BOVINE THERIOGENOLOGY

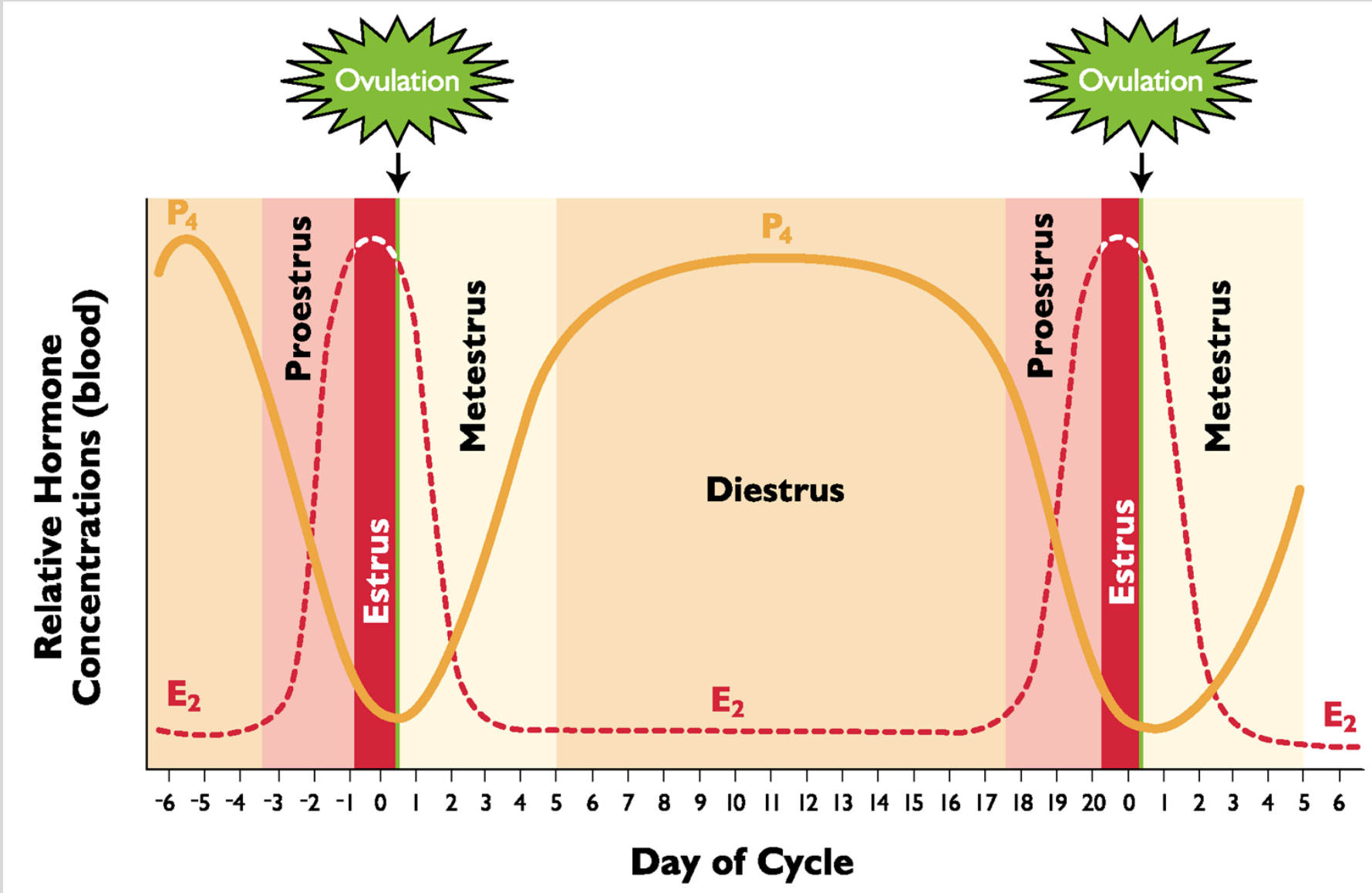
Dr. Gretchen Hopson, VMD

Lecture Structure

1. Review of the Bovine Estrus Cycle

2. Cycle manipulation and timed Artificial Insemination

3. Pregnancy Diagnosis: Ultrasound vs. Manual Palpation


Ovulation
Ovulation
P4
Proestrus
Estrus
Metestrus
P4
Diestrus
Proestrus
Estrus
Metestrus
E2
E2
E2
Relative Hormone Concentrations (blood)
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 0 1 2 3 4 5 6
Day of Cycle

Bovine Cycle (*Bos taurus)*

- 21 days on average in most cattle, 84% of cattle have a cycle length of 17-28 days.
- Most mature cows have 2 follicular waves. Heifers tend to have 2-3 follicular waves. This changes the choice of protocol for synchronization of ovulation for artificial insemination
- Nonseasonal breeders

Buffalo Cycle

- 21 days on average in most buffalo, but greater variation than in cattle
- Buffalo can vary from 1-3 follicular waves per estrus cycle
- Nonseasonal breeder, but can appear to have seasonality due to crop availability and variance in feed.

Item	Cows	Heifers
Estrus duration (h)	7.3 ± 7.2	11.3 ± 6.9
Conception rate (%)	<50	>50
Pregnancy Loss	High	Low
Multiple ovulation (%)	14	5
Twinning rate (%)	8	~1

Estrus is **short**!!

Ovulation is 12 hours AFTER estrus

Source:

University of Wisconsin- Paul Fricke

Estrus is **variable**

5-27 hours in length

Ovulation is 24-48 hours after estrus

Iran J Vet Res. 2020 Summer; 21(3): 163–171.

PMCID: PMC7608042

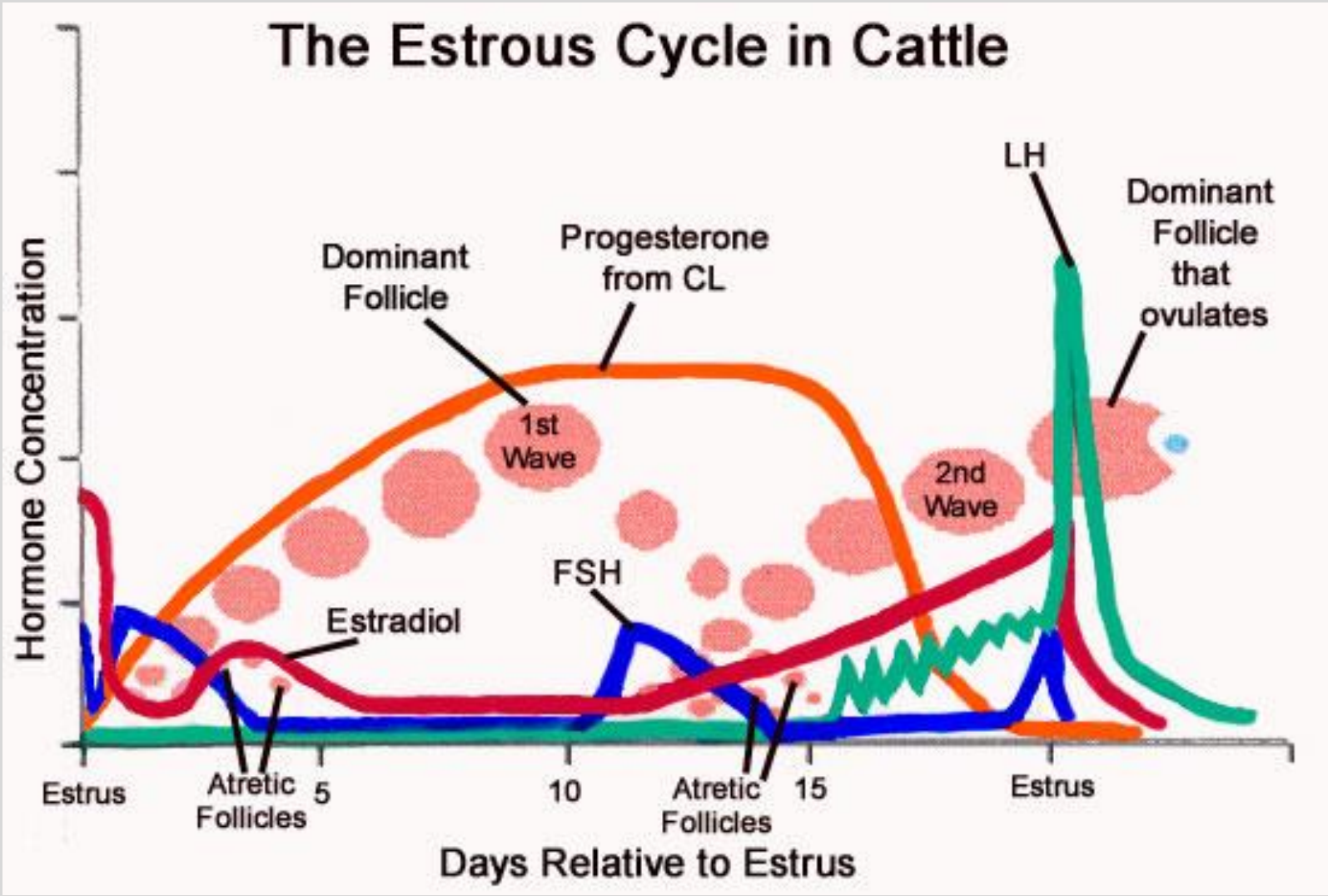
PMID: 33178293

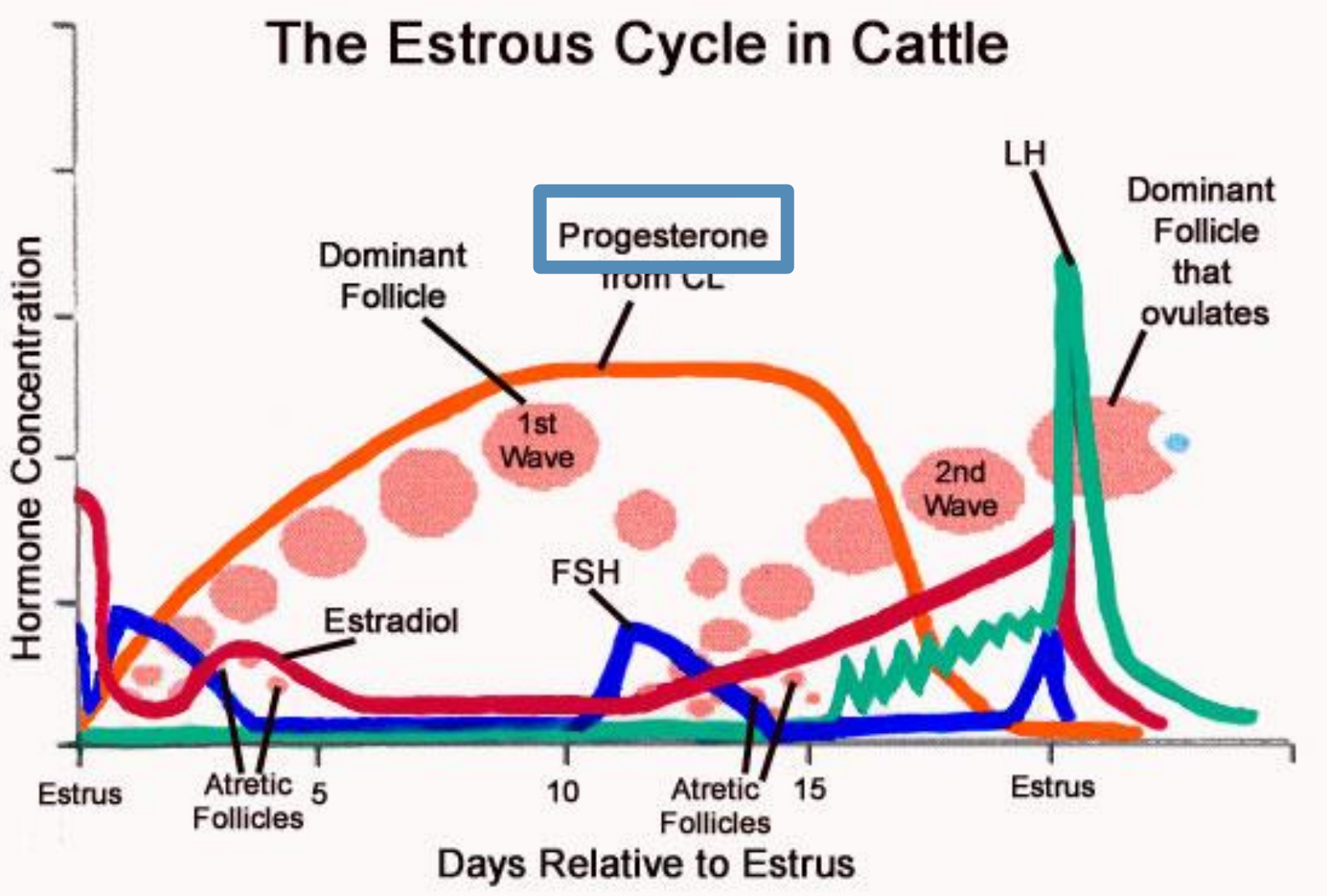
Reproductive enhancement in buffalo: looking at urinary pheromones and hormones

G. Archunan

Why is estrus synchronization and artificial insemination a benefit to all producers?

1. Quickly advances the quality of genetics within a herd despite the number of livestock owned by a producer
2. Eliminates the need for breeding bulls that are often aggressive and costly to maintain
3. Reduces the spread of venereal disease
4. Lessens the need for visual heat detection improving pregnancy rates


The Estrous Cycle in Cattle
Hormone Concentration
Dominant Follicle
Progesterone from CL
LH
Dominant Follicle that ovulates
1st Wave
2nd Wave
FSH
Estradiol
Estrus
Atretic Follicles
5
10
Atretic Follicles
15
Estrus
Days Relative to Estrus



Progesterone

-made by the Corpus luteum (CL)

-sustained during pregnancy

-prominent in diestrus

-**CIDR**:
'artificial' CL

-**MGA**:
Melangesterol acetate; orally active progesterone

CIDR (Controlled Internal Drug Release) of Progesterone

Most common product in the US is made by Zoetis

Advantages*:

-More cows and heifers become pregnant earlier, resulting in higher pregnancy rates.

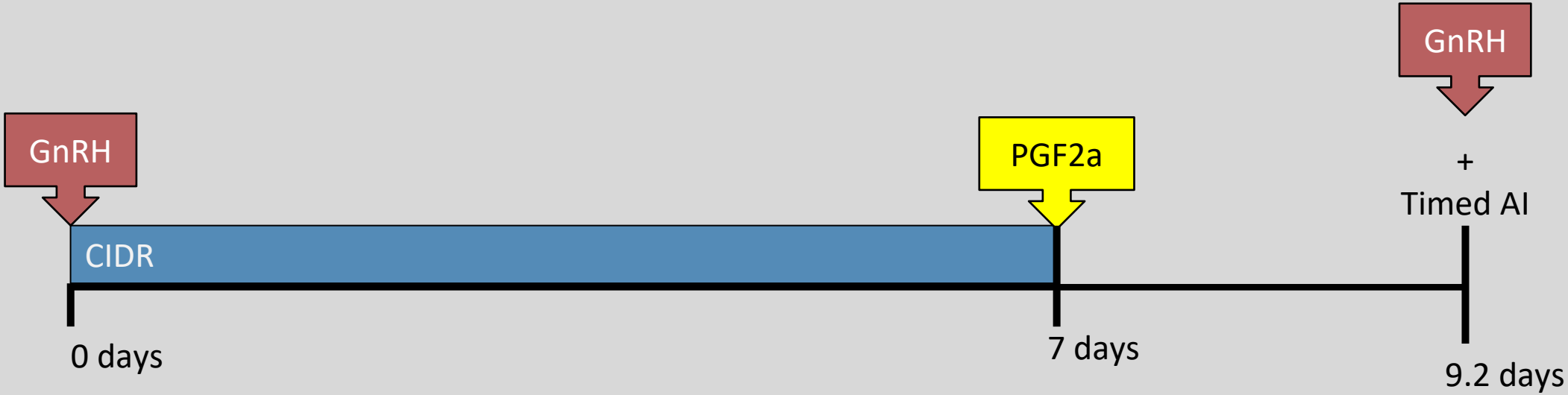
-Easier and more accurate heat detection.

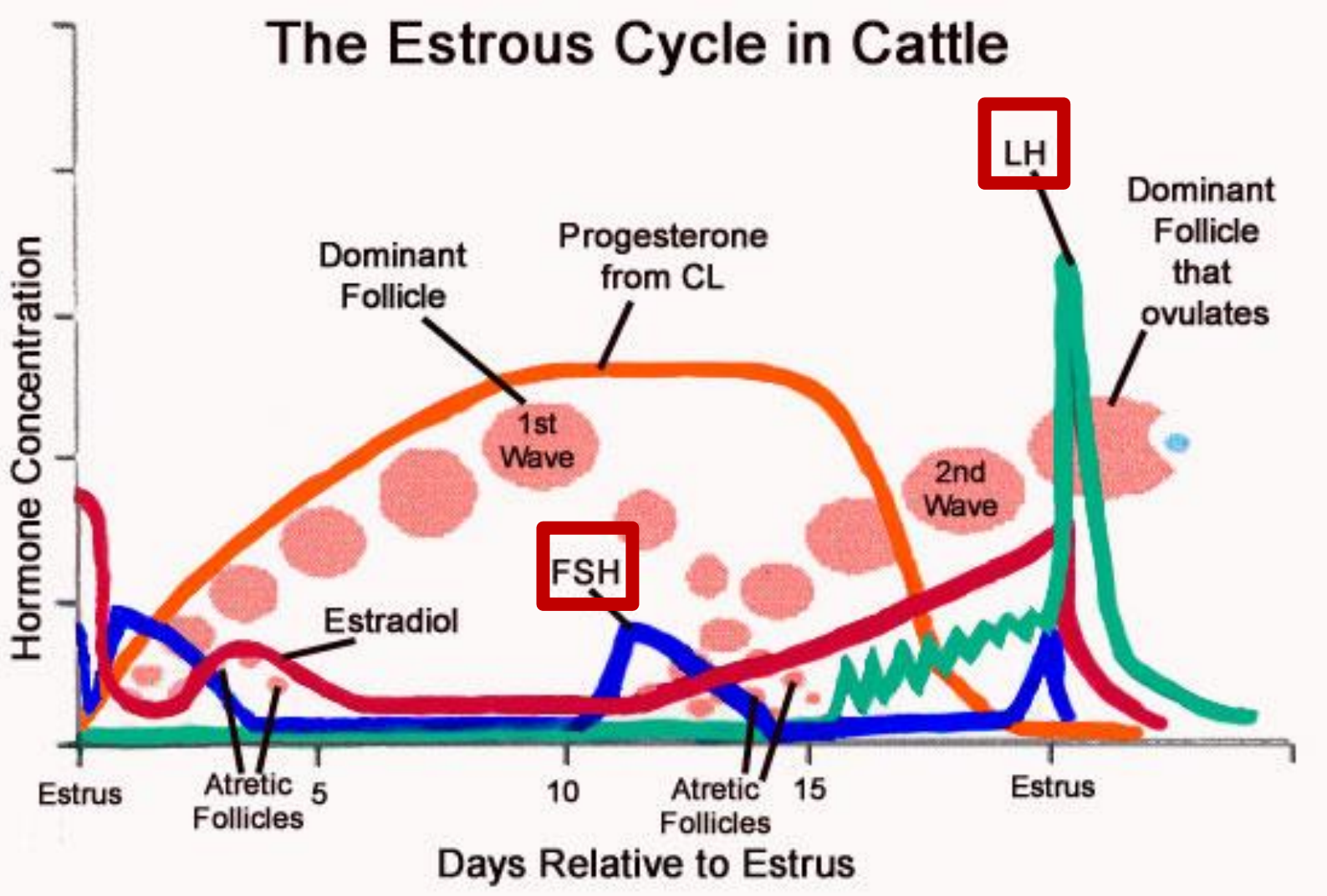
-More focused heat detection and easier AI breeding within a narrower window of time.

-Heifers freshening at a younger and more consistent age.

*Source: Zoetis®

7 day CoSynch + CIDR®





GnRH- Gonadotropin releasing hormone

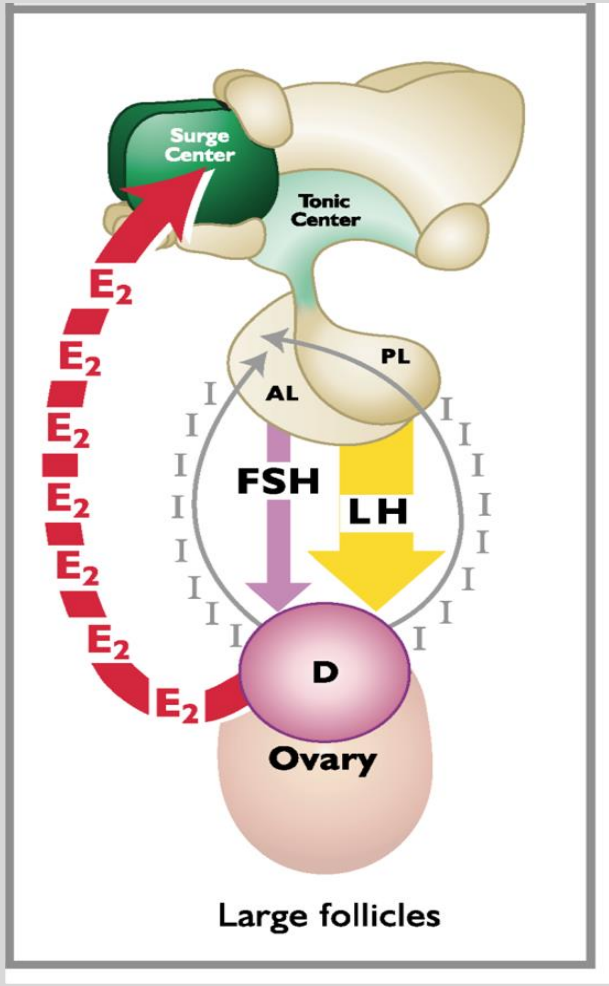
-Increases follicle stimulating hormone (FSH) and increases luteinizing hormone (LH)

-GnRH is made by the hypothalamus which increases the production of FSH by the anterior pituitary and the production of LH by the posterior lobe of the pituitary

GnRH- gonadotropin releasing hormone

Commonly available product for intramuscular injection: gonadorelin

Dose of Factrel ®:
2-4mL (100-200mcg) per cow
Intramuscularly

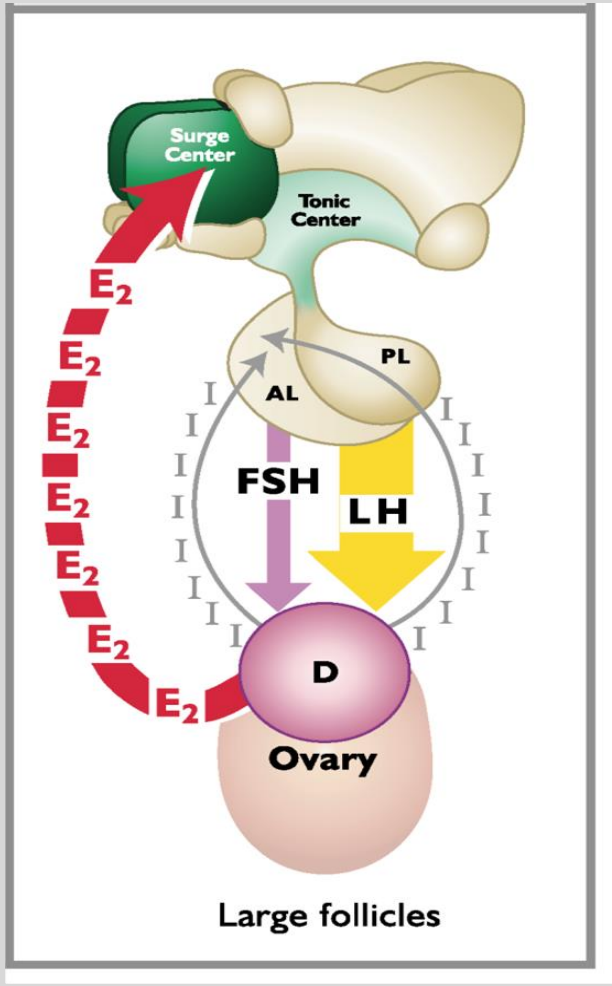


Estradiol cypionate (ECP)

Not licensed for use in the United States.

INDICATIONS
To apply in the following cases in cattle:

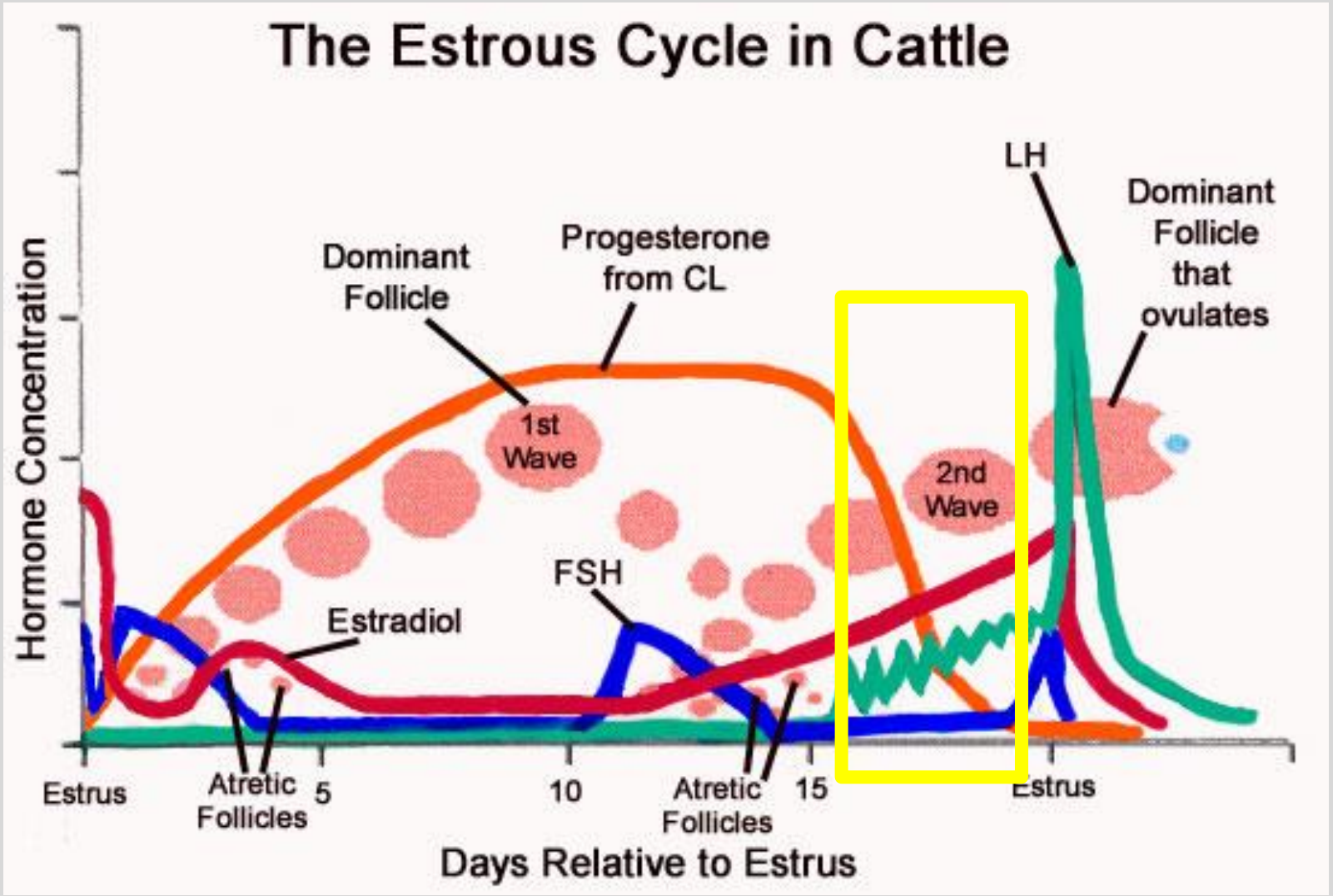
- Treatment of persistent corpora lutea.
- Expulsion of exudates and purulent material (metritis and pyometras).
- Assist in the expulsion of retained placenta and mummified fetuses.
- In heat synchronization programs. Source: Zoetis



Estradiol cypionate (ECP) vs. GnRH

- ECP is an alternative to GnRH for upfront follicle control, but may not be as effective as GnRH for anestrous cows.
- If ECP is used upfront at CIDR insertion, the CIDR must be in place for 9 days, rather than 7 days when using GnRH.
- **Pregnancy rates to TAI tended to be greater in suckled cows when treated after PGF2a with ECP than GnRH.**

Source: Kansas State Research and Extension



PGF2a-prostaglandin

Leuteolytic hormone reducing progesterone levels allowing for an estrogen surge and ovulation

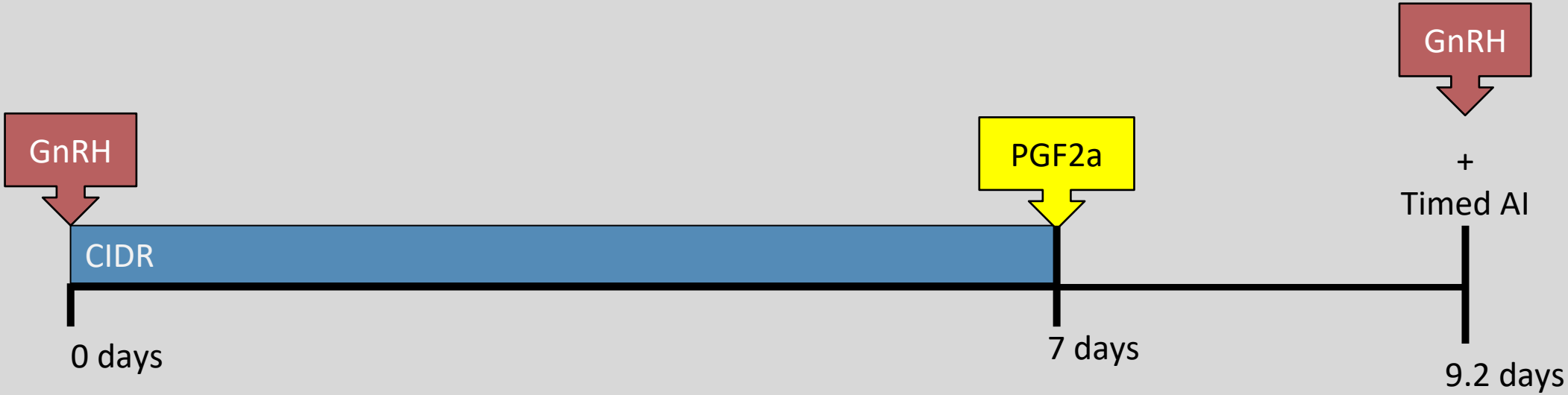
PGF2a-

-An example of a common synthetic prostaglandin is dinoprost

-PGF2a can also be used for induction of parturition and for the resolution of metritis

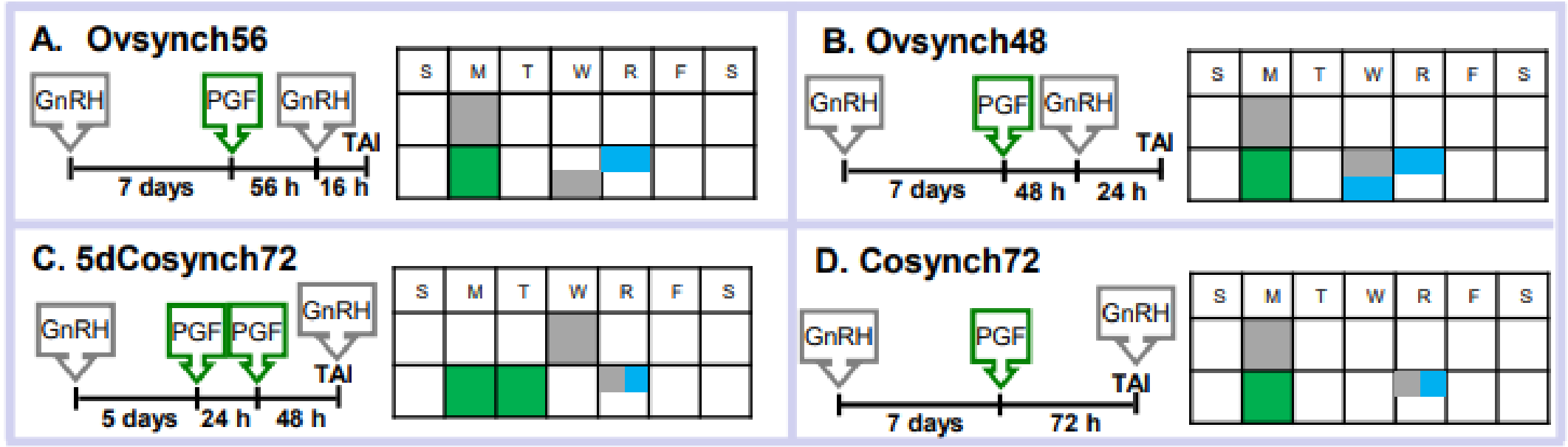
Lutalyse® Dose: 25mg IM
(this would be 2mL IM of Lutalyse HighCon ®)

7 day CoSynch + CIDR®



Ovsynch methods used for TAI

Can be used alone or with presynchronization methods (see above). Programs can be used with or without EDAI.



A CIDR can be used with any of these programs (CIDR Ovsynch). The CIDR is inserted at first GnRH and removed at PGF. An example would be CIDR-Ovsynch56.

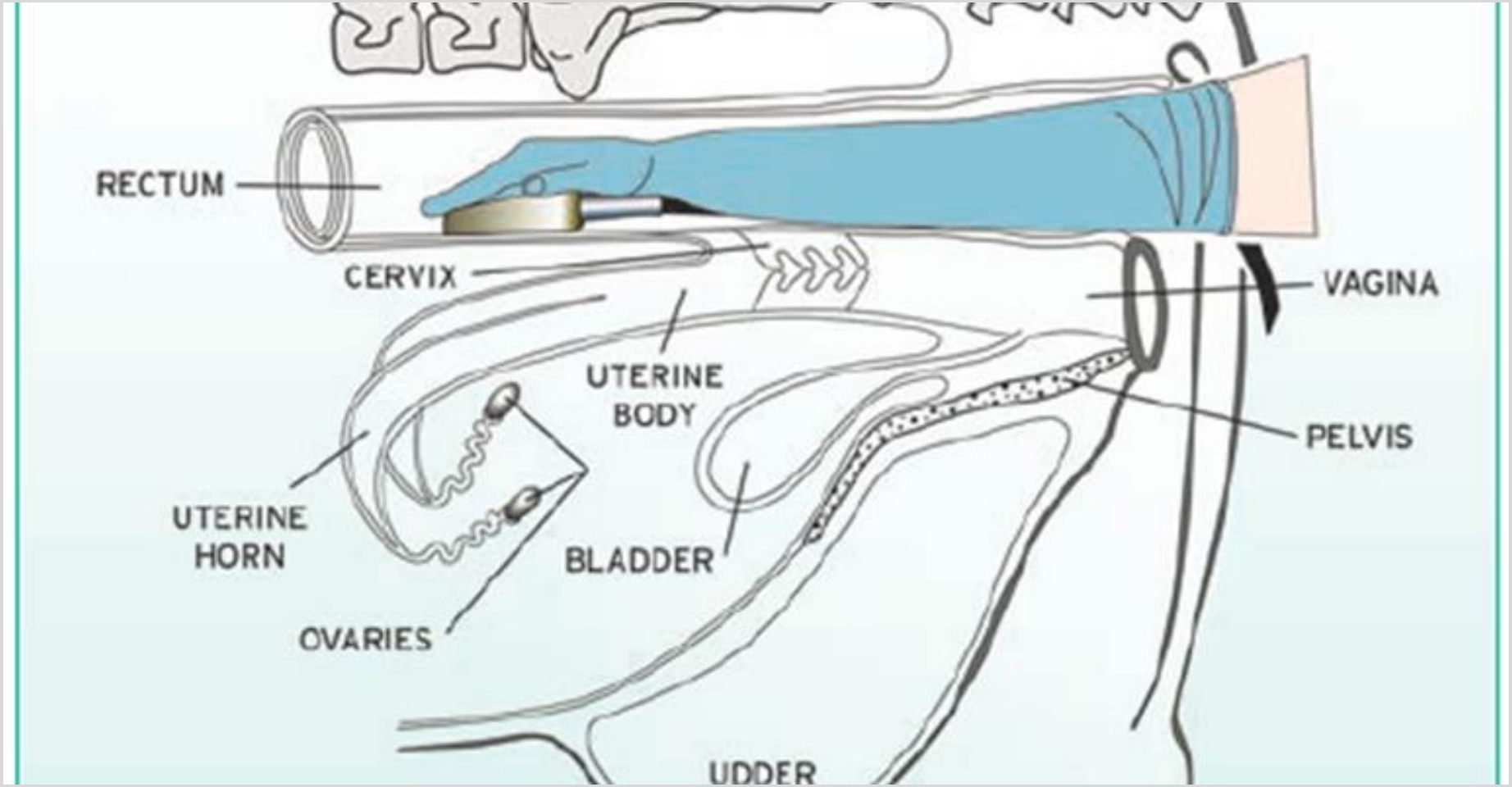
Source: https://www.dcrcouncil.org/wp-content/uploads/2017/03/Dairy_Cow_Reproduction_Protocols_Final09302015.pdf


Alembic
OXEL INJ

Ultrasound of the Bovine Uterus per rectum

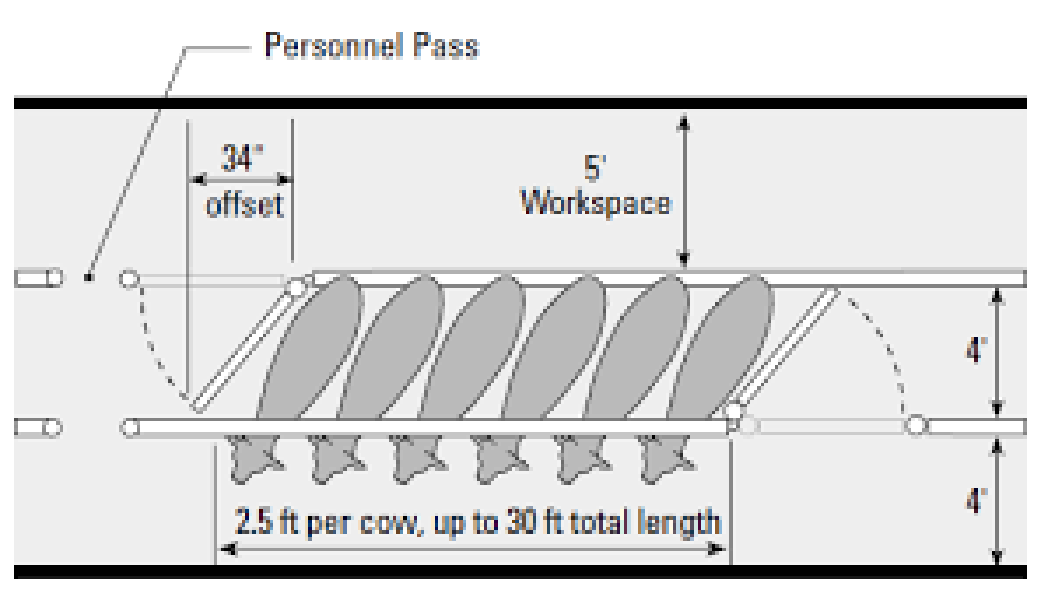
Advantages:
-earlier pregnancy diagnosis
-more accurate assessment of ovarian structures (e.g. follicular vs. luteal cyst)
-knowledge of fetal viability
-fetal sexing (54-65 days of gestation)
-efficient diagnosis of pyometra, endometritis, neoplasia
-early detection of twin pregnancy
-less trauma at early gestation with the rare need to retract the uterine horns

Disadvantages:
-initial investment
-need for extensive experience and training with equipment
-expensive to repair



Sourcehttps://www.imv-imaging.in/veterinary-learning/farm-animal-learning/reproductive-tract/the-use-of-ultrasonography-in-oestrus-synchronisation-programs-for-cows/

- **Insist on proper restraint any time you are palpating a cow or buffalo, but especially when using ultrasound!**



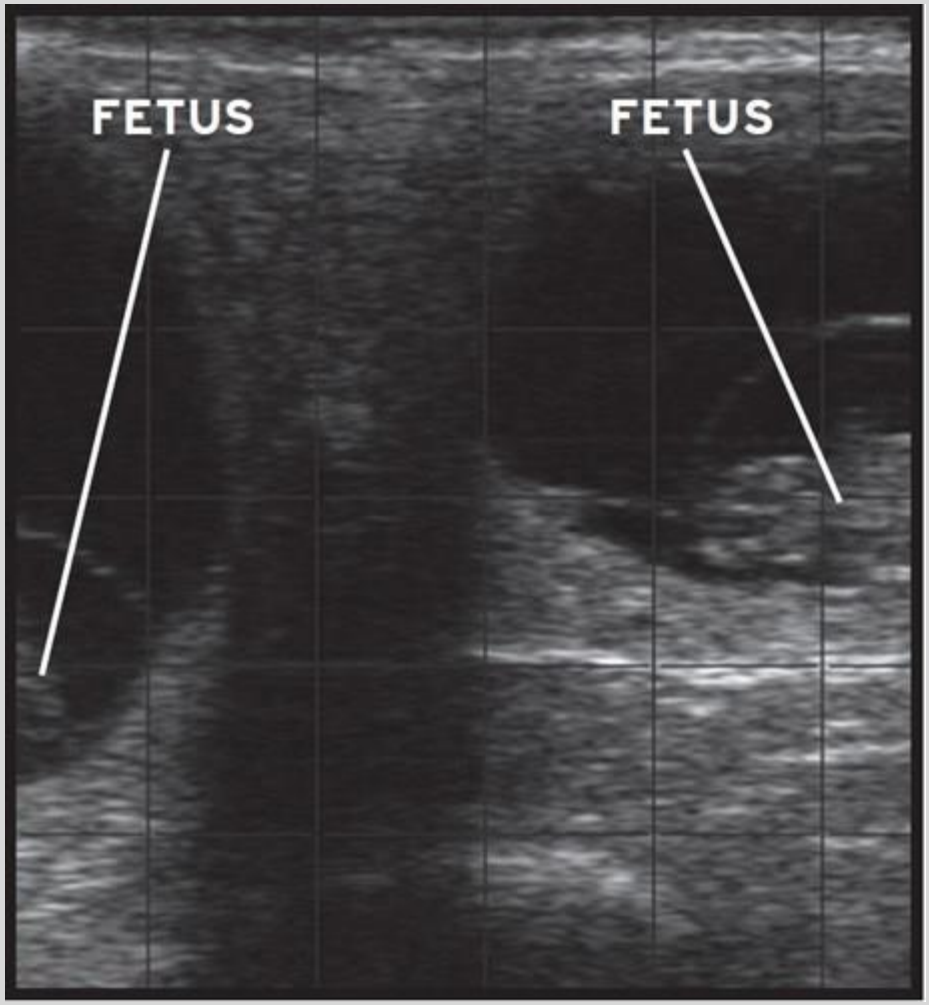
Source: https://mountainscholar.org/bitstream/handle/10217/68088/Adams_colostate_0053N_11306.pdf;sequence=1

Additional examples of good restraint:

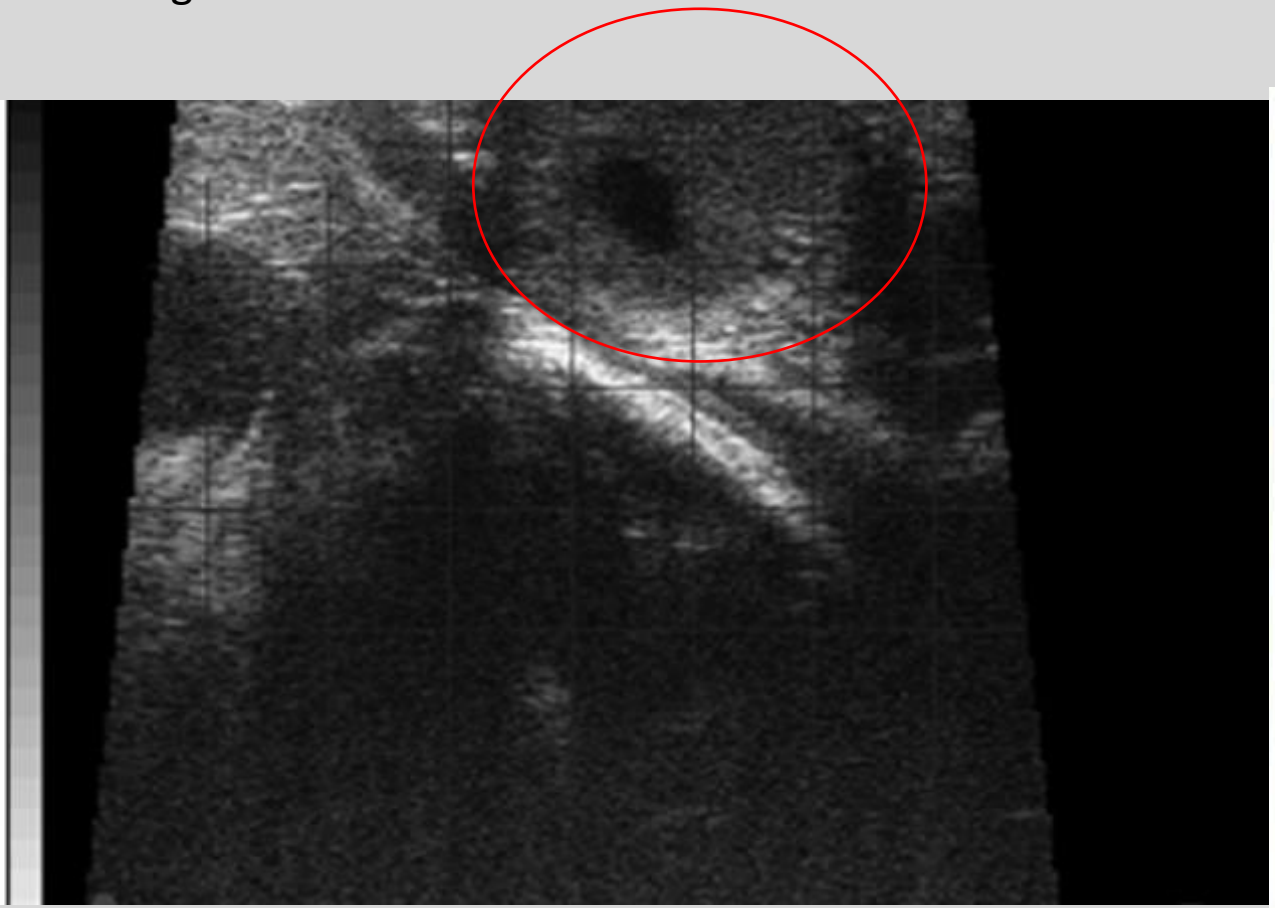
Source: https://extension.uga.edu/publications/detail.html?number=B1416&title=Managing%20Mastitis%20in%20Dairy%20Heifers%20to%20Improve%20Overall%20Herd%20Health

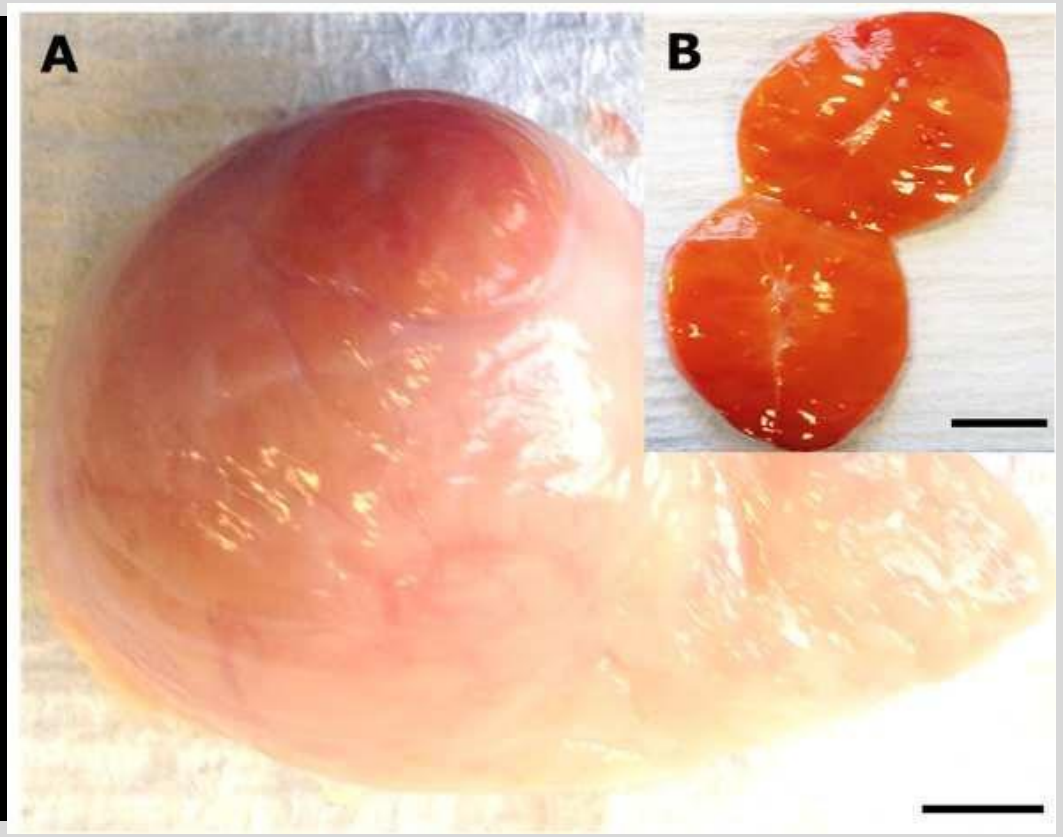

BCF Technology
Easi-Scan:Go

Twin Pregnancy

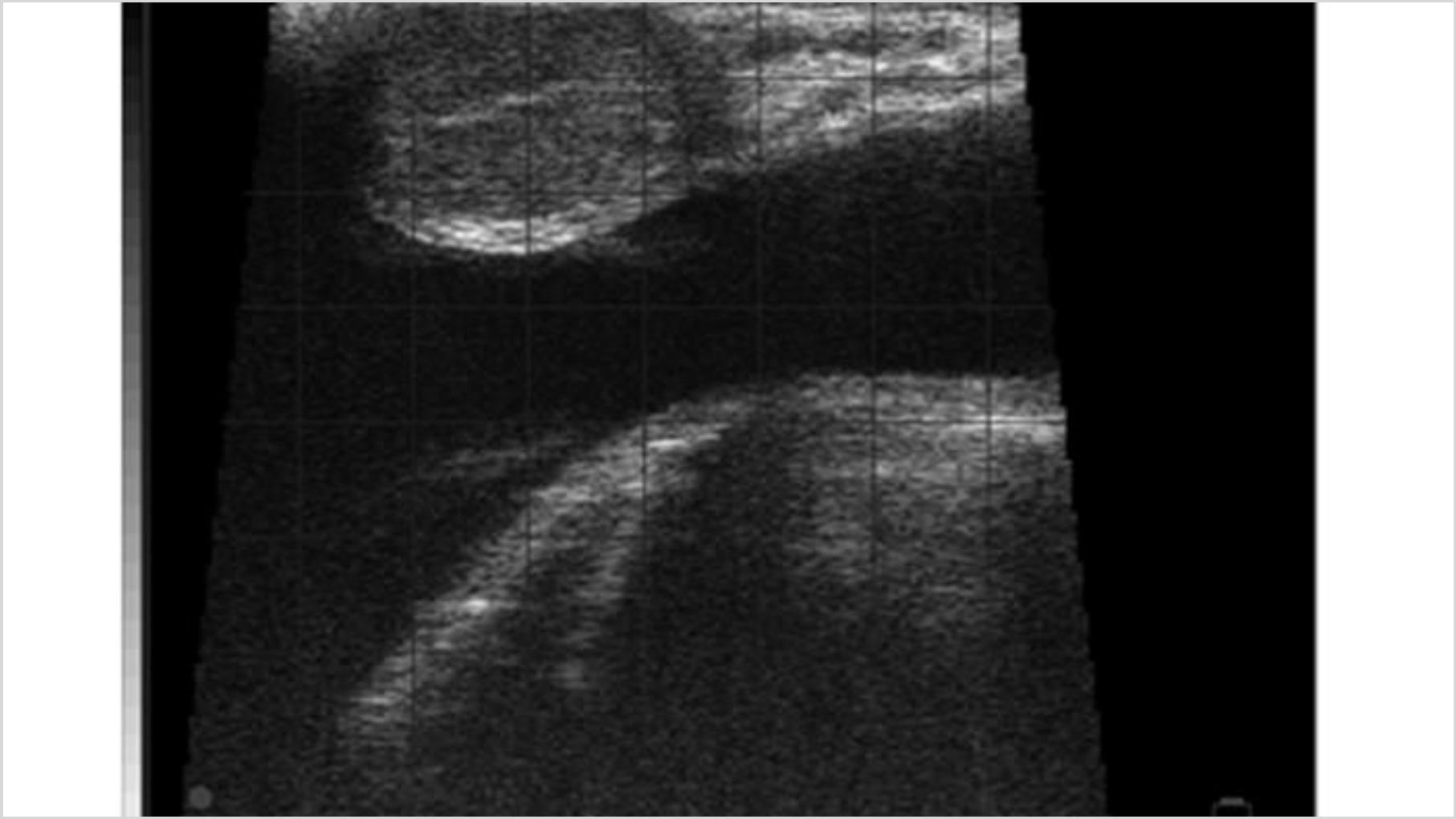


Scanning ovarian structures:





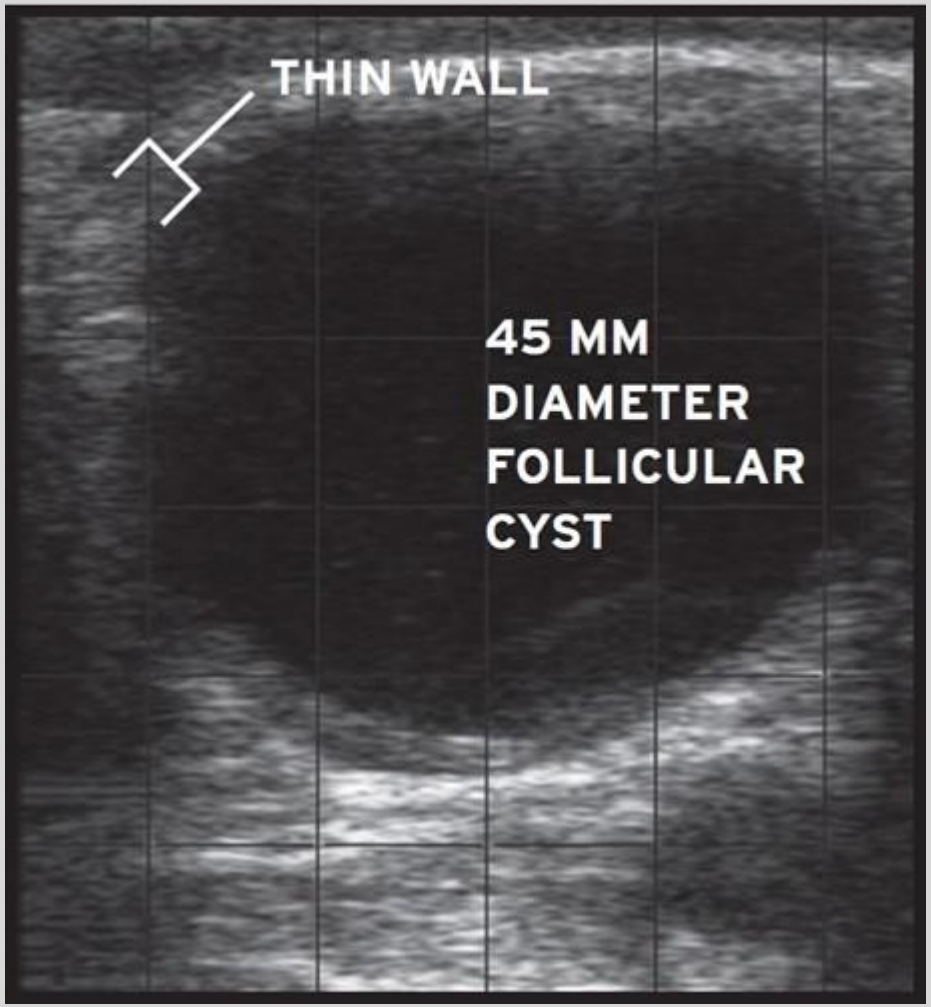
Source: https://www.imv-imaging.in/search?q=Reproductive%20tract&filters=Learning

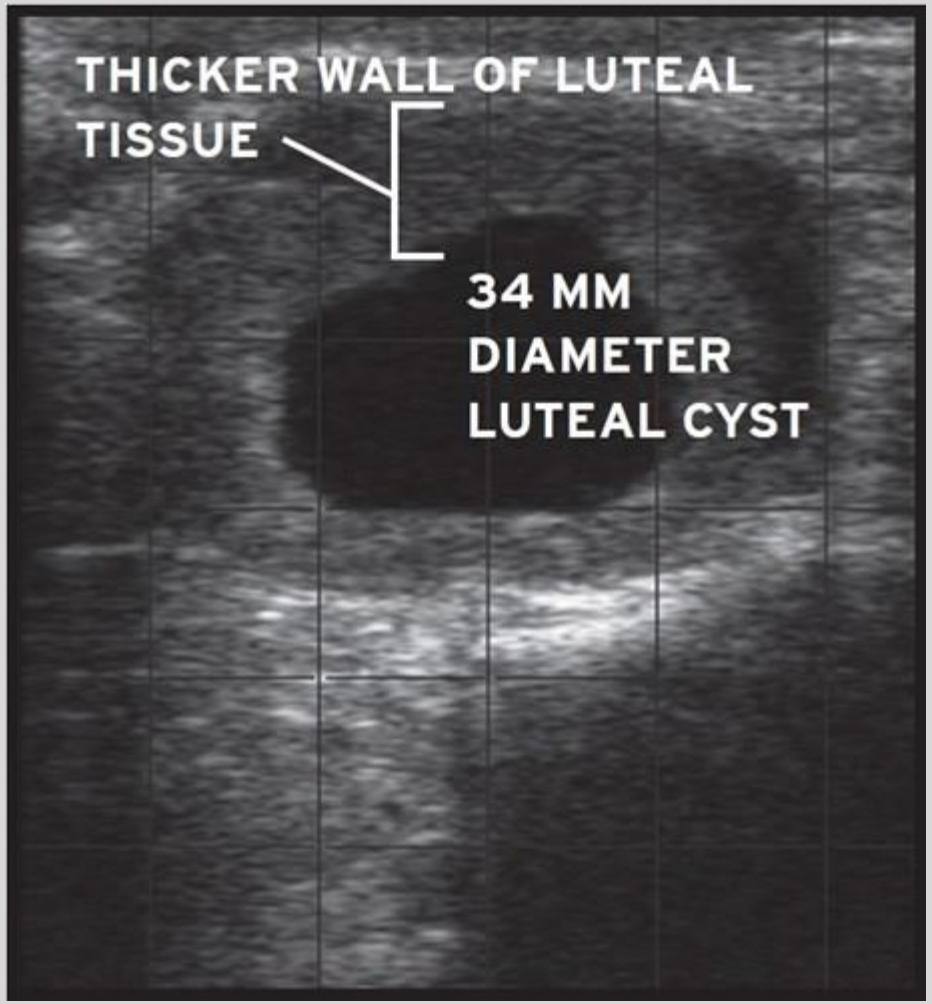


Source: https://www.imv-imaging.in/search?q=Reproductive%20tract&filters=Learning

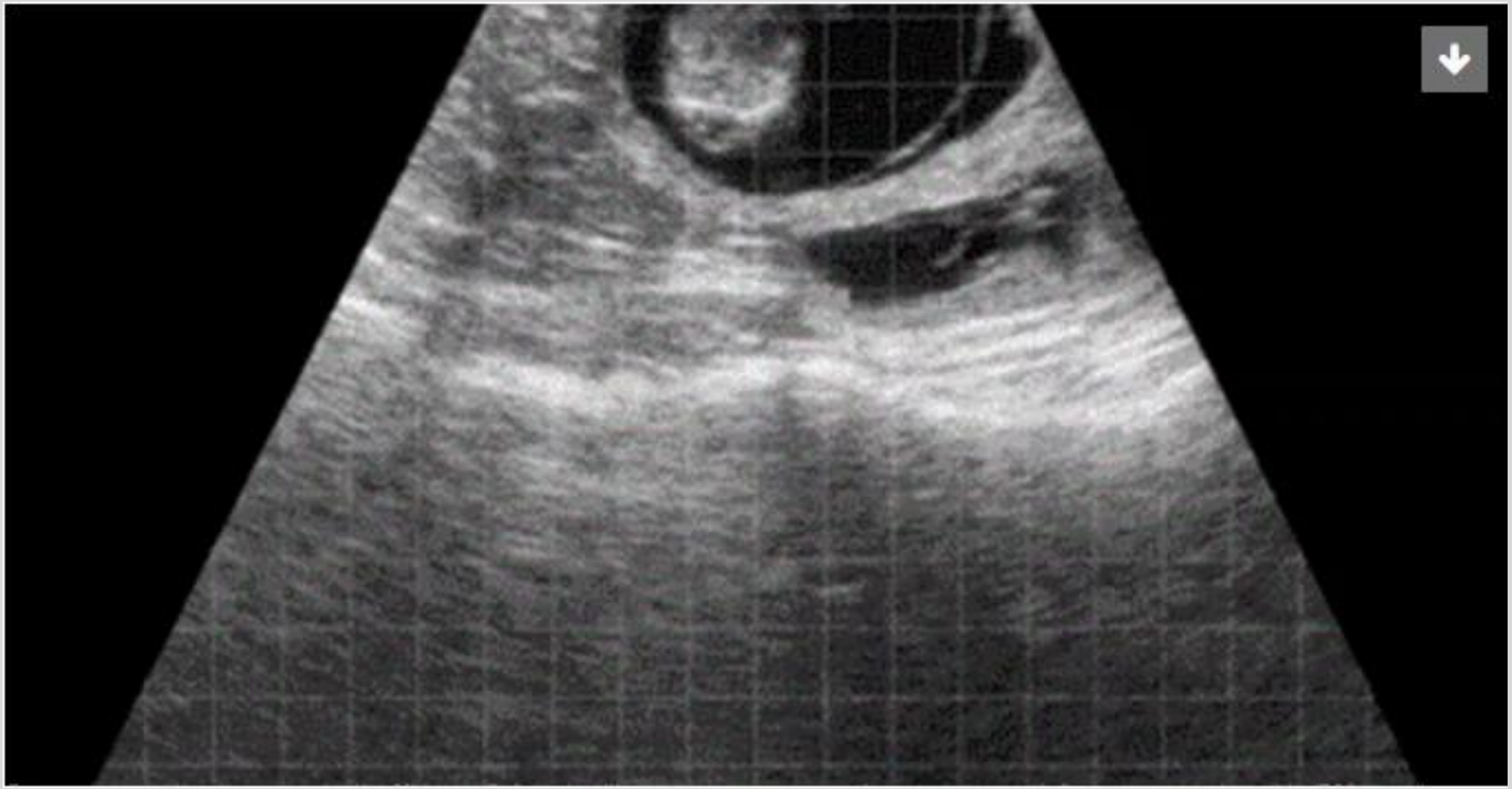
Ovarian follicles

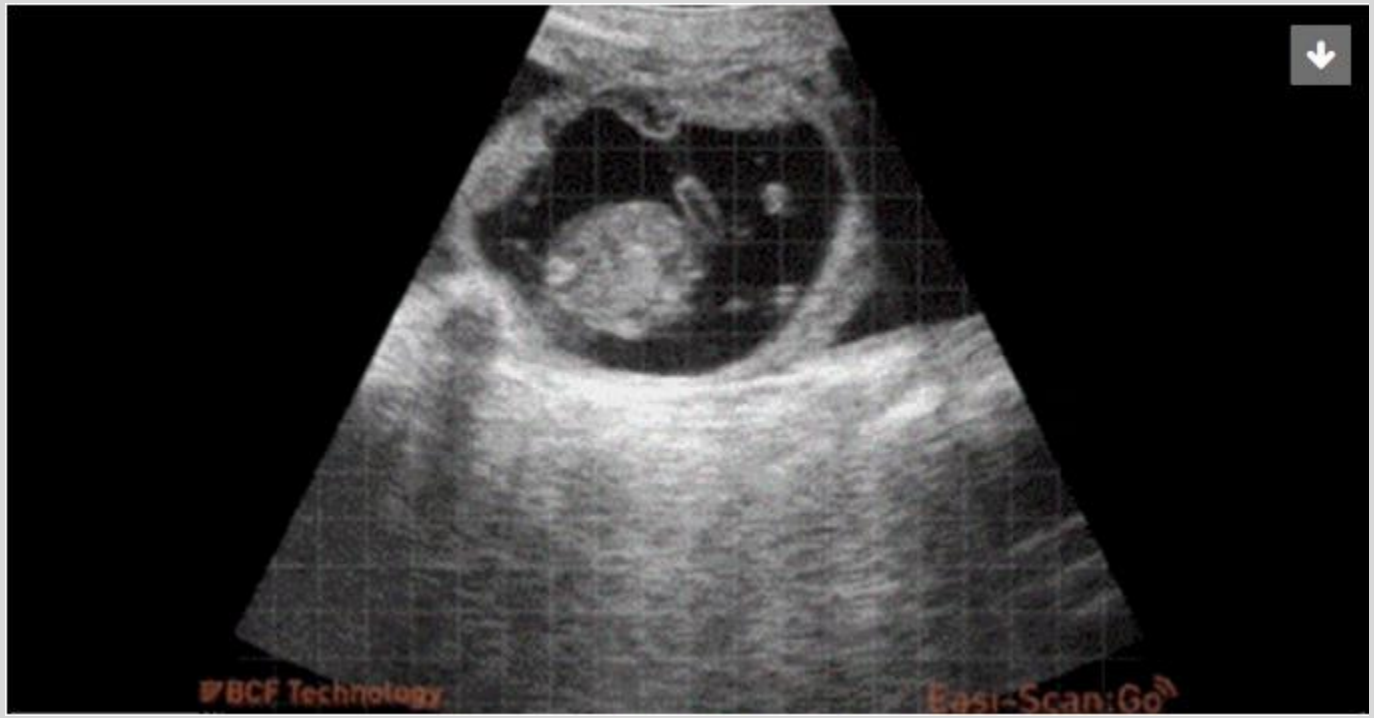
Source: https://www.magonlinelibrary.com/doi/abs/10.12968/live.2018.23.4.154?journalCode=live





Source: https://www.imv-imaging.in/veterinary-learning/farm-animal-learning/reproductive-tract/evaluation-of-ovarian-and-uterine-structures-in-cows/




BCF Technology
Easi-Scan:Go

Metritis in the bovine uterus:

Other common uses of an ultrasound in bovine medicine:

- Teat structure, disease
- Rumen motility
- Calf pneumonia diagnosis
- Omphalitis vs. umbilical hernia

Thank you!