

The Importance of Minerals for Fertility in Sheep

What animals eat has a considerable impact on their health. Therefore it is important to supply sufficient amount of feed which will provide them with energy, protein, vitamins, minerals and trace elements. An animals requirements change with age, status and environment, for optimal results it is important adjust the amount and composition of the feed to the animals requirements. Minerals are needed to form skeletal structures, for digestion and in metabolic processes within the body. Most nutritional disorders are due to excess, deficiencies or imbalances between individual nutrients and in particular minerals, trace elements and vitamins. Copper deficiency in the diet of pregnant ewes may lead to abnormal development of the nervous system of the foetus and the birth of swayback lambs. Minerals rich in iron, offered to sheep grazing a pasture with adequate copper levels can cause copper deficiency, since iron 'locks up' the copper molecules making them unavailable to the animal. On the other hand, an excess of copper in the diet of sheep may result in sudden death through copper poisoning.

Body weight is an important parameter to measure but not sufficient because of the variation in mature body size between different breeds and within herds. Measuring the body condition score (BCS) is useful tool, especially in combination with body weights, to assess the nutritional status of an individual animal as well as the flock and this can be used to adjust the feeding rate or composition. There is an optimum BCS for each stage of the production cycle but especially around breeding and pregnancy it is important to have the ewes at the right condition.

Breeding:

The period from weaning to breeding of ewes is critical if a high twinning rate is desired. Condition of ewes should be good, so the ewes shouldn't be too skinny because this will have a negative impact on ovulation rates and overall fertility. Ewes should also not be allowed to become excessively fat, because this also reduces the fertility and can cause problems later in gestation (fatty liver, twin lamb disease). Ewes should make daily gains from weaning to breeding, the rate depends on the desired weight but should be 60 – 70% of projected mature weight at breeding and 80 – 90% of projected mature weight at lambing.

Flushing:

Flushing or extra feeding prior to mating will increase ovulation rate and positively affect lambing results. Flushing improves body condition prior to breeding, it is accomplished by providing supplemental feed to ewes approximately 2 weeks prior to and 2-3 weeks into the breeding season. Moving sheep to a better quality pasture if available will also accomplish the same thing. Flushing has the best result with mature ewes which are not too fat.

It is important to identify the requirements of a particular flock on a particular farm and to supplement with minerals and trace elements as accurately as possible. If specific deficiency problem is known or suspected in the flock, then it is worthwhile to investigate by analyzing soil and pasture mineral composition to identify the lacking minerals. The problem is much better to control by the use of specific products or measures rather than by a 'shotgun' approach.

A few minerals and vitamins are of special interest during mating and throughout pregnancy because they play an important role in ovulation, embryo development and placental growth.

Selenium (Se) is a component of the enzyme glutathione peroxidase, central to the antioxidant system. Selenium in combination with vitamin E are known to have a positive effect on fertility by improving

ovulation rates. Furthermore supplementation of Se decreases the prevalence of retained placenta, metritis, and cystic ovaries, as well as the prevalence and severity of mastitis and udder edema. The most classical signs of deficiency is white muscle disease, signs of toxicity include blind staggers, sloughing of hooves, lameness, loss of hair, and emaciation.

Vitamin E (α -tocopherol) is essential for integrity and optimal function of muscular, reproductive, circulatory, immune, and nervous systems. Vitamin E can be found throughout tissues in the body in small amounts but is not stored in large amounts. Therefore, during periods of stress when there is increased oxidation in the tissues vitamin E can be depleted quickly. The main role of vitamin E is to act as an intercellular and intracellular antioxidant. This role is closely related to the role of selenium and can be synergistic. Vitamin E oxidation protects the cell membrane by preventing oxidation of lipid materials to free radicals and peroxides in cells. In more active cells the risk of cellular damage is higher when vitamin E is limiting. Vitamin E deficiencies during pregnancy may lead to white muscle disease and the sudden death of young lambs. In ewes it can result in increased incidence of retained placenta, metritis and cystic ovaries and reduced immune function.

Zinc (Zn) is a component of metalloenzymes involved in carbohydrate, lipid, protein, and nucleic acid metabolism. It plays an important role in the ovulation. Signs of deficiency include weak hoof horns, increased incidence and severity of mastitis, and parakeratosis. Signs of Zn toxicosis include reductions in immune function.

Cobalt (Co) is a component of vitamin B₁₂, which is involved in propionate metabolism and methionine synthesis. When Co supply is not limiting, ruminal microorganisms can synthesize all vitamin B₁₂ required by the animal. Cobalt deficiency will decrease vitamin B₁₂ production within days. However, vitamin B₁₂ hepatic reserves can last for months in the adult cow. Cobalt plays an important role with the fertilization. Signs of Co deficiency are those of vitamin B₁₂ deficiency and include fatty liver, reduced resistance to infections, weight loss, and failure to grow. Signs of toxicity include reduced feed intake, body weight loss, and anemia.

Early pregnancy:

An adequate level of feeding in early pregnancy is crucial to embryo survival. Whilst prolonged periods of starvation are uncommon under UK farming conditions, short periods of semi-starvation may occur from time to time, such as early winter snowstorm on the hill. On the other hand malnutrition due to inadequate energy, protein, vitamin or mineral status is not uncommon. It is crucial that the effects of flushing pre-tupping to maximize ovulation rate are not invalidated by poor feeding in the weeks after. Sudden changes in the quantity, quality or type of food offered should be avoided. The aim should be to keep ewes sufficiently well fed to maintain body weight and condition for at least 6 weeks after conception. In flocks with a six week tupping period this means for three months after introduction of the rams.

Mid pregnancy:

During pregnancy the lamb is in contact with the ewe via the placenta. The attachment begins just a fortnight after conception and is complete by four to five weeks into pregnancy. There is no direct connection between blood supply of the ewe and the foetal lamb, but there's a constant exchange of nutrients and other essential substances from the ewe to the foetus and of waste products from the foetus to the ewe.

In order to produce big strong lambs and an adequate supply of milk, it is therefore vital to feed ewes appropriate during mid-pregnancy to ensure maximum growth of the placenta. Avoid extremes of both under and over feeding and keeping a close watch at the body condition score. Having ewes in a good BCS prior to mating is very important, because during summer and early autumn body condition can be put on relatively easy and cheap at pastures. The energy reserve laid down as fat at this time are invaluable, both during pregnancy and lactation.

If the ewes were in good condition (3 – 3.5) a mild degree of under feeding during mid-pregnancy can be tolerated. The loss of body condition should never exceed more than 0.5 points.

Late pregnancy:

The number of lambs that will be born at the lambing time is largely determined in the weeks before, during and immediately after mating. Some losses occur during mid- and late pregnancy through abortions or conditions such as twin lamb disease, but apart from flocks which have particular problems in this regard, these losses should be small.