

Progress in the Production Technology and Application of Cotton and Goat Sex Semen

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Abstract: Sex control technology for meat sheep is a new breeding technique that is of great significance for rapidly expanding the population of excellent meat sheep breeds, accelerating the improvement and breeding of milk goat breeds, and improving the economic benefits of milk goat breeding industry. There is no international standard or national standard for the sex controlled frozen semen of meat sheep, and there is no unified requirement for production technology and product quality. The production level is uneven, and the product quality is unstable. The inconsistent use of sheep sex controlled frozen semen by sheep breeders has affected the industrialization and application of sheep sex controlled frozen semen products and this technology in China. In addition, the lack of unified quality standards has also led to chaotic market sales prices and vicious competition between domestic and foreign products, seriously affecting the normal and rational development of the entire industry. The development of sheep sex control semen separation technology and the influence of various factors on sheep (including varieties, individual differences, diluent formula, freezing procedure, feeding management) in order to effectively analyze the sexual semen of sheep and goats, the influence of sheep and goat sexual semen of promotion, application and prospect are discussed. This paper provides reference for the research, development, popularization and application of selective artificial insemination technology.

1. Introduction

China is a big sheep raising country, and the number of sheep and goats ranks first in the world. In recent years, the consumption market of goat milk and goat has expanded rapidly, and the development scale of goat milk and goat has been expanding. The sheep industry has increased, but the number of sheep has not increased due to restrictions such as efficient breeding techniques. The contradiction between supply and demand in China is becoming increasingly prominent, and it is urgent to solve this outstanding problem. Gender management techniques are segmentation through human intervention, a method that allows female animals to produce expected sex offspring. Among them, sex control semen technology has been developed since the 1980s. Over the years, researchers have developed a variety of sperm isolation methods, of which the most mature, stable, and reliable method is still flow cytometry. Method of cell isolation. Most of the important economic characteristics of animal husbandry in livestock production are closely related to gender.

Sexual control of semen technology can make full use of the production traits controlled, restricted or affected by sex, improve the reproductive efficiency, and control the offspring. Gender can increase the intensity of livestock selection and accelerate the breeding process. The wide use and application of gender-controlled sheep semen will greatly improve the lives of its citizens.

The efficiency of using sheep avoids the infectious diseases caused by this crossing. Therefore, the gendered semen production techniques address the above problems,

Livestock production is very important. The development of sheep sex control semen production technology will have a very important influence on the development of sheep raising industry in China. It has great influence and application value. This review summarizes the development of X / Y sperm separation techniques in sheep and the factors influencing sex control semen production in sheep. The application of hormones and sheep sex control semen will provide a reference for the development and more effective application of sheep sex control technology in the future.

2. X / Y sperm separation technique

Currently, the X / Y sperm separation technique is based on X / Y sperm differences and mainly involves free-flow electrophoretic screening.

Selection method, flow cytometric separation, microfluidic separation, immunoisolation, pH isolation, X / Y sperm motility difference analysis.

Lifa et al. According to the study report, flow cytometric isolation of ^[1] and X / Y sperm motility difference of ^[2] have been further studied in sheep.

And the pH isolation method.

2.1 Flow cytometry separation Flow cytometry separation uses the difference in the amount of DNA of X and Y sperm.

This method is characterized by high purity and accurate separation, and as the technology matures, its application in dairy cows is constantly improving.

The effect is significant. The DNA content of bovine X sperm is about 3.8% higher than that of Y sperm, and the separation accuracy is more than 90%, which is relatively ideal.

The pregnancy rate during the heat period can reach 60% to 80%. However, this approach has not been studied in sheep due to sperm differences between species. Although the difference between sheep X / Y sperm and cattle sperm was as high as 4.4%, it is difficult to obtain highly vigor sperm by this method due to its weak resistance to cold agitation. Overseas studies have demonstrated that X / Y sperm can be isolated from Sany dairy goats by flow sorting, cryopreserved and used for the production of promising lambs. Later, domestic researchers used flow cytometry to isolate X / Y sperm in dairy goats, and found that the vitality of X / Y sperm was 0.42-0.43, and the purity of X sperm found that the purity of Y sperm reached 94%.96% purity, X sperm 96% purity, separation rate 4 200 / s and Y sperm 4 500 / s. To obtain better sex control semen, the researchers optimized the ^[3] of the X / Y sperm flow sorting technology system in dairy goats. After thawing, X / Y sperm motility increased by about 10% and the purity of X / Y sperm also increased. All reached more than 95%, and the average separation rate of X / Y sperm was 5000 / s. Due to the large individual differences in sheep, this method has not been effectively applied in sheep studies. However, as researchers dig deeper, this approach may also achieve the same results in sheep production as in the sex control of cattle.

2.2 X / Y sperm motility difference separation method

X / Y sperm motility separation method refers to the use of X / Y sperm motility difference for X

/ Y sperm separation. This method was first reported in 2019 to use ligand to activate Toll-like receptor 7 / 8 (TLR 7 / 8) to select the motility of sperm carrying X chromosome without changing the motility of Y sperm. These are two factors that control frozen semen and thus influence sexual behavior. Freezing procedures, feeding and management are only part of many causes, and these factors can also interact.

2.3 Variety Differences There are some differences in the semen quality and freezing resistance of different animal varieties. Experts have studied four varieties.

The cryopreservation results of fresh semen of qualified breeding sheep showed that the overall vitality, progressive vitality and rapid and progressive vitality of hu sheep sperm were excellent. It was significantly higher than the sperm of the Australian white breed and black Dubull sheep, among which the sperm showed the worst performance after freezing. It can be seen that the freezing tolerance of the sperm varies according to the breed of the sheep. At the same time, experts believe that simmental cattle, red Angus cattle, when we compare the semen quality of domestic and cattle semen before and after freezing, we found that the quality of frozen semen of breeding cattle is quite different. Dairy cow sperm had higher freezing resistance compared to beef cattle. Studies have also shown the existence of different breeds of pigs.

Semen quality also has a significant impact. The effect of breed on the quality of frozen semen may be due to the sperm membrane or semen of animals of different breeds. There are some differences in the pulp, and this scientific issue needs further research.

2.4 Individual differences

Individual differences in sheep have a great impact on the quality of sex control semen. High and stable semen quality after freezing and thawing is one of the most important prerequisites for artificial insemination of frozen semen. However, good semen quality before freezing does not necessarily ensure resolution.

Sperm quality after freezing. Shu Gang et al. reported that different genotypes between individuals can also lead to differences in semen quality. Bai Yangyang. ^[4]

The detection of Indel and CNV of two genes in northern Shaanxi white cashmere goats and their association study with semen quality found that the CNV sites of genes significantly affected the ejaculate amount, semen concentration, sperm motility and live sperm number of goats. Some studies have also shown that the freezing resistance of sheep sperm in different individuals also varies in ^[5], which also makes it difficult to study the freezing control in sheep. The study of the factors affecting sperm freezing resistance will provide experimental support for the application of sheep sex control semen. According to the relevant properties of individual semen, the semen of excellent individuals is selected for frozen preservation to improve the stability of the sperm quality after thawing, which can minimize the problems of low thawing vitality and low conception rate caused by the difference of individual semen. 2.3 Diluent formula Sheep sperm is adversely affected by oxidative stress and cold stress during freezing, which reduces the semen quality and conception rate, which greatly limits the application of frozen sperm in sex management of sheep. Therefore, the sheep are rarely cryopreserved.

Liquid release is also an important factor affecting semen quality. In the cryosolvent formulation, due to the action of antifreeze such as glycerol.

By moving sperm quickly through the ice crystal stage, damage to sperm during freezing can be reduced. The study found that the use of glycerin as cryoprotectant in the formulation of goat frozen semen dilution and two kinds of cryoprotection agents was better than ethylene glycol, and different formulations had better protective effect on semen. Fluid mass is more affected. However, in

another study, the role of dimethylformamide, ethylene glycol and dimethyl sulfoxide in replacing glycerol in the cryopreservation of sperm in sarnone dairy goats. The result is that dimethylamide it better protects the sperm motility properties. Comparing dilutions based on egg yolk, skim milk, and soy lecithin, Liang et al. Through liquid cryopreservation of goat semen and artificial insemination experiments, it was found that soybean lecithin could be used for cryopreservation of goat semen. Use fat instead of egg yolk or skim milk. The addition of non-animal additives, such as soybean lecithin, can not only avoid some epidemics, but also have high permeability, easy to obtain and suitable for mass production. In the future, we will study the mechanism of sperm freezing damage, develop a more suitable formula for sheep freezing dilution, avoid substances that damage sperm during freezing, improve the motility of frozen and thawed sperm, and ensure the use of frozen semen for other indicators of sheep sex management.

2.5 Freezing procedure

The quality of semen after thawing is one of the important factors in determining the effect of artificial insemination, and the cooling of semen is an important factor in determining the effect of artificial insemination.

The freezing procedure has an important effect on sperm motility. The formation of ice crystals in sperm cells is important for the survival of sperm after freezing and thawing.

At temperatures of 0 to -60 °C, ice crystals can form inside the spermatids, causing irreversible damage to the sperm. According to the research, the successful freezing of sheep, cattle and pig sperm required a higher cooling rate (3050 °C / min).

This indicates that the cooling rate of 40°C / min can more reliably freeze Saneng dairy goats in the five different gradient cooling rates.

Sperm motility and cell membrane function were assessed according to programmed freezing procedures (5 to -10 °C, cooling rate 6 °C/min, -10 to -140 °C cooling rate (40°C / min) significantly increased the fertilization capacity and semen quality of SAN dairy goats.

2.6 Breeding management

The production of sheep frozen semen is not only closely related with breed, individual differences, diluent formulation and freezing procedures, but also with the level of feeding management. "Maturity determines the amount of semen produced. Increased nutrient levels in early childhood can stimulate complex biochemical interactions between metabolic and neuroendocrine signaling leading to precocious puberty. The middle promotes testicular growth and development. Studies have shown that increasing nutrient levels can promote testicular development in animals, thus increasing the production of frozen sperm and the motility, motility and IVF ability of sperm after freezing and thawing. In feeding management, the nutritional status of the breeding ram is also important for sperm quality. Deficiency or imbalance of substances important for semen synthesis (e. g., fatty acids, amino acids, minerals, and vitamins) can affect sperm quality. If the ratio of energy to protein is incorrect, sperm production is severely impaired and sperm density is reduced. This study found that the addition of soy isoflavones to the feed improved antioxidant parameters and improved semen quality in sarnone dairy goats. It is also reported that different feeding systems have a certain impact on the growth and development, fat accumulation and semen quality of sheep, and it is believed that it has a certain impact on the growth and development, fat accumulation and semen quality of sheep.ram. In conclusion, ram feeding management requires attention to nutritional adaptation and management to ensure good semen quality.

3. Application of sheep sex control semen

With the rapid development of sheep breeding industry, the research on the supporting technology of sheep sex control semen has gradually deepened. We can see that production/preservation technologies, estrus synchronization technologies, artificial insemination technologies, laparoscopic insemination technologies, in vitro fertilization and sexually controlled embryo production technologies, and embryo transfer technologies are also being developed. Among them, the use of frozen semen for sheep sex management is generally divided into three aspects: artificial insemination, laparoscopic insemination and embryo transfer.

3.1 Artificial insemination is the most direct method for artificial insemination of controlled semen after production, which is simple and convenient.

Great for big promotions. However, the reproductive organs of sheep are quite different from those of cattle, and artificial insemination using the rectal method is not possible. Secondly, this method is used because the cervix of the sheep reproductive tract is more tortuous, which makes it difficult to transport semen to the uterus, but also because the number of effective sperm in sexual semen is low.

The application of this method in sheep has some limitations. Some studies have used frozen goat semen to perform artificial and deep insemination of local goats, and achieved good results, and the conception rate during estrus reaching more than 85%. However, separation of goat sex and frozen semen was artificially done.

Although the conception rate after insemination test did not achieve the desired effect, probably due to differences in effective sperm counts, future studies and improvements of insemination devices and insemination methods will improve conception rates are expected to be further improved.

With the rapid development of sheep industry, the research on the support technology of semen control is gradually deepened. Production and preservation technology, estrous synchronization technology, artificial insemination technology, laparoscopic insemination technology, in vitro fertilization, sexual control technology and other "controlled embryo production, embryo transfer technology is also under development. Among them, the sex management of frozen semen generally involves artificial insemination, laparoscopic insemination and embryo transfer. It's divided into two aspects.

3.2 Artificial insemination

Artificial insemination is the most direct method of postpartum artificial insemination using controlled semen, which is simple and convenient. Secondly, the cervix of the sheep reproductive tract is relatively tortuous, so it is difficult to transport semen to the uterus, and the number of effective sperm in the sexual semen is also low, so this method will not be used. Applying this approach to sheep has certain limitations. The study of artificial insemination and deep insemination of local goats, Boer goats and dairy goats with frozen goat semen has achieved good results, with the conception rate reaching more than 85%. However, the separation of goat sex and semen was done manually.

Although conception rates after insemination tests did not reach the expected results due to differences in effective sperm count, future research and improvements in insemination equipment and insemination methods will improve conception rates and hopefully further improvement. Artificial insemination and other indicators.

4. Conclusion

With the rapid development of molecular biology technology, omics technology and gene editing technology in sheep production, genetic

The continuous maturity of collective breeding application can realize the early breeding of good breeding ram, improve the utilization efficiency of breeding ram and reduce the feeding cost. We can then apply omics and gene editing techniques to study the mechanisms by which sex control and sex control semen production and develop fully autonomous systems. The main controllable X / Y sperm separation method can improve the separation efficiency and improve the quality of frozen sperm. It can minimize the damage and provide an ideal means of separation. Through the combination of estrus, artificial insemination and in vitro fertilization, sex control embryo production, embryo transfer and other technologies, the population can achieve efficient and rapid reproduction, expand the range of superior varieties, shorten the breeding cycle, and significantly improve the economic benefits of farmers." However, there are also many problems that need to be solved.① The main problems of individual differences and sperm resistance are weak low temperature impact, and the production of controlled frozen semen is unstable; 2) the current mature sperm separation technology does not have automatic separation technology.

Due to significant intellectual property rights, sperm separation costs are high, and indicators such as sex control of frozen semen are not ideal. Assisted reproductive techniques are used to overcome this drawback, but they can cause irreversible damage to ewes, shorten the longevity, and increase costs.③ Sperm separation technology is not mature, low separation efficiency, unable to isolate high quality, high motility sperm.④ Without the active participation of the front-end sheep breeding farm and the semen separation company, the quality of the controlled frozen semen cannot be guaranteed, and the control liquid stays in the middle. There are certain limitations and difficulties in supporting technology, and the lack of relevant professional and technical personnel at the grass-roots level cannot guarantee the practical application effect. The economic benefit of the terminal application is not clear, which leads to the imperfect system, low market visibility and difficult promotion.

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