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Monograph

Estrus Synchronisation in Ewe Using Hand-Made Progesterone Sponges

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1. Introduction:

In India, sheep contribute as an important livestock species for the rural agricultural economy. According to the 20th livestock census, India is blessed with a large number of sheep population (74.26 million) and contributes 13.83% to India's total livestock population. India holds 44 total registered indigenous breeds of sheep. However, due to the poor reproductive efficiency and productivity of these indigenous breeds, such large bio-resources could not provide enough financial support to the small farmers. Hence the need of the time is to upgrade the small farmers through different managerial procedures which could be easily performed at their doorsteps and reward them with more financial wealth. Through management procedures like estrus synchronization in sheep by handmade intravaginal sponges, farmers in fields could easily increase reproductive efficiency. It could help increase the poor fecundity rate of Indian breeds and farmers could easily increase their profits by obtaining more than one lamb crop per year.

Estrus synchronization in farm animals focuses on the manipulation of the estrus cycle and estrus at the same time. In does, the opportunity for control and manipulation is greater during the luteal phase and is achieved by stimulating and synchronizing estrus in ovular ewes can be accomplished by administering exogenous progesterone in combination with gonadotropin (Wildeus, 2000).

For many years, ewes have been the subject of synchronization of estrus studies (Scales, 1967; Allison & Kelly, 1978; Akusu & Egbunike, 1984; Zarkawi, 2001; Martinez-Ros *et al.*, 2018) but the ideal synchronization process is still unknown. Therefore, it is instructive to

summarize the findings of previous studies and draw reasonable conclusions.

1.1. Definition:

The artificial use of hormone preparations to induce estrus in female animals to synchronize estrus, pregnancy, and birth is known as “estrous synchronization technology” (Wildeus, 2000). The term “synchronization of estrus” refers to the process of controlling the estrous cycle or inducing estrus in an extensive number of females at a particular time (Odde, 1990).

1.2. Basis for Synchronization of Estrus:

(a) Alter CL's life expectancy/span (b) Alter the follicles' development and the timing of ovulation

2. Synchronization Methods:

(a) **Gonadotropins (GnRH protocols):** GnRH stimulates the release of LH and FSH and stimulates follicular development. GnRH Protocols include Ovsynch and Cosynch

(b) **Prostaglandins:** One can anticipate estrus two days after injection because prostaglandin induces regression of the CL (luteolysis) and reduces progesterone output, which leads to a return to estrus. Prostaglandin protocols include the PGF one-shot method and the PGF two-shot method.

(c) **Progestin:** Progestin is a form of progesterone that extends the period of time progesterone is present and prevents animals from coming into heat. Progestin protocols include MGA+ prostaglandin and CIDR

3. Overview of progesterone-based synchronization methods:

Progesterone, a steroid hormone produced primarily by the corpus luteum, plays a crucial role in regulating the estrous cycle and preparing the reproductive tract for pregnancy.

3.1. Progesterone-Releasing Devices: Commercially available devices, such as Controlled Internal Drug Release (CIDR) inserts, intravaginal progesterone-releasing devices (IPRDs), and progesterone-releasing ear implants, deliver controlled doses of progesterone over a specified period. These devices are inserted in animals and release progesterone, mimicking the physiological levels observed during the luteal phase of the estrous cycle. Progesterone-releasing devices are commonly used in cattle, sheep, goats, and occasionally in swine for synchronization of estrus and improvement of breeding efficiency.

3.2 Injectable Progesterone Formulations: Injectable formulations containing synthetic or natural progesterone derivatives are administered to animals to induce and synchronize the luteal phase of the estrous cycle. These formulations may include progesterone in oil, progesterone analogs, or progestins that exert similar biological effects to endogenous progesterone. Injectable progesterone-based protocols are often used in combination with other hormones,



such as gonadotropin-releasing hormone (GnRH) agonists, to optimize synchronization outcomes.

4. Development and Preparation of Progesterone Sponges:

Developing progesterone sponges involves using specific materials and components to ensure the proper delivery of progesterone for estrus synchronization in farm animals. Below are the important steps for making progesterone sponges:

4.1 Progesterone Source: Pharmaceutical-grade progesterone (for example medroxyprogesterone) is the primary active ingredient used in making progesterone sponges. Progesterone is available in powder or crystalline form and must meet purity and quality standards for use in animal health applications.

4.2 Sponge Base Material: The base material for the sponge matrix is typically a sterile, biocompatible polymer or sponge-like substance that can absorb and retain progesterone. Common materials include polyurethane foam and polyvinyl alcohol (PVA) sponge.

4.4 Progesterone Solution or Suspension: Progesterone is dissolved or suspended in a carrier solution or vehicle to impregnate the sponge matrix. The carrier solution may consist of water, ethanol, or other solvents compatible with progesterone stability and absorption.

4.7 Preparation of Progesterone Sponges: The required doses of medroxyprogesterone acetate were weighed into a glass vial dissolved in ethanol and kept overnight. Dissolved progesterone was taken into a 5 ml syringe and impregnated into sponges by pricking the needle into the sponges. The sponges were then dried in a hot air oven at 40°C. Progesterone-impregnated intra-vaginal AVIKESIL-S is a cost-effective sponge developed for oestrus induction and synchronization in sheep at CSWRI- Avikanagar, Rajasthan. These sponges have been commercialized and till date, more than 15000 sponges have been supplied to different agencies including ICAR and SAU institutes, the State Government of Rajasthan, KVK, and NGOs.

5. Use of hand-made progesterone sponge for estrus synchronization in ewe:

Implantation of progesterone sponge into vagina up to the external os of cervix by using applicator



The sponges are kept for 11 days in the vagina to prolong the estrous cycle



On day 11- the sponge is removed and given an intramuscular administration of PMSG



Heat detection after 2-3 days



6. Conclusion:

The use of hand-made progesterone sponges for estrus synchronization in ewes shows promise as a cost-effective and accessible alternative to commercially available products. The simplicity and affordability of the hand-made sponge preparation make it accessible for small-scale sheep producers or in regions where access to commercial products is limited. Furthermore, the customizable nature of handmade sponges allows for flexibility in progesterone dosage and sponge size, catering to the specific needs of different breeding programs and ewe populations. Overall, the development and evaluation of handmade progesterone sponges offer a promising avenue for enhancing reproductive management practices in sheep farming, ultimately contributing to improved productivity and profitability for producers. With continued refinement and validation, hand-made sponges could emerge as a valuable tool for estrus synchronization in ewe breeding programs worldwide.

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