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Review

The Effect of Pre-Pregnancy Feeding on the Sex Ratio of Sheep and Cattle

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ABSTRACT

Preface and pregnancy before the birth of sheep and cattle will be born in the determination of the genders of sheep and cattle will have some benefits in breeding strategy, dairy cattle breeding and strategy to help the establishment of the connect planning of the enterprises. Meat quality is important in fattening enterprises. Therefore it is desired to have female animals which are going to be born in fattening enterprises and male milk production. Therefore the determination of the sexes of chickens that will be born in pregnant sheep and cattle bring some benefits in aquaculture. Studies to determine prenatal total sex in the sun are mode by applying different methods on previous pregnancy feeding spermatozoa, embryos and fetuses. In this review, detailed information about the effect of previous pregnancy feeding on baby gender will be given in sheep and cattle which are not currently used in our country.

Keywords: Feeding, pre-pregnancy, sex ratio.

Determination of prenatal sex and sex-selective pregnancy have attracted the attention of people since ancient times. The first experiments revealed that there were nutrients and substances that were effective in the determination of sex by Greek philosophers in the antiquity period. Peck[1] (384-322 BC) found that females were denser and colder in terms of air and water and that males were formed in more dilute and warm winds. He defended the false thinking that the male fluid would merge with the offspring, but was known as the first true empiricist as a result of his first scientific empirical studies. Democritus (460-370 BC) by the right testicle male and female left testis said that more developed. Interestingly, if "strong sperm" was a key role in the development of the child, it was interestingly produced by two sexes, both parents believed that a male individual would be born strong, on the contrary, "weak sperm" was synchronized with the development of a girl. In addition to this information, ovum and semen preserved its secret until the 17th century. Leeuwenhook (1677) first discovered spermatozoites using a real scientific microscope.[1-3]

In 1827 and towards the end of the century fertilization was scientifically observed and the current view of that time led to the idea of chromosomal determination when the sex determination was under environmental control. In the 20th century, the chromosomes of mammals were examined and it was found that Y chromosome was important in male sex formation. The theory that Y-bearing spermatozoa is supposedly slightly lighter and faster and brittle and shorter than X-bearing sperm has been proposed by Kleegman (1966) and then by Shettles (1970).[4]

In the 21st century, the effect of the testis determining gene and the sex determination region were found anomalies.[3]

Nowadays it is important to determine the gender of the offspring in sheep and cattle in pre-pregnancy feeding in terms of obtaining meat or dairy products. Meat quality is important in fattening establishments

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and in each period, fattening establishments are separated from the herd which has reached a certain number of healthy and sufficient weight for slaughter. There are two ways to replace a male animal separated from the herd. The first way is to produce in the herd, such as the genetic structure of the known and the protection from external infectious agents such as the advantages. The second way is to bring foreign animals from outside. As the genetic structure of the new animal is not known, the stress of the incoming animal as well as the other animals in the environment create stress against the foreign animal and the incoming animal brings infectious agents that can make the herd sick from the outside, resulting in loss of yield as a result. Therefore the first route is more preferred because it is safer and carries less risk. It is desirable that the offspring to be born in fattening establishments shall be male and female animals producing milk in dairy establishments. Therefore it helps to determine the sex of the offspring in pregnant sheep and cattle and to increase the ratio of the sex required by the breeder. Gender determination helps production of meat and milk production enterprises in sheep cattle to plan the business strategy correctly so that it is necessary to have milk cattle enterprises with the increase in meat prices and increase in milk prices of fattening enterprises according to the position of the enterprise for the needs of the market.[3]

Whether pre-pregnancy feeding has an impact on the sex ratio, has long been the subject of controversy. Pregnancy involves complex processes involving ovulation, spermatogenesis, embryo development, uterus and ruminants. There are multiple factors affecting embryo life; Genetic, hormonal effects, dietary composition of nutrients, pre-pregnancy nutrition, stress, environmental and animal health factors such as regulation of sex ratio has been reported to affect. Among the most important periods in adult sheep nutrition, firstly the vaccination period and then the lactation period after pregnancy period are known.[3]

In sheep holdings, additional feeding, known as Flushing, is a common method to increase the ovulation rate in female breeding sheep before mating, as well as the pregnancy and lambing rate. Feeding in sheep can directly affect egg cell development, ovulation, fertilization, embryo quality, development, survival, attachment to the uterine wall, and so on.[5]

In the studies, concordant results have not been obtained because of the effects of different experimental conditions and nutrition may occur through multiple systems.[5]

It has been reported that sex ratios depend on the duration of seeding and cleavage stage. It has been reported that there is a statistically significant difference between the sex ratios (around 50% sex) of the embryos formed by the fertilization of female gametes in different processes after the maturation stage (eight hours after the removal of the first polar body).[6]

Similarly, it has been reported that after six hours of incubation with frozen bull semen, a statistically significant male embryo was seized in proportion to 9, 12 and 18 hours.[7] Few studies on the effect of pre-pregnancy feeding on sex ratio in sheep and cattle have been reported in the literature, whereas in studies conducted, factors such as fertilization time and maturation time have been investigated.[8]

EFFECT OF ENDOCRINE HORMONES

The intrauterine period of ovary and testis is under the influence of direct or indirect development of endocrine hormones. Among the endocrinological factors, there is Luteinizing Hormone (LH), Serotonin and Follicle Stimulan Hormone (FSH) along with Anti Müllerian Hormone (AMH) Müllerian Inhibiting Substance (MIS) which is very important in gender differentiation. The sex determination region (SRY) causes cell proliferation and growth factors are required for male sex discrimination. There was an increase in the division of 5′-bromo-2′-deoxyuridine (BrdU) cells responsible for the size increase of the male gonad in SRY gender discrimination.

Other growth factor genes are essential for the development of testicular fibroblast growth factor 9 (Fgf9), platelet-derived growth factor receptor alpha (Pdgfra) and insulin growth factor receptors. The absence of Fgf9 results in the opposite of XY sex, and in mice with the same three insulin receptor genes missing, the absence of Pdgfra inhibits the growth of Leydig cells.[7]

EFFECT OF MINERAL SUBSTANCES

Stolkowski and Lorrain[9] studied pre-pregnancy diet women specific to the amounts of calcium, magnesium, and 75 to 80% of mothers were boys due to the use of sodium and potassium.[10]

For couples with three or more daughters and non-males, calcium and magnesium certainly resulted in a higher number of girls in sodium potassium deficiency

in the mother's diet. Researchers hypothesized that mineral intake may affect the sex ratio for humans as well, resulting in a predominantly male child due to excess sodium and potassium in their mothers.[7]

EFFECT OF RATION PROTEIN AND ENERGY LEVEL

Dietary protein and energy levels have been reported to play a major role in the development of pregnancy. Adequate and balanced rations should be arranged for special requirements before postpartum insemination and correct body condition scores in cows. In studies, high levels of protein in the diet may change secretions such as progesterone concentration in the uterus or blood urea concentration, and it is thought that these changes may have an effect on pre-pregnancy feeding and sex ratio. One point to consider when examining the effects of protein content on diets on fertility is ruminal destruction. Protein content in the ration is divided into two parts, which can be broken down or not broken down according to the hydrolysis ability of rumen microorganisms. It has been reported that the fertility problem seen in a herd fed with a ration containing degradable protein in the rumen is corrected by re-adjusting the ration rates; It is reported that these problems are important in determining the embryonic sex that occurs before the mother recognizes pregnancy by not shaping fertilization.[9]

THE EFFECT OF POLYUNSATURATED FATTY ACIDS ON SEX RATIO

Polyunsaturated fatty acids are used to increase the energy density of ration in cattle and are also some energy-independent special nutrient components. These include steroidogenesis, prostaglandin biosynthesis, and transcriptional regulation, involved in the regulation of genes involved in the maternal immune response and in tissue regeneration. It is a polyunsaturated fatty acid that is abundant in most seed lipids and flaxseeds. Polyunsaturated fatty acids may affect fertility in livestock.[9]

They suggested that polyunsaturated fatty acids may affect the sex ratio for sheep and cattle. In three groups of Holstein cows, either 0%, 3% or 5% fatty acids (rich in omega-6) were supplemented with protected fat in the form of calcium salt up to 14-21 days before birth.[9]

It was reported that 42.1% boys were born in the control group.[8] It has been found that omega-6 polyunsaturated fatty acids, linoleic acid linoleic acid (LA) or cis-12 conjugated linoleic acid conjugated linoleic acid (CLA) are more likely to produce male embryos compared with omega-3 alpha linolenic acid alpha-linolenic acid (ALA)-free.[9]

Thus, a statistically significant difference was detected in cows fed with omega 6-rich diet, and then the oocyte was directly affected by sex ratio of polyunsaturated fatty acids, while in vitro maturation with omega-3 and bovine cumulus oocyte complexes and ALA, omega-6 LA or trans-10, cis-12 CLA supplemented.[7]

Proportion of embryos produced When the SRY gene PCR device was used, similar results were obtained *in vivo*.[9]

THE ROLE OF X AND Y CHROMOSOMES IN FERTILIZATION

The sex of the offspring in mammals is shaped during fertilization. Intrauterine period of female and male gonads is under the effect of direct or indirect development of more than one factor. The most important of these are endocrinological and environmental factors, especially genetics. If the ovum containing haploid X chromosome is combined with spermatozoa with haploid X chromosome during fertilization, female (XX) and male (XY) sexes are formed when Y is combined with chromosome. Genetic factors include H-Y antigen, WT-1 gene, SRY gene.[11,12]

Gender separation is the Y chromosome that carries the testis determining factor (TDF) in the sex determination region (SRY) protein. If spermatozoa are separated according to X or Y chromosomes prior to insemination, the sexes of embryos are determined after insemination using these spermatozoa.[11-13] The greatest proven distinction among spermatozoa carrying X or Y chromosomes is that the amount of DNA on these chromosomes varies by gender. Because the Y chromosome is smaller than the X chromosome, its DNA is approximately 3% larger than the Y chromosome. Since the X and Y chromosomes of the spermatozoa have different swimming rates, positive results have been determined that the sex ratios of the offspring can be changed.[14]

X and Y chromosomes are obtained individually in sperm in the determination of gender, electrophoresis, filtration, immunological techniques, centrifugation, pH changes in the storage medium, sedimentation and motility criteria are very different methods are applied and are not useful in practice.[12,13,15]

As a result, studies show that the fetal development of the offspring resulting from this pregnancy can be programmed by changing the nutrient composition of sheep and cattle in the pre-pregnancy period, which is important for pre-pregnancy feeding in sheep and cattle. Thus, together with the feeding rations before pregnancy, the physiological and biochemical structure of the uterus and ovum and the ability of the X and Y chromosomes to fertilize the egg can be regulated before the fertilization period. In addition, sex ratio can be affected by using the characteristics obtained by pre-pregnancy feeding in ruminant animals and it is thought that it is possible to change the sex ratio in the farm by developing pre-pregnancy feeding strategies.[1-11,16]

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