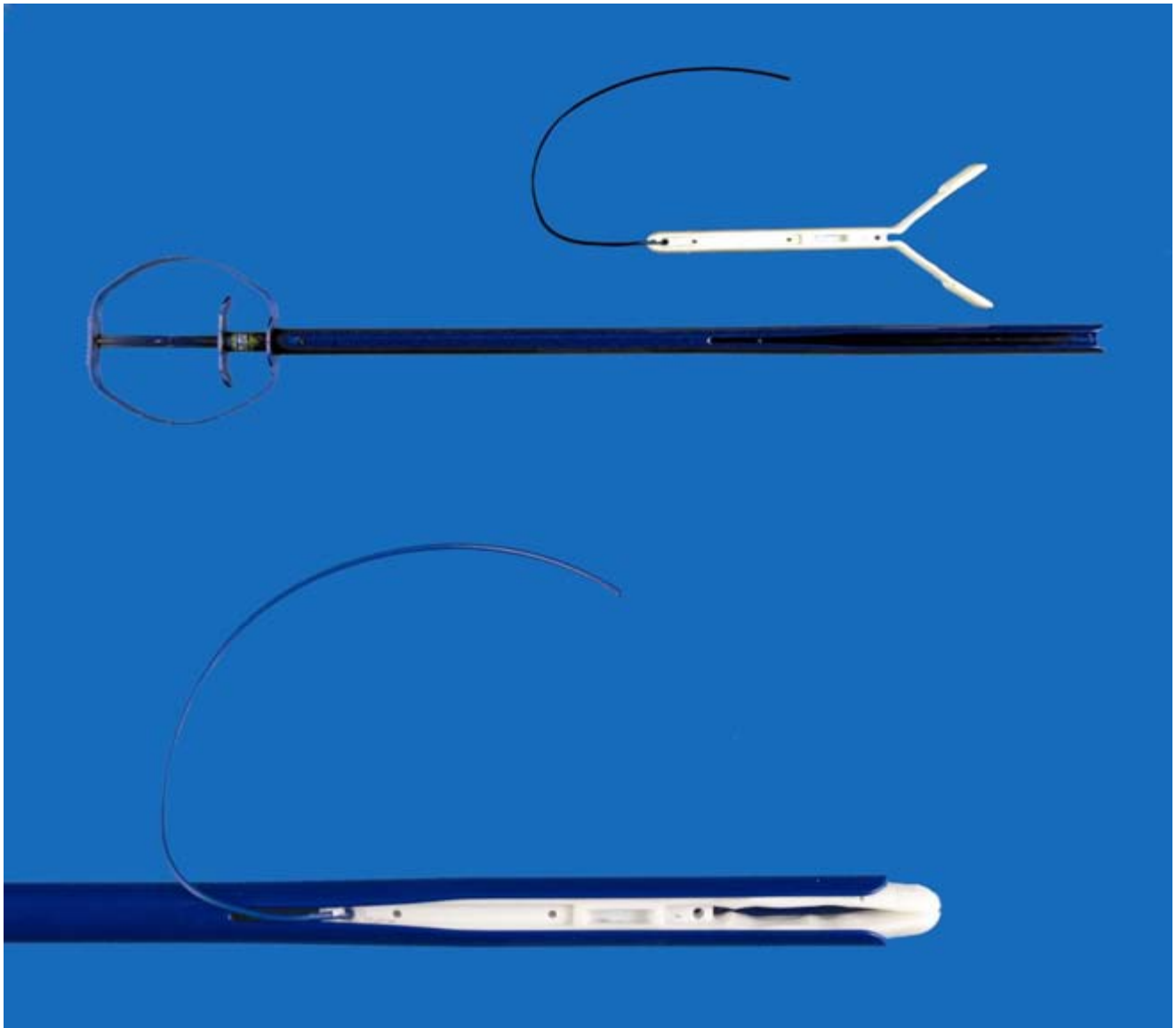
Progesterone

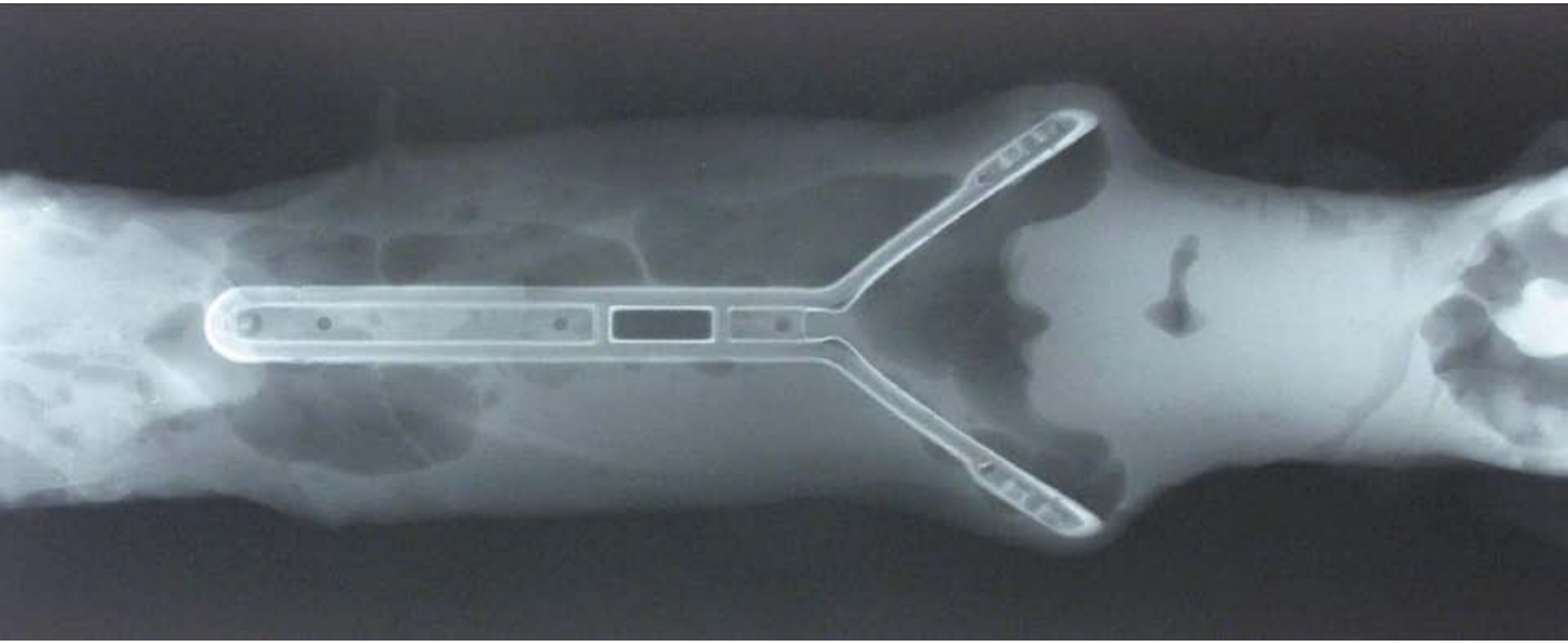
- During its administration, the animal will not ovulate but after its withdrawal, the group will come into estrus about the same time
- Progesterone can also ‘jumpstart’ anestrous animals into cycling
- P4 can be given orally or intravaginally
  - Orally: Melengestrol acetate (MGA)
  - Intravaginally: Controlled Internal Drug Release (CIDR)

Hormones for Estrus Synchronization
Progestins



CIDR vaginal insert

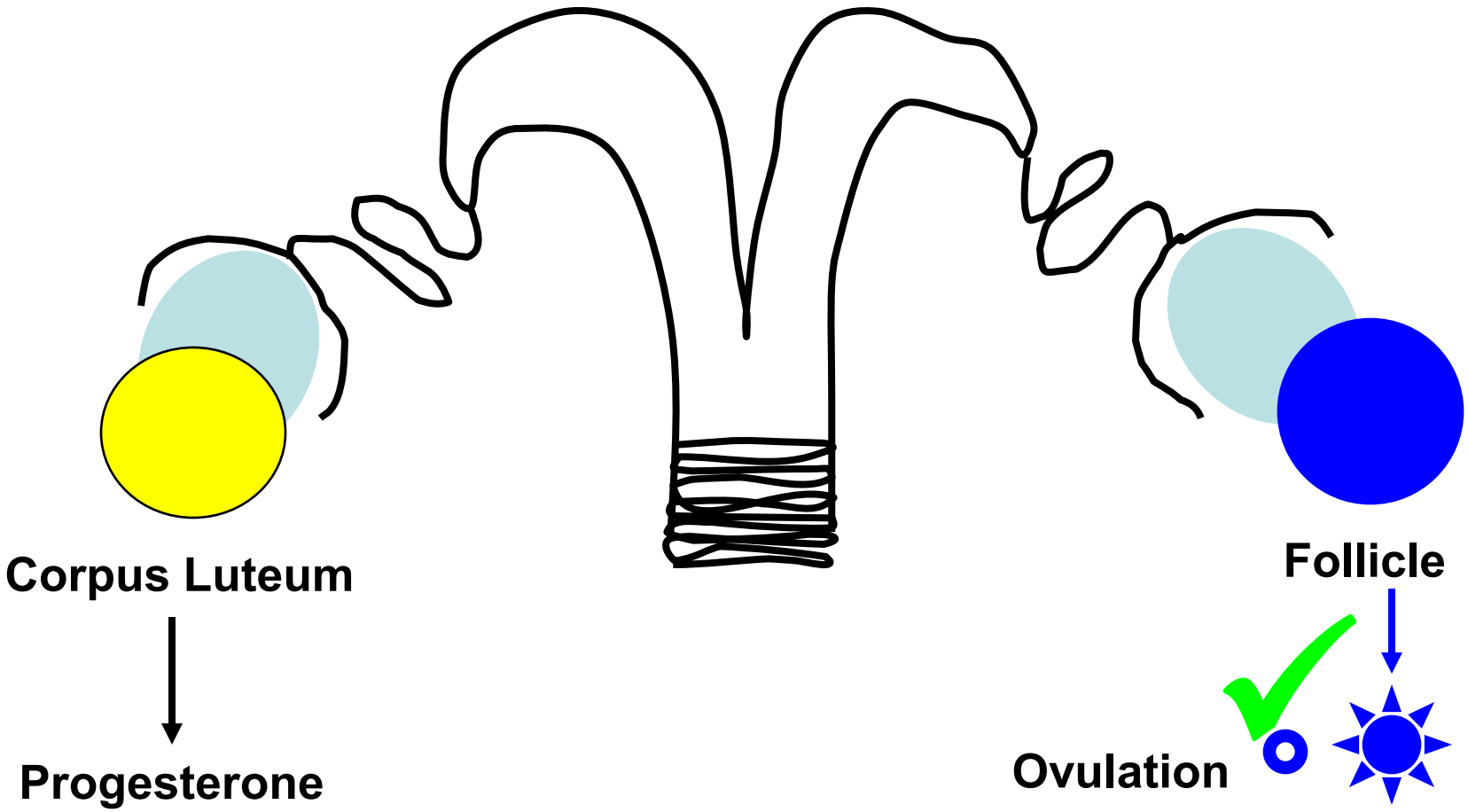




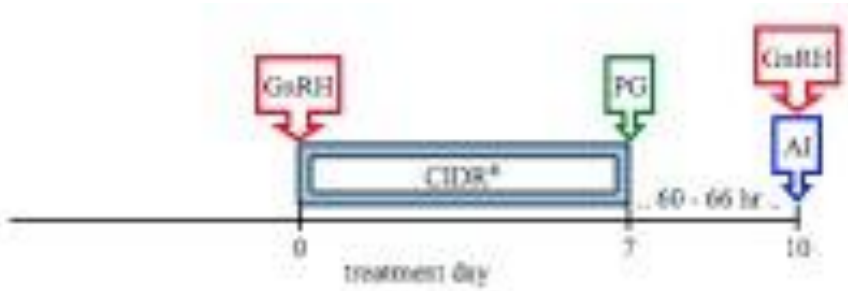
GnRH

- Injection to induce ovulation
- A large “enough” follicle must be present on ovary
- Can also “jumpstart” some anestrous females
- Brand names
  - Cystorelin
  - Factrel
  - Fertagyl
  - Ovacyst

Hormones for Estrus Synchronization
GnRH



Estrous Synchronization Protocols

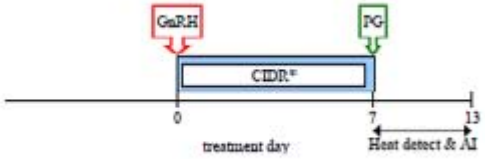


Beef Cow Protocols - 2013

Heat Detection

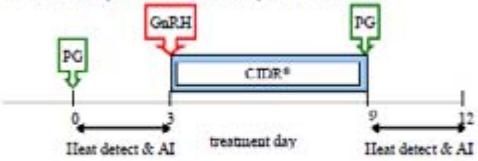
Select Synch

Select Synch + CIDR®



PG 6 day CIDR®

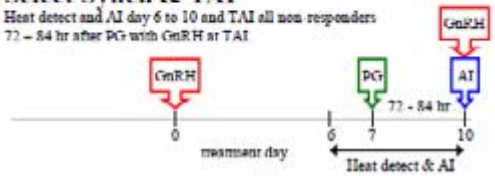
Heat detect and AI days 0 to 3. Administer CIDR to non-responders and heat detect and AI days 9 to 12. Protocol may be used in heifers.



Heat Detect & Time AI (TAI)

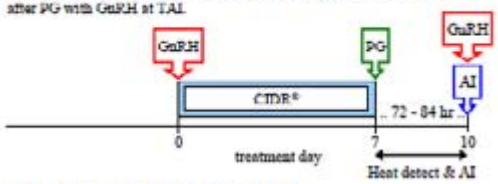
Select Synch & TAI

Heat detect and AI day 6 to 10 and TAI all non-responders 72 – 84 hr after PG with GnRH at TAI



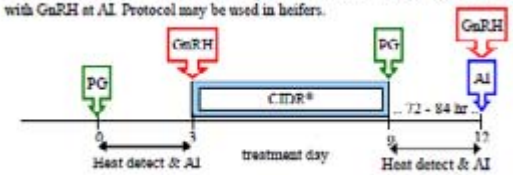
Select Synch + CIDR® & TAI

Heat detect and AI day 7 to 10 and TAI all non-responders 72 - 84 hr after PG with GnRH at TAI.



PG 6 day CIDR® & TAI

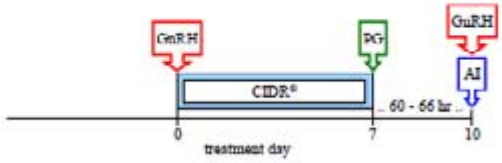
Heat detect & AI days 0 to 3. Administer CIDR to non responders & heat detect and AI days 9 to 12. TAI non-responders 72 - 84 hr after CIDR removal with GnRH at AI. Protocol may be used in heifers.



Fixed-Time AI (TAI)*

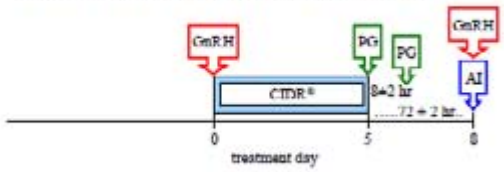
7 day CO-Synch + CIDR®

Perform TAI at 60 to 66 hr after PG with GnRH at TAI.



5-day CO-Synch + CIDR®

Perform TAI at 72 ± 2 hr after CIDR removal with GnRH at TAI.
Two injections of PG 8 ± 2 hr apart are required for this protocol

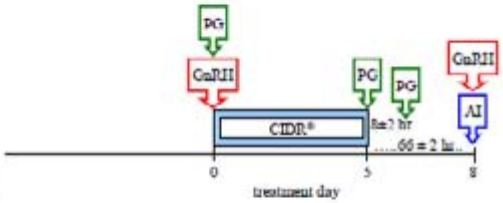


Fixed-Time AI (TAI)*

for *Bos indicus-influenced* cows only

PG 5-day CO-Synch + CIDR®

Perform TAI at 66 ± 2 hr after CIDR removal with GnRH at TAI.
Two injections of PG 8 ± 2 hr apart are required for this protocol.



* The time listed for "Fixed-time AI" should be considered as the approximate average time of insemination. This should be based on the number of cows to inseminate, labor, and facilities.

GnRH — Cystorelin®, Factrel®, Fertagyl®, OvaCyst®

PG — estroPLAN®, Estrumate®, In-Synch®, Lutalyse®, ProstaMate®

Approved 12-06-12

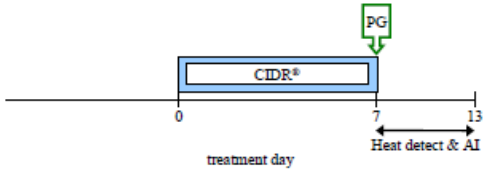
Beef Reproduction Task Force

Beef Heifer Protocols - 2013

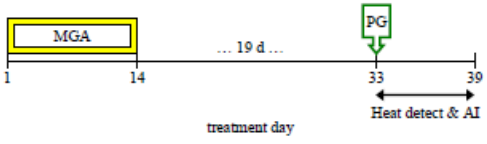
Heat Detection

1 Shot PG

7-day CIDR®-PG



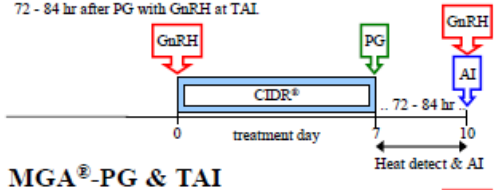
MGA®-PG



Heat Detect & Time AI (TAI)

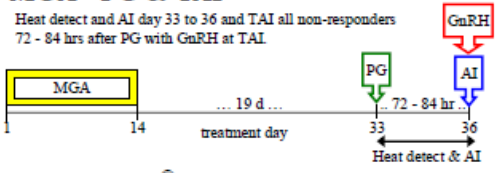
Select Synch + CIDR® & TAI

Heat detect and AI day 7 to 10 and TAI all non-responders
72 - 84 hr after PG with GnRH at TAI.



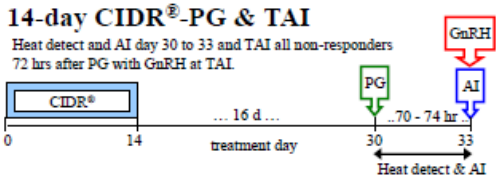
MGA®-PG & TAI

Heat detect and AI day 33 to 36 and TAI all non-responders
72 - 84 hrs after PG with GnRH at TAI.



14-day CIDR®-PG & TAI

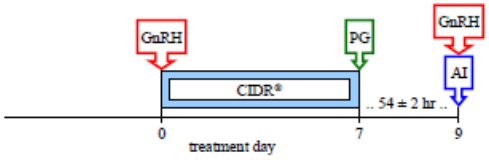
Heat detect and AI day 30 to 33 and TAI all non-responders
72 hrs after PG with GnRH at TAI.



Fixed-time AI (TAI)*

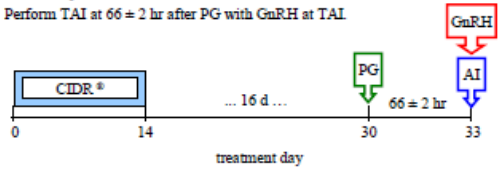
7-day CO-Synch + CIDR®

Perform TAI at 54 ± 2 hr after PG with GnRH at TAI.



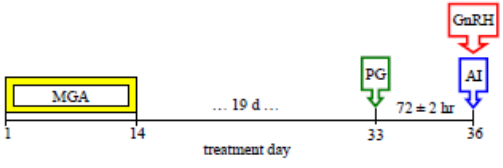
14-day CIDR®-PG

Perform TAI at 66 ± 2 hr after PG with GnRH at TAI.



MGA®-PG

Perform TAI at 72 ± 2 hr after PG with GnRH at TAI.



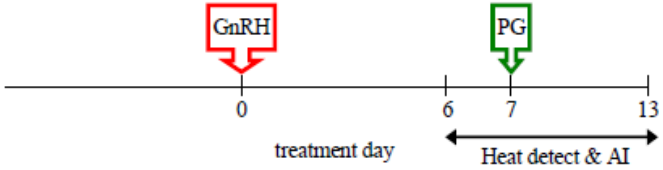
* The times listed for "Fixed-time AI" should be considered as the approximate average time of insemination. This should be based on the number of heifers to inseminate, labor, and facilities.

GnRH — Cystorelin®, Factrel®, Fertagyl®, OvaCyst®

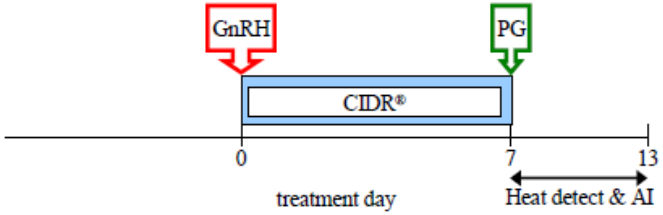
PG — estroPLAN®, Estrumate®, In-Synch®, Lutalyse®, ProstaMate®

Protocols for **cows** using *heat detection*

Select Synch

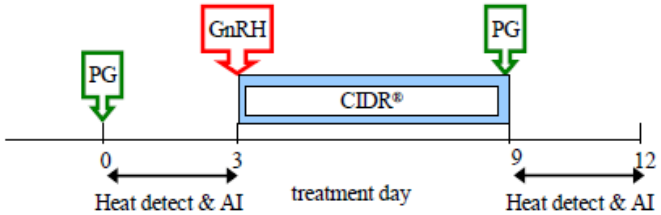


Select Synch + CIDR®



PG 6-day CIDR®

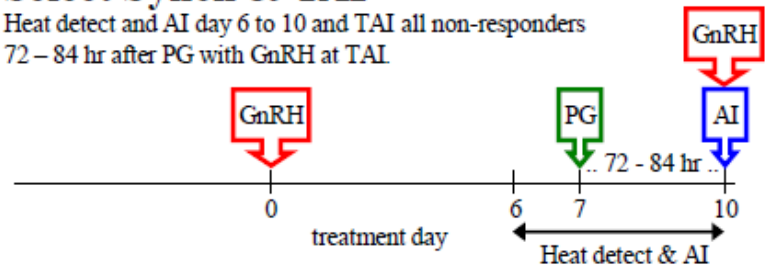
Heat detect and AI days 0 to 3. Administer CIDR to non-responders and heat detect and AI days 9 to 12. Protocol may be used in heifers.



Protocols for **cows** using *heat detect + timed AI*

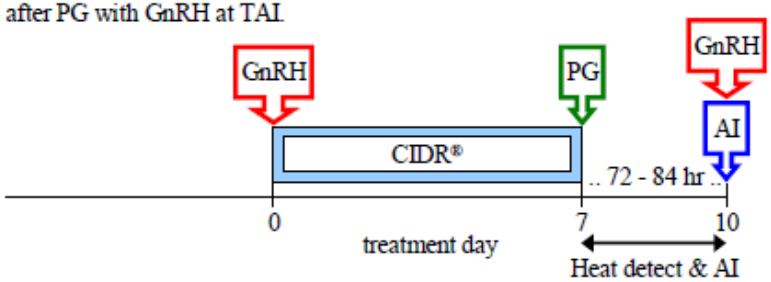
Select Synch & TAI

Heat detect and AI day 6 to 10 and TAI all non-responders 72 – 84 hr after PG with GnRH at TAI.



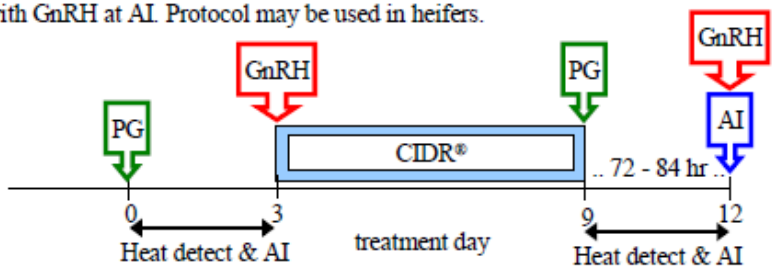
Select Synch + CIDR® & TAI

Heat detect and AI day 7 to 10 and TAI all non-responders 72 - 84 hr after PG with GnRH at TAI.



PG 6-day CIDR® & TAI

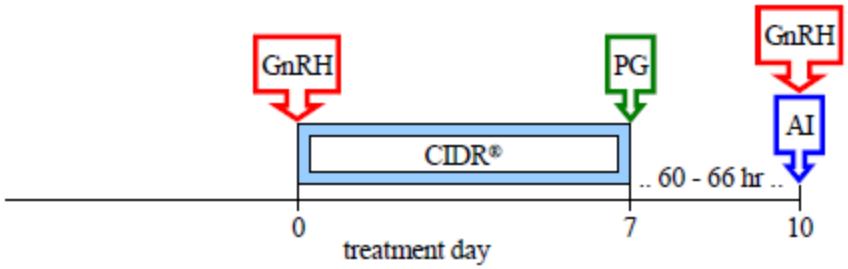
Heat detect & AI days 0 to 3. Administer CIDR to non-responders & heat detect and AI days 9 to 12. TAI non-responders 72 - 84 hr after CIDR removal with GnRH at AI. Protocol may be used in heifers.



Protocols for **cows** using *fixed timed AI only*

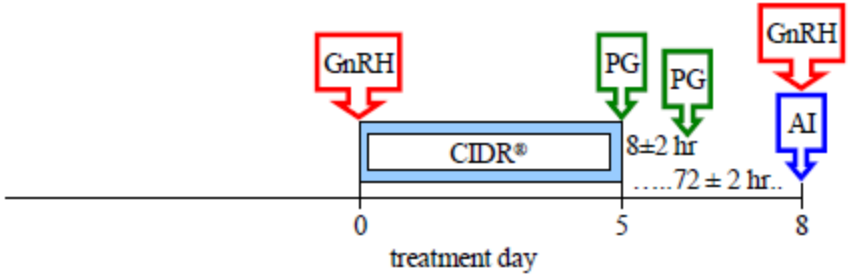
7-day CO-Synch + CIDR®

Perform TAI at 60 to 66 hr after PG with GnRH at TAI.

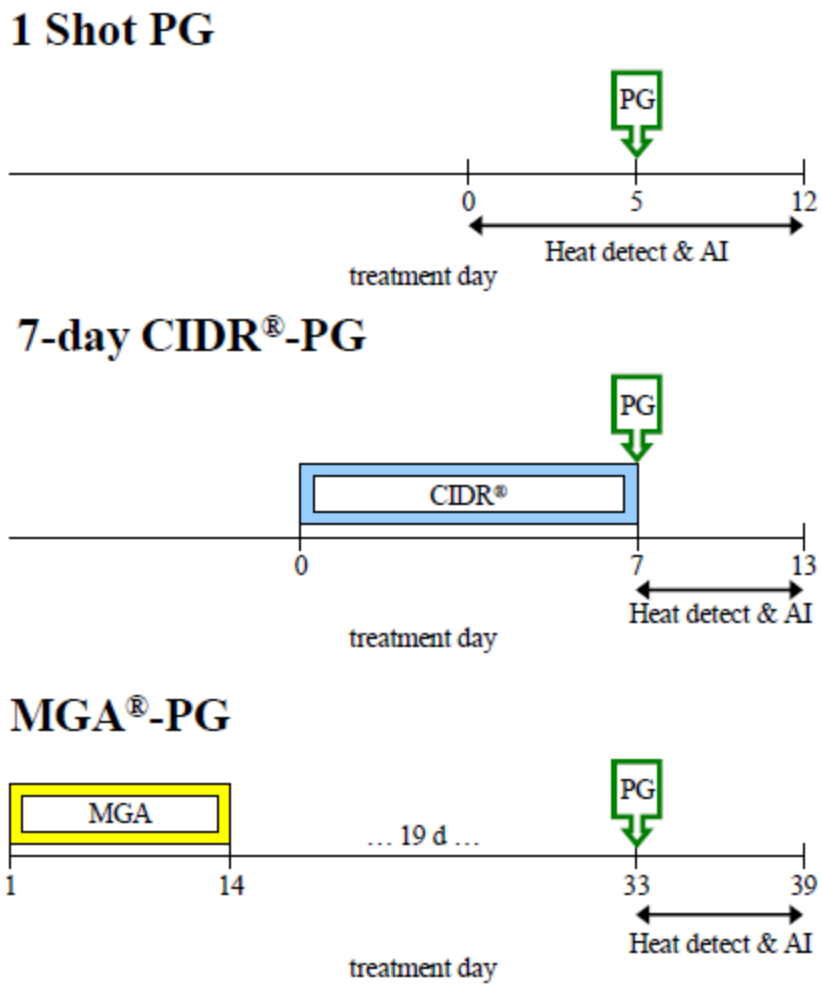


5-day CO-Synch + CIDR®

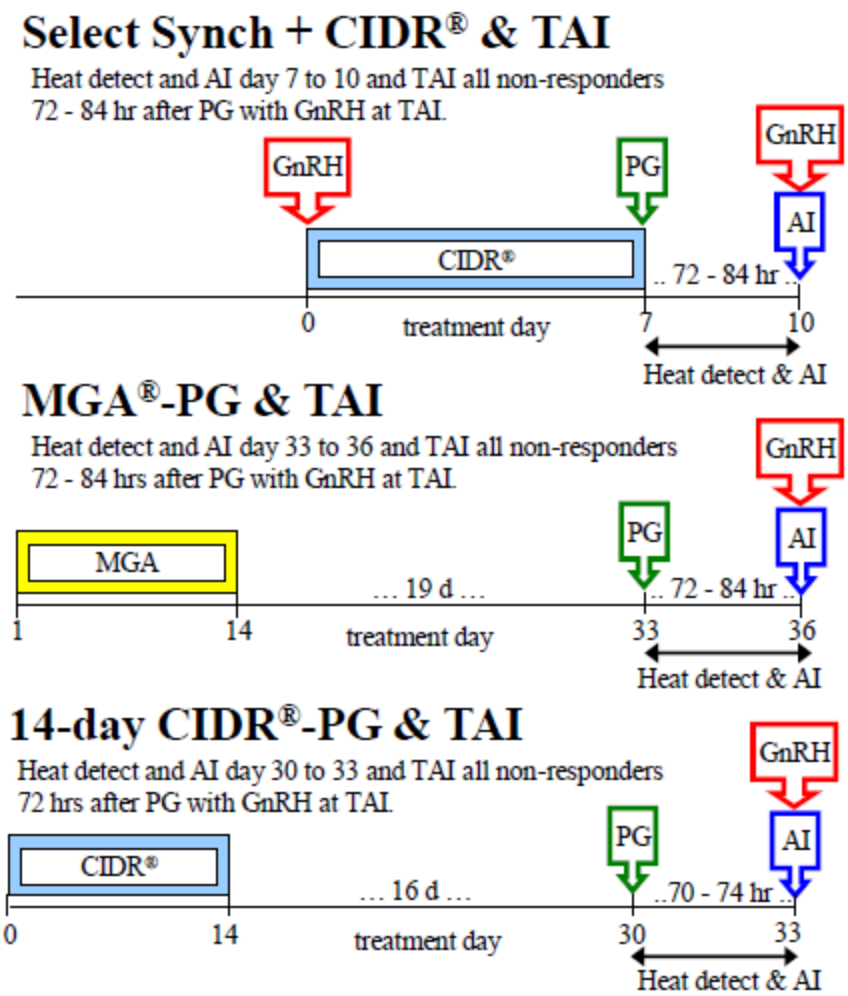
Perform TAI at 72 ± 2 hr after 1st PG with GnRH at TAI.
Two injections of PG 8 ± 2 hr apart are required for this protocol.



Protocols for **heifers** using *heat detection*



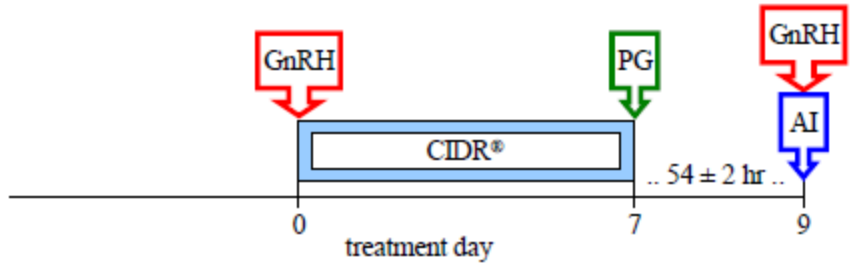
Protocols for **heifers** using *heat detect + timed AI*



Protocols for **heifers** using *timed AI only*

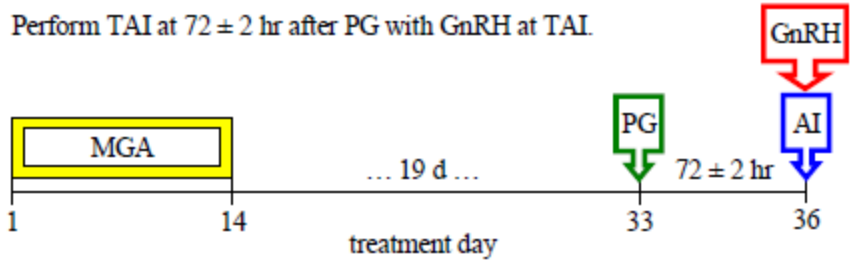
7-day CO-Synch + CIDR®

Perform TAI at 54 ± 2 hr after PG with GnRH at TAI.



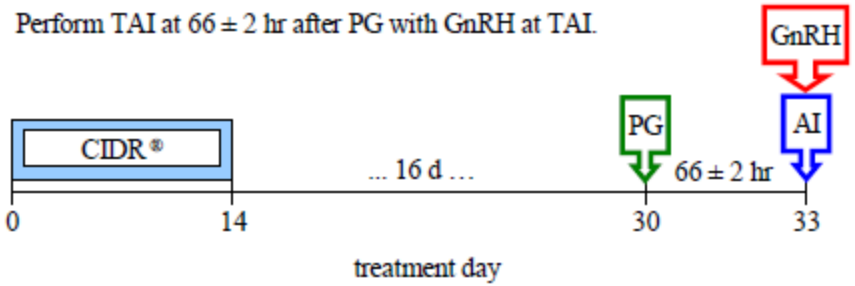
MGA®-PG

Perform TAI at 72 ± 2 hr after PG with GnRH at TAI.



14-day CIDR®-PG

Perform TAI at 66 ± 2 hr after PG with GnRH at TAI.



Estrus Synchronization Planner

Iowa Beef Center
IBC
Iowa State University

Beef Reproduction Task Force

Inputs

Breed Type	**1**	**1**=*Bos taurus*, **2**=*Bos indicus* influence
Date to start breeding:	**6/1/2012**	*(Example: 6/1/2013)*
Time of day you want to breed:	**9:00 AM**	**Last PG injection given @ 5/29/12 3:00 PM**
Detection-Insemination type:	**3**	**1** = Estrus AI, **2** = Estrus AI & Clean-up AI, **3** = Fixed-Time AI
Estrus synchronization system:	**22**	*Select number from list of systems below.*
Days from last AI to bull turn in:	**9**	**Cow Systems** 22 = 7 Day CO-Synch+CIDR with Fixed-Time AI - 66
Trips through the working facility:	**3**	

Calendar

6/12/13

Estrus Synchronization Planner

22 = 7 Day CO-Synch+CIDR with Fixed-Time AI - 66

Producer Name:
Address:
Town:
Phone Number:
Group:
Prepared by:
Phone Number:

Date to start breeding:	6/1/2012
Clean-up bull turn in date:	6/10/2012
Start of calving season:	3/9/2013

Last PG injection given @ 3:00 PM on 5/29/2012

Fixed time AI done @ 9:00 AM on 6/1/2012

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
5/20/2012	5/21/2012	5/22/2012	5/23/2012	5/24/2012	5/25/2012	5/26/2012
		* Insert CIDR device in all females * Inject GnRH - all females				
5/27/2012	5/28/2012	5/29/2012	5/30/2012	5/31/2012	6/1/2012	6/2/2012
		* Remove CIDRs * Inject PG - all females			* GnRH injection & Fixed time AI (60-66 hrs after PG)	
6/3/2012	6/4/2012	6/5/2012	6/6/2012	6/7/2012	6/8/2012	6/9/2012
6/10/2012	6/11/2012	6/12/2012	6/13/2012	6/14/2012	6/15/2012	6/16/2012
* Turn in Bull Power						

Which Protocol?

Determine potential results and costs

- Select the best system for YOUR situation

Advantages and tradeoffs must be weighed in terms of:

- Cost
- Time
- Facilities
- Labor Requirements
- Cows

Heat Detection

- Amount needed depends on system selected
- Must be done carefully as part of the synchronization program
  - Many females exhibit heat at the same time

Labor Needs

- Insemination
  - Inseminator fatigue
- Semen thawing, preparation of insemination equipment and record keeping
- Working cattle through facilities
  - More people = better efficiency ???
- Heat detection
  - People and hours depend on selected system

Facilities

- Need to be in good repair
  - Pressure of more animals in a shorter time frame
- Fixed-time A.I. program
  - Holding pen space

Identification

- Really important for heat detection
- Essential to get maximum value from A.I. program
  - Keep “barn sheet”

Cow ID	Date/Time in heat	Date/Time A.I.’d	Sire	Tech.	Notes
133	5/13 6:00AM	5/13 6:00PM	HCC Hero	LJ	Good Tone
169	5/14 6:00PM	5/15 6:00AM	HCC Firecracker	LJ	Showed no signs of heat

Conditions Affecting Cycling

Beef Cows

- Two Factors:
  - Rest after calving
  - Body condition after calving

- The better the BCS and the longer after calving the more likely to enter heat
- Proper nutrition is essential after calving
  - Nutritional requirements double while nursing a calf

Percent Likelihood of Estrus After Calving

Interval After Calving (days)	**Body Condition** (% cows cycling)		
	Thin	Moderate	Good
30	3	7	13
40	19	21	31
50	34	45	42
60	**46**	**61**	**91**
70	**55**	**79**	**96**
80	**62**	**88**	**98**
90	**66**	**92**	**100**

(ABS Global A.I. Management Manual, 5th ed.)

Conditions Affecting Cycling

- **Beef First Calf Heifers**
  - Take longer to begin cycling than cows
  - Higher nutritional demands
    - Must support their growth and milk production for calf
  - Good nutrition can shorten recovery time after calving
    - Require special attention to improve cycling rate
      - Separate heifers from cows several months before calving
      - Feed with goal of heifers being in moderate to good condition
  - As virgin heifers, inseminate 2 to 3 weeks before older cows

Conditions Affecting Cycling

Beef Virgin Heifers

- 3 factors affect when cycling begins
  - Age
  - Weight
  - Breed
- Inseminate 2 to 3 weeks ahead of cows
  - Provides more time for recovery before rebreeding
- Nutrition must be carefully watched to ensure:
  - High percentage are cycling
  - Heifers respond to synchronization drugs

QUESTIONS??