Artificial insemination in ewes

Recommended Instructor to student ratio:
1:<35 Over the rail/ shot in the dark (OTR/SID)
1: <12 Laparoscopic AI

Objective
To artificially deliver an effective dose of semen to the ewe’s uterus.

Alternatives to animal use for teaching
Practice on abattoir specimens prior to demonstration on ewes. Previous anatomy and associated course work.

Details of procedure
The procedure requires synchronisation of oestrus within the mob of ewes and identification of the ewes in oestrus followed by insemination of those ewes.

1. Synchronisation of oestrus
There are two approaches to controlling the time of oestrus in ewes.

I. Progesterone or compounds with progesterone-like activity (progestagens) are administered for 12-14 days. Due to feedback on the hypothalamus and pituitary, the ewes do not come into oestrus during treatment. By the end of the treatment period, the ewe’s corpus luteum will have regressed, regardless of the stage of the cycle at which treatment commenced, and cessation of the treatment should result in all ewes coming into oestrus in the next 2-3 days.

There are two ways of administering progestagens. The more common way is to insert a polyurethane sponge, pessary or controlled internal drug-releaser (CIDR) impregnated with an appropriate dose of progestogen into the vagina of the ewe. Less commonly, progesterone is formulated in a solid, slow-release vehicle and implanted under the skin. Ewes commence coming into oestrus 24-36 hours after removal of progesterone sponges or CIDRs (progestagen delivery device), with a peak at 48 hours, and nearly all ewes should enter oestrus by 60 hours.

If control over the time of oestrus is sufficiently precise, it is not necessary to use teaser rams/whethers and observe oestrus, the ewes being inseminated at a fixed time after sponge or CIDR removal. Usually a minority of treated ewes fail to exhibit oestrus but may still become pregnant if inseminated. The precise time of fixed-time inseminations varies with the type of synchronisation treatment and the processing of the semen, but ewes are typically inseminated at 48-60 hours post progestagen removal.

II. The second and less commonly used approach to controlling oestrus is to administer a single dose of prostaglandin. This induces luteolysis, and the ewe returns to oestrus. However, prostaglandins are only effective when given more than 4-5 days after oestrus, so in order to get all ewes into oestrus at the same time a second prostaglandin treatment must be given, preferably about 12 days after the first. Prostaglandins are only effective in ewes that are cycling regularly and may cause abortions if given during the first 60 days of pregnancy. They do not give sufficient control over the time of oestrus to enable fixed-time inseminations.

Regardless of the method of synchronisation employed, reduced fertility at the synchronised oestrus is likely to be a serious problem. This results primarily from an effect of the treatment to depress sperm transport through the cervix and is observed after both AI and natural mating. The dose of progestagen incorporated into the sponge and the timing of insemination relative to the LH surge are important factors regulating penetration of the cervix by spermatozoa in such ewes.
2. Identification of ewes in oestrus

Accurate and early detection of oestrus is essential. Oestrus can be detected by vasectomised rams (teasers) wearing harnesses with marking crayons. The choice of hot, cold or milk crayons is important.

One percent of teasers are joined about 6am the day AI is started and marked ewes are drafted at 2pm. These ewes are either discarded or inseminated that afternoon to familiarise staff with the task being undertaken, to test equipment and check on ram fertility. Only ewes with increased amounts of clear mucus are inseminated. In this draft of ewes, sheep could be in early or late oestrus.

This first draft after insemination is kept separate. After the first day ewes are drafted at 9am and 4pm each day. By using this technique, by far the greatest majority of ewes are presented within 12-24 hours of the onset of oestrus, provided the teasers are efficient. Two teams of teasers are alternated every three days to ensure this. Teasers may be inefficient when an increasing number of ewes with creamy mucus are presented. This indicates that oestrus has terminated.

3. Insemination

In the cervical method, a small volume of diluted semen is inserted just inside the external os of the cervix. The ewe’s hindquarters are elevated, usually by placing them over a fence rail, and the inseminator uses a duck-billed speculum inserted into the vagina and a head lamp to enable them to guide the inseminating pipette into the cervix. The semen is deposited no more than 10-20 mm inside the cervical canal. With two catchers, a skilled operator can inseminate 100 ewes per hour by this method. (Known as ‘over the rail’ method.)

Alternative inseminating procedures are available. In the simple vaginal insemination method, semen is deposited ‘blind’ into the cranial vaginas of sheep standing in a race. This is also known as the ‘shot-in-the-dark’ (SID) method. In this case a larger volume of diluted semen containing more sperm is required to obtain fertility comparable with that obtained with the cervical method. This method is not recommended for frozen thawed semen.

Semen can be deposited directly into the uterus, via the technique of laparoscopy. In this case 0.02-0.04 mL of diluted semen containing about 15-60 x 10^6 sperm is deposited into the lumen of one or both uterine horns from a sharp-tipped glass pipette or needle and syringe that has been inserted laparoscopically (keyhole) through the ventral wall of the abdomen. This technique is attractive where valuable, frozen-thawed semen is to be used, since it permits good fertility with much smaller sperm doses than do the cervical and SID methods.

Drugs, chemicals or biological agents

1. Drugs required for synchronisation.
2. Antiseptic for laparoscopic wounds.

Impact of procedure on well-being of animal(s)

The procedure is well tolerated, however conception rates are variable and ewes will require special management to reduce lamb losses.

Reuse and repeated use

Use only one animal per demonstration of AI. Sterilised equipment is needed for each new demonstration.

Care of animal(s) during/after the procedure

Ewes are normally held in a large holding yard during the day to save re-mustering. After insemination, quietly move the ewes to a holding paddock close to the shed and away from daily traffic and disturbance by dogs. Then carefully and slowly return them to their paddock. Avoid unnecessary disturbance and stress for 10-14 days over the critical period of embryo attachment.

Pain relief measures

The operation is usually performed without pain relief measures. Local anaesthetic (eg. lignocaine) should be administered at the laparoscopic portal site.

Qualifications, experience or training necessary to perform this procedure

Operators should be familiar with the correct techniques and the anatomy and physiology of the ewe before attempting this procedure. Laparoscopic artificial insemination is a ‘restricted act of veterinary science’ and may only be carried out by a veterinarian, the owner of the animals or his/her employee.
Reference

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