FACT SHEET

L-1016

FACTORS INFLUENCING REPRODUCTIVE EFFICIENCY IN EWES

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Sheep normally are seasonal breeders and produce varying numbers of young at each conception. In view of this, scientists are quite interested in trying to control and influence the breeding habits of ewes.

Influence of Breed

The mutton breeds of sheep, such as the Hampshire, Suffolk and Southdown, normally breed in the fall of the year and drop lambs in the spring.

The finewool breeds, Rambouillet, Delaine, and Debouillet are more nearly year-round breeders. The Dorset, under most conditions, is nonseasonal in breeding habits. These breeds produce lambs most any time, but tend to be more productive when bred in the fall to lamb in the spring.

Some breeds, and some individuals within a breed, have higher reproductive rates than others. This allows for some improvement through selection for this trait. Inbreeding has been shown to lower ovulation rate along with increased embryonic mortality rate.

Age of the Ewe

The number of multiple births increases from the yearling age to about 6 years of age, and then begins to decline.

Best Time to Breed

The ovulation rate (number of eggs shed at each heat or estrual cycle) is lowest at the first of the breeding season. Vasectomized or epidectomized rams, run with the breeding ewes through the first heat period, tend to stimulate them and increase the ovulation rate at the second heat period.

Temperature

Many believe that ewes begin to come in heat with cooler weather. The breeding season in most breeds probably is brought on more by changes in day length in changing from summer to fall.

Temperature has much more effect on the fertility of rams than on ewes. Semen quality drops during the hot part of the summer and increases wtih cool weather. Many rams lose much of their sex drive during hot weather. Hafez (11), states that ewes may go into anestrus for a short period during the hottest part of the summer and ewes continuing to cycle may not settle if the temperature is too high. Shelton (13), states that temperature in excess of 100 degrees F. for much of the day and for extended periods may cause embryo loss from the time of mating to about 8 days after mating.

Sheep moved from countries north of the equator to areas south of the equator, or vice versa, change their breeding pattern to fit the seasons in the new environment.

Research workers have been able to alter the normal breeding season of ewes by controlling the daylight hours. This further points out the effect of light on the breeding season.

Nutrition

Keeping ewes in good physical condition probably influences good reproductive efficiency more than any other factor. When ewes are not too fat, increasing the level of nutrition about 2 weeks before breeding (flushing) sometimes will increase the number of lambs born by increasing the ovulation rate. Young ewes must be in good body condition before flushing is effective. Ewes in poor to weak body conditions have a higher incidence of silent estrus, which the ram cannot detect.

Van Horn and Payne (15); Bennett *et al.* (4) and Edey (9) suggest that too low a level of nutrition during early gestation may result in embryo loss and a lower lamb crop. The data suggest that most of these losses occur early in gestation. These results may not be applicable to ewes kept on the farm where nutrition is usually more adequate.

Neurogenic or Psychological Factors

The use of vasectomized rams 2 to 3 weeks before turning out the breeding rams apparently stimulates the onset of estrus and increases the ovulation rate.

Many attempts have been made to change the breeding season and reproductive rates of ewes by

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using various hormones and hormone combinations. *Results have been erratic and not dependable.* Hormone treatments are receiving much attention and publicity.

Some of the hormones used and their functions follow:

Pituitary Gonadotropins

The anterior pituitary gland secretes the three gonadotropic hormones FSH, LH and LTH. These hormones regulate the ovaries in the production of ova (eggs), ovulation and the release of ovarian hormones, primarily 17A estradiol and some estrone.

Most of the commercially prepared hormone material is extracted from freeze-dried pituitary glands and sold under specific trade names.

Placental Gonadotropins

Pregnant mare serum (PMS) has physiological functions similar to pituitary FSH and is recovered from pregnant mares between the fortieth and one hundred and twentieth day of pregnancy.

Estrogenic Hormones

These hormones, known as the female sex hormones, are secreted by follicles in the ovary. Substances with estrogenic activity have been found in both the animal and plant kingdoms and have been synthesized. The subterranean clovers contain materials with estrogenic activity genistin, genistein and coumestrol (Hafez 11). There are synthetic estrogenic-like materials on the market, such as stilbestrol and hexestrol.

Estrogens produce estrus in the ewe, produce female appearance and, working together with progesterone, stimulate growth and secretory activity of the reproductive tract, but must be in the proper ratio and amount.

Progestogens

Progesterone is the most common natural occurring progestogen and is secreted by the lutein cells of the corpus luteum (yellow body) of the ovary.

A wide variety of progestogens has been synthesized and found to be potent and effective when administered orally or by injection.

Progesterone ordinarily works with estrogen. It produces no known specific effects when working alone. It often is referred to as the hormone of pregnancy and is necessary for the maintenance of gestation. Very small amounts of progesterone, working with estrogen, produce heat or estrus in the ewe. When given continuously over a period of time, progesterone prevents heat and ovulation.

Heat and Ovulation During the Nonbreeding Season

A great deal of experimental work with hormones and hormonal materials has been conducted to attempt to induce estrus and ovulation during the nonbreeding season. Among the first were Cole and Miller (5), McKenzie and Terrill (12) and Bell *et al.* (2) who showed that ewes could be brought into heat during anestrum by the injection of estrogenic substances. Naturally occurring estrogens were first used.

Synthetic estrogen-like materials, such as stilbestrol, are less expensive and have largely replaced the natural occurring estrogens in later years. This artificially induced estrus during normal anestrum usually is not accompanied by ovulation nor can have ovulation without standing estrus, so conception is not possible. An estrogenic material, sold as E.C.P., received a great deal of publicity in the early 1950's. It was reported to produce both estrus and ovulation in anestrous ewes. Bell *et al.* (3) showed that estrus was produced, but not ovulation. These researchers made successive injections in the early spring to produce normal cycles in the early summer. The results were negative.

Cole and Miller (5) first reported estrus and ovulation during anestrum through injections of pregnant mare serum at 17-day intervals. Consistent results were not obtained by other workers. Ovulation could be produced readily by injections of PMS or other gonadotropins of pituitary origin, but ovulation usually was not accompanied by estrus. Bell *et al.* (2) showed that combinations of estrogens and gonadotropins simultaneously and estrogens administered a short time before or after the gonadotropin injection commonly produced heat, but not ovulation.

Dutt (7) reported that five injections of 30 mg. of progesterone at 3-day intervals followed by a single injection of 500 I.U. PMS rather uniformly produced both estrus and ovulation in the anestrual ewe. Bell *et al.* (1954) using a series of progesterone injections, followed by an injection of PMS, produced heat and probably ovulation in 60 to 80 percent of several hundred ewes treated. Many ewes bred did not settle. The reason may have been due to poor ram fertility or to high embryonic mortality. It was determined that limited success caused the cost to be prohibitive.

Synchronization of Estrus

Progesterone will prevent estrus and ovulation and both estrus and ovulation will follow the cessation of the progesterone treatment within a few days – if the treatment is given during the regular breeding season. Estrus must be occurring before it can be synchronized.

Research has shown that ewes bred during the first estrual period following synchronization show a lower reproductive rate than those bred at the second estrual period.

A pessary (sponge) impregnated with 1 to 6 mg. fluorogestone may be inserted into the vagina with a string attachment for ease of removal) and left for 12 to 14 days (Baker 1); Thimonier *et al.* (14). The hormone is absorbed slowly through the vaginal wall, blocking pituitary gonadotropin release. Estrus occurs 30 to 72 hours following removal of the pessary. Fertility is varied and increases on subsequent estrous periods. Administration of 1000 to 1200 I.U. PMS immediately following pessary removal on day 12 or 13 of the cycling ewe demonstrated to increase ovulation rate and lambing rate in certain trials (Curl *et al.*, 6). PMS accompanied with estrogen treatment also has been implicated in bringing on the onset of estrous in anestrous ewes.

At this point it is not feasible to use hormonal induction materials, especially in large flocks, until the cost factor and consistent research data become reconciled.

Hormonal Treatment to Increase the Reproduction Rate

Several research workers have reported that injections of PMS on the twelfth or thirteenth day of normally cycling ewes will increase the reproductive rate.

Conclusions

1. Estrogens administered to anestrual ewes can produce heat or estrus, but this usually is not accompanied by ovulation.

2. Administration of PMS to anestrual ewes can produce ovulation which generally is not accompanied by heat or estrus. FSH will produce similar results.

3. Combinations of estrogens and gonadotropins have produced *erratic results* in producing heat and ovulation simultaneously. *It might be concluded that they generally are not dependable.*

4. Synchronization of estrus in cycling ewes is possible. The conception rate is higher at the second heat period following synchronization.

5. The hormonal balance of the ewe is very sensitive and difficult to control.

6. At present, most hormonal treatments involve too great a cost in time, labor and materials to be practical for commercial sheep producers. Long-term effects on the ewe are not known.

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