Dr. Hussein Abbas Khamees, *PhD. Theriogenology*
Department of Surgery and Obstetrics, College of Veterinary Medicine
University of Al-Muthanna, Samawa, Iraq
hussinabbaskhamees@mu.edu.iq

ASSISTED REPRODUCTIVE TECHNIQUES

Assisted reproductive techniques (ART): A medical procedure used mainly to address infertility. It is including procedures such as *in vitro* fertilization, intracytoplasmic sperm injection (ICSI), and/or may involve the use of fertility medication. The Assisted reproductive techniques in veterinary medicine are called (Reproductive Techniques) and it is including:

1. Estrous synchronization.
2. Superovulation.
3. *In vitro* fertilization.
4. Intracytoplasmic sperm injection (ICSI).
5. Embryo transfer.
6. Laparoscopic intrauterine insemination.
7. Sperm sexing.
8. Animal cloning and embryo splitting.
9. Ultrasonography technique.

ESTROUS SYNCHRONIZATION

Estrous synchronization involves the use of one or more hormonal and non-hormonal methods to get females into heat within a short period (36 to 96 hours). New methods are developed daily for improving our ability to synchronize heat and/or result in timed insemination without heat detection.

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Uses of estrous synchronization:

1. Make a large number of females come into estrous at the same time.
2. Increasing the pregnancy rate, getting cows pregnant faster (shortening average days open), and helping heifers to become pregnant.
3. Used in dairy farms to ensure an increase in the daily milk production rate.
4. Fattening calves' programs and increased deliveries shorter time than normal.
5. Avoid failures due to bad estrus detection or poor estrus expression.
6. Treatment of repeat breeders and different anestrus conditions (including the presence of inactive ovaries, small follicles, and follicular cysts)
7. Exact synchronization of donors and recipients in embryo transfer and IVF programs.

1. Estrus synchronization in the cow:

A. Using the Prostaglandins: The hormone, prostaglandin ($PGF_2\alpha$), was the first available for estrous synchronization. Prostaglandin systems work equally well for cows or heifers. Cows must be cycling for $PGF_2\alpha$ to have any effect.

1. One injection protocol:

This system is used where heat detection is practiced, and drug costs are a concern. If less than 3% of cows can be found in heat per day before injection, abandon the idea (60-70%) of cows will be bred AI using this system.

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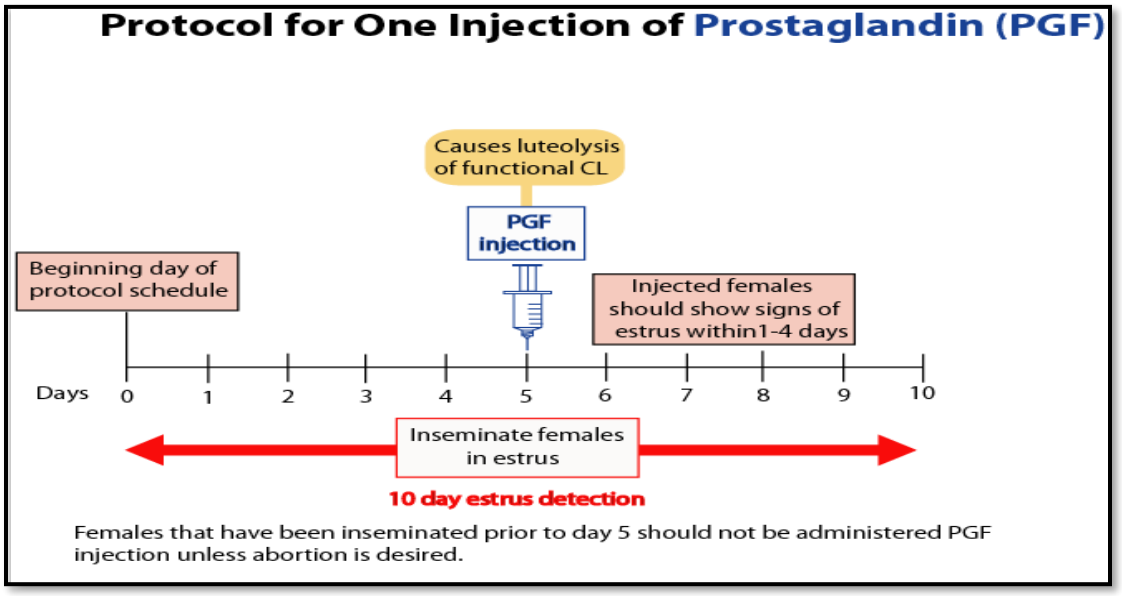

2. Two Injection protocols:

This system was used to bring more cows in heat during the AI period (90%). Heat detection must be practiced. If extended heat detection is not a concern but drug costs are a problem, then animals can be heat checked and bred after the first injection of $PGF_2\alpha$. Animals not showing heat following the first injection would then be administered a second $PGF_2\alpha$ injection 11-14 days later and then bred.

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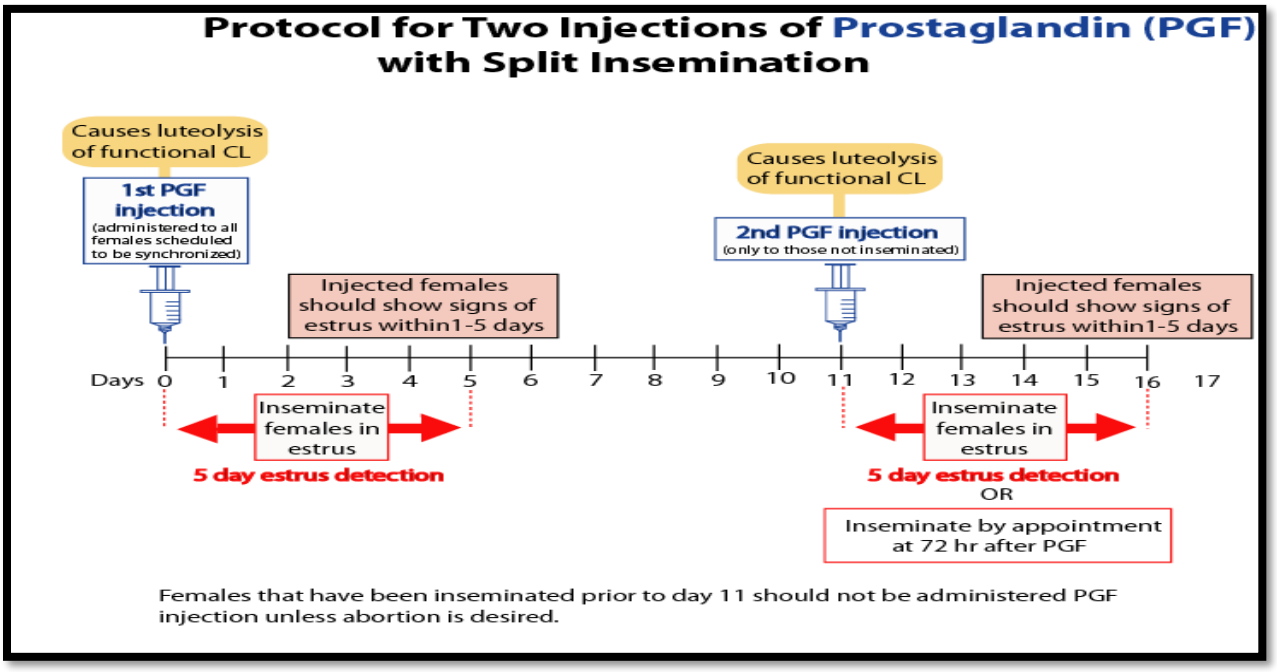

B. Using progesterone: progesterone-like compounds have been frequently tried over the years as a method of estrus synchronization. Two have been commercially available.

1. Using MGA & $PGF_2\alpha$:

Synthetic progesterone (Melen-gesterole-acetate) has been used with prostaglandins ($PGF_2\alpha$) for synchronization. This protocol takes advanced planning and requires bunk feeding. This program works best with larger groups of heifers that are already fed grain and where heat detection is practiced. Animals will show heat after MGA feeding is stopped, but their fertility is reduced (<20% pregnancy rate). These animals should not be bred.

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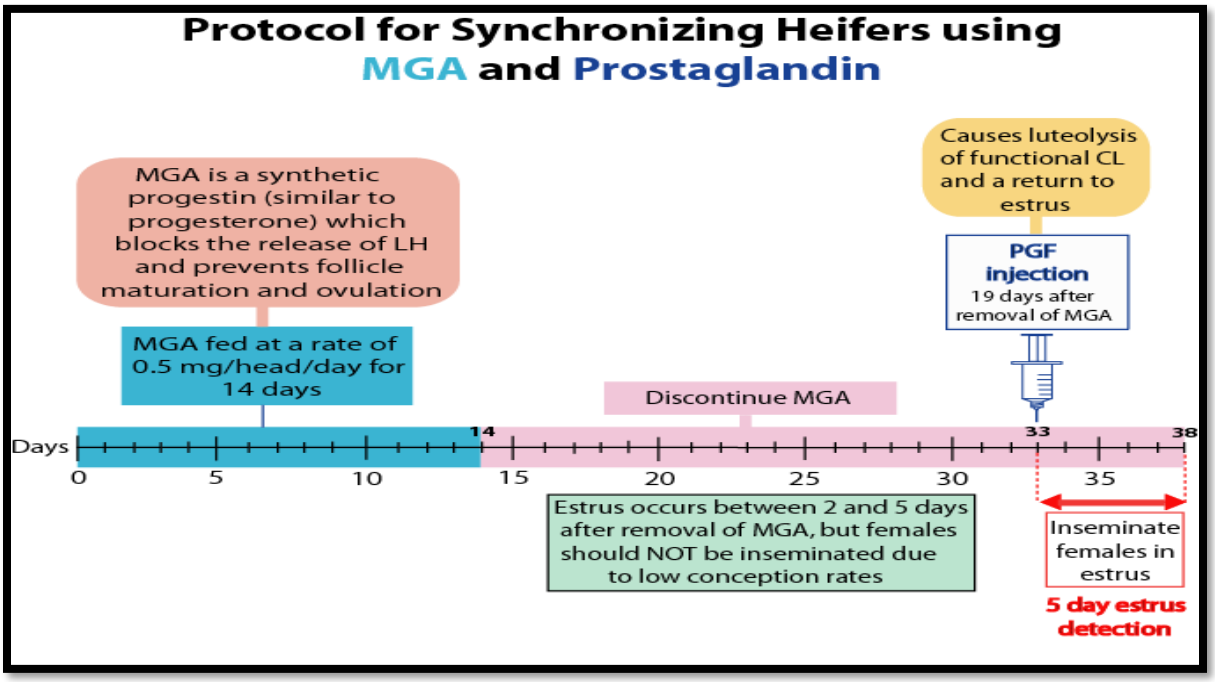

2. Using PRID or CIDR with PGF$_2\alpha$:

Progesterone Releasing Intra-Vaginal Device (PRID) is a revolutionary device (Delta shape) made from a poly-ethylene spine and EVA (ethyl vinyl acetate) for faster and more consistent release of progesterone. Once inserted, PRID Delta provides a controlled release of **1.55g of natural progesterone**. A progesterone-containing device that is inserted into the cow vagina has become commercially available. The surface area of the PRID Delta and its presentation within the uterus ensures contact and exchange with the vaginal environment. The increased surface area has been suggested as a parameter that could be used to increase plasma progesterone levels - PRID Delta surface area is 155cm^2 compared with 120 cm^2 for Control Internal Drug Release (CIDR) (T-shape) device.

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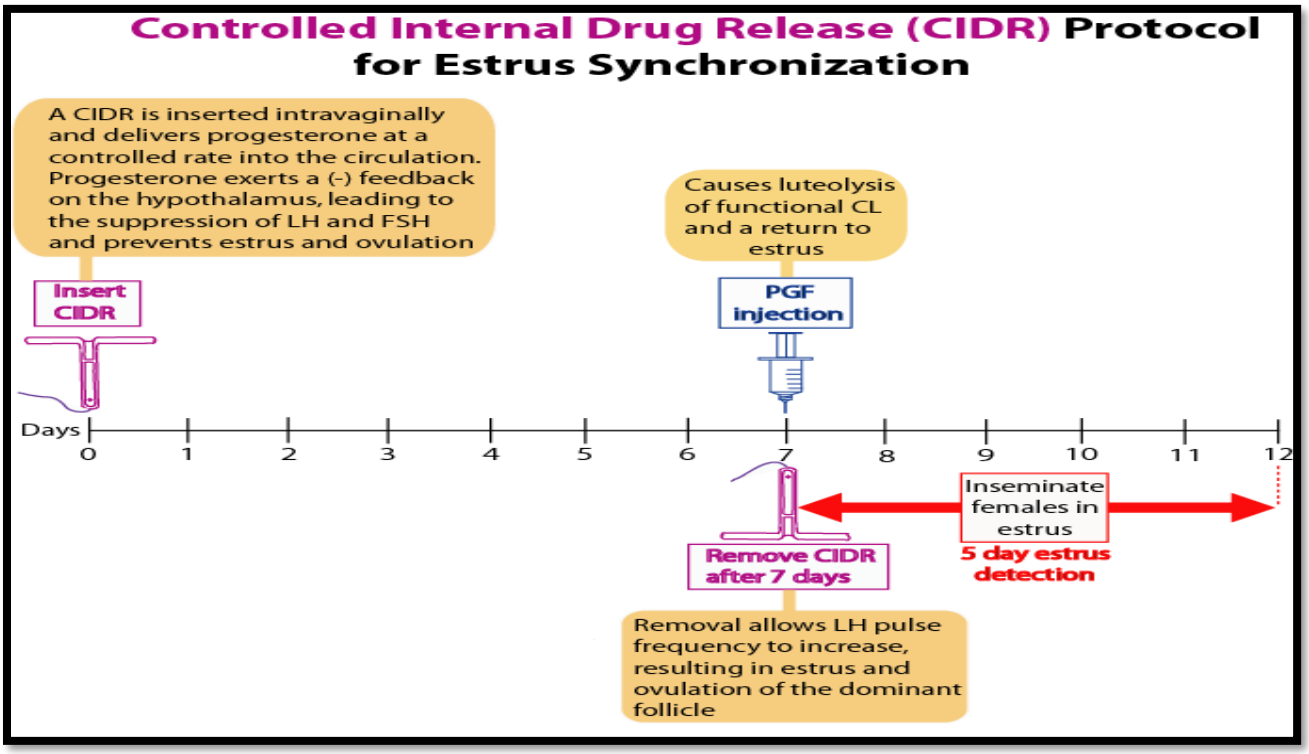

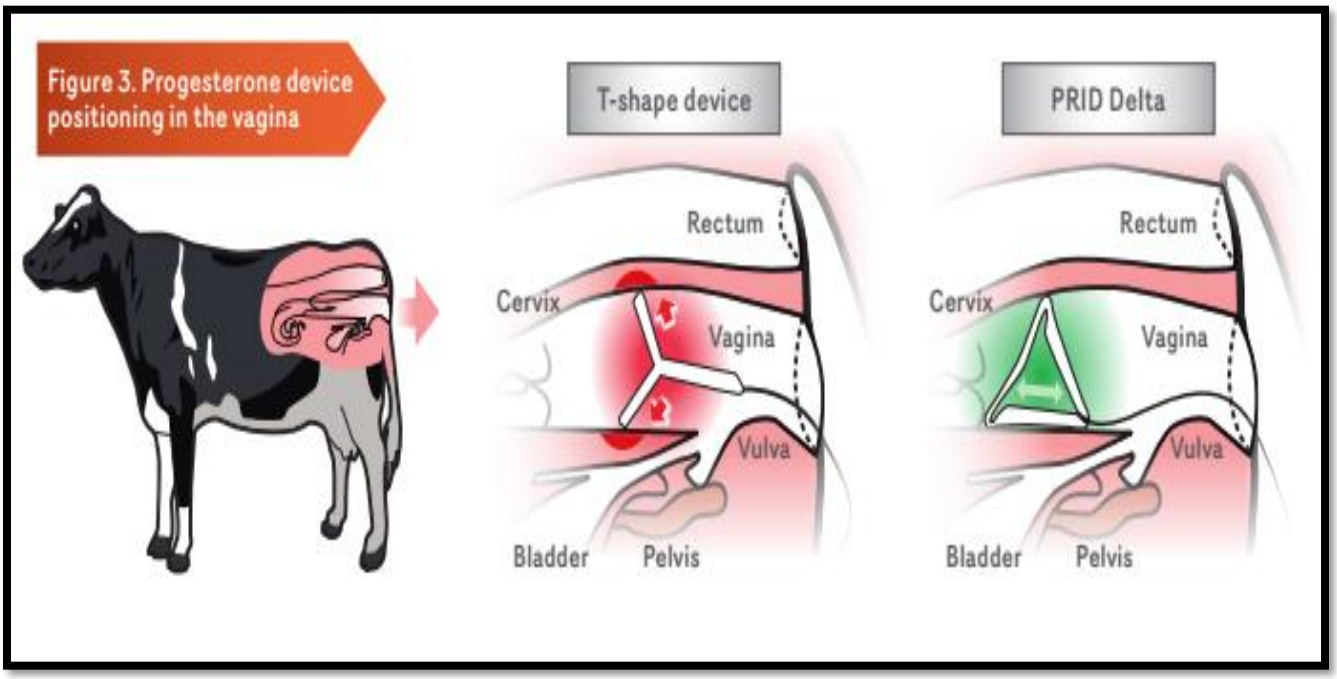

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C. Using the GnRH+ $PGF_2\alpha$: recently, the hormones GnRH and prostaglandins have been used together for estrous synchronization. The effectiveness of these programs in heifers is being researched, timed breeding results in pregnancy rates similar to other timed breeding programs (40%-60%).

- **Ovsynch:** using GnRH and $PGF_2\alpha$ to synchronize ovulation in lactating dairy cows. Ovsynch was the first synchronization protocol developed that allowed for an AI resulting in conception rates similar to that of AI after detected estrus.
- **Co-Synch** is a specific form of Ovsynch in which the AI occurs at the time of the second GnRH injection. The advantage of Co-Synch is that one less handling is required for each cow compared to Ovsynch; the disadvantage of Co-Synch is that conception rates may not be optimized compared to AI at 12-18 h after Ovsynch.

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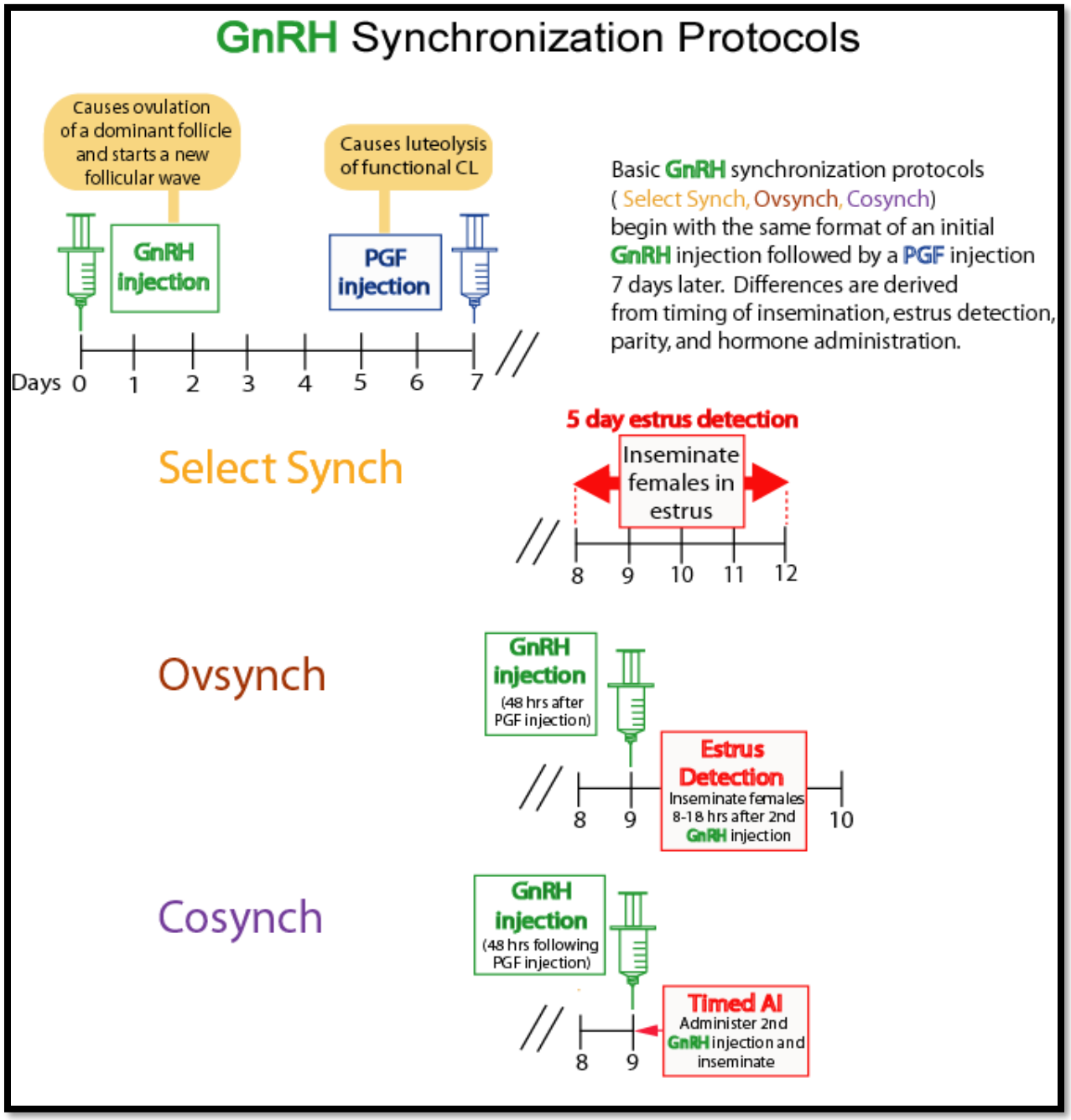

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2. Estrus synchronization sheep and goat:

Estrous synchronization in sheep and goats was complete by many protocols: [vaginal sponges, CIDR, and synchromate-B (implants)].

A. Vaginal Sponges:

1) **Day 1**: Insert sponge, CIDR, or whole SMB implant for 12 days. (Use clean technique), lubricate the applicator of sponges or CIDR and insert at an upward angle.

2) **Day 12**: Remove sponge, CIDR, or whole SMB implant and inject (400 IU PMSG) or (600 IU $PGF_2\alpha$) or (200 IU HCG).

3) **Day 13**: Introduce **teaser ram** to better synchronize ewes and to mark ewes as they come into heat.

4) **Day 14**: Inseminate ewes 52-55 h after progesterone device removal, or 10-18 h after ewe is marked by teaser ram.

5) **Day 24**: Reintroduce teaser ram and then inseminate 10-18 h after ewe is marked or introduce fertile ram (1 ram to 5 ewes).

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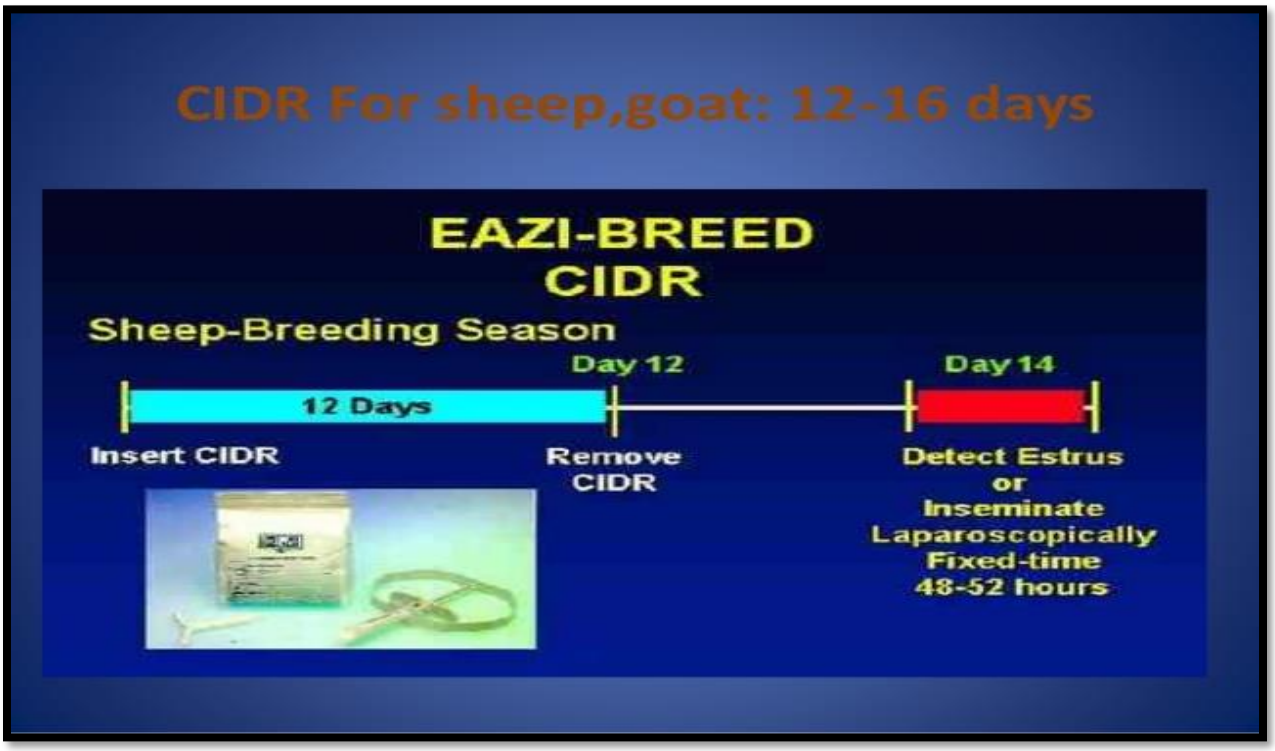
Vaginal sponge



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B. Using the prostaglandin: the mechanism of action for prostaglandins is to induce the regression of the CL, thus interrupting the existence of progesterone from the CL and telling the body that no pregnancy exists. The ewe will ovulate within a very predictable time. It is completely ineffective in non-cycling ewes when no CL exists.

- ✓ When a single treatment of prostaglandin is given to a flock of cycling ewes, 60 to 70% of the flock will exhibit a synchronized estrous beginning 30 to 48 h later.
- ✓ If complete synchronization of the flock is required: 2 treatments 9 days apart are needed. Combining a 7-day CIDR or SMB implant of progestin with prostaglandin is also effective.

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Method: using a (Lutalyse or Estrumate):

- **Day 1**: Inject Lutalyse at 15 mg. = 3cc or Estrumate at 150 mg = 6cc (intramuscular injection)
- **Day 10**: Repeat injection of the same dose.
- **Day 11**: Introduce teaser ram.
- **Day 12-14**: Inseminate ewes 10-12 h after ewe is marked by teaser ram (ideal time = 42 h after the last injection). Heat lasts 18 - 36 h, but fertility decreases with each hr.
- **Day 27-30**: Watch for teaser marks and inseminate 10-12 h later.