THE SCIENCE WORLD
A Monthly e Magazine
ISSN:2583-2212
June, 2025 Vol.5(6), 7442-7445

Popular Article

Epigenetic Regulation of MIR-25 And LNC107153 On Expression of Seasonal Estrus Key Gene CHGA in Sheep

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DOI:10.5281/ScienceWorld.15773119

Abstract

This study sheds light on the complex epigenetic regulatory processes that control the expression of chromogranin A (CHGA), a key gene that controls seasonal estrus in sheep. We show that microRNA-25 (miR-25) and long non-coding RNA 107153 (Lnc107153) control the expression of CHGA in a complex way through epigenetic changes using a wide range of methods, including bioinformatics analysis, quantitative real-time PCR, and functional assays. Our results show that miR-25 directly targets CHGA and lowers its expression. Lnc107153, on the other hand, functions as a competitive endogenous RNA by binding to miR-25 and changing CHGA expression. Our data also reveal that the miR-25/Lnc107153/CHGA axis is very important for controlling the seasonal reproductive cycle in sheep. This has big effects on how to improve breeding techniques and reproductive efficiency in small ruminants. This study gives us new information on the molecular processes that cause seasonal estrus, which could help us find new ways to improve sheep's reproductive performance.

INTRODUCTION

Seasonal estrus is a key part of sheep breeding and reproduction. It has a big effect on the timing and success of breeding programs and the overall reproductive efficiency of small ruminants. Being able to manage and change seasonal breeding patterns would be a huge help to the livestock business since it would make lamb production more efficient and increase reproductive results. Epigenetic regulation is a complicated process that controls gene expression without changing the DNA sequence. It is very important for managing many biological functions, such as reproduction. Recent

research has shown that certain genes, like microRNA-25 (miR-25), long non-coding RNA 107153 (Lnc107153), and chromogranin A (CHGA), have a big role in controlling seasonal estrus in sheep. It is interesting that miR-25 and Lnc107153 change the activity of CHGA, a gene that plays a big role in the reproductive cycle. This affects the seasonal breeding patterns in sheep. Learning about these complicated genetic relationships can help us come up with better ways to breed sheep and make them more fertile, which will help improve animal husbandry techniques as a whole.

Epigenetic regulation of CHGA:

There are several different ways that miR-25 and Lnc107153 control CHGA expression. miR-25 is a microRNA that specifically targets the 3' untranslated region (UTR) of CHGA mRNA. This causes the mRNA to break down or stop being translated, which lowers the level of CHGA expression. Lnc107153, on the other hand, is a long non-coding RNA that functions as a competitive endogenous RNA (ceRNA) and inhibits miR-25 from binding to CHGA mRNA. The inhibitory impact of miR-25 is lessened, which makes CHGA expression go higher. The way miR-25 and Lnc107153 interact with each other changes CHGA expression, which affects the reproductive cycle in sheep.

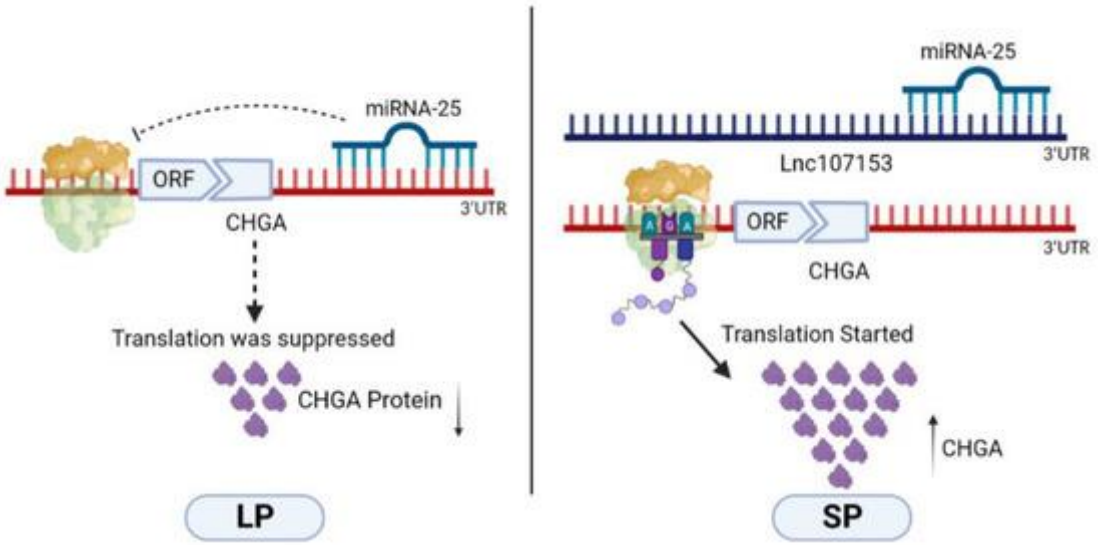

Fig1. Epigenetic regulative network of Lnc107153-miR-25-*CHGA* involved in sheep seasonal reproduction.

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Published 29 /06/2025

Epigenetic regulation is the use of several methods to modify gene expression without changing the DNA sequence. DNA methylation is an important epigenetic mark that usually adds a methyl group to cytosine residues in CpG dinucleotides, which stops genes from being expressed. Another important method is histone modification, which adds or removes certain chemical groups, such acetyl or methyl groups, to the histone proteins that DNA wraps around. These changes can either loosen or tighten the structure of chromatin, which can make it easier or harder for genes to be transcribed. There are other epigenetic processes that are significant for modulating gene expression, such as chromatin remodeling and non-coding RNA-mediated regulation. These systems work together to control gene expression in a way that is both dynamic and reversible, which affects many biological processes.

Impact on Seasonal Estrus:

miR-25 and Lnc107153 control chromogranin A (CHGA), which is very important for changing the estrus cycle in sheep. CHGA is a major player in the reproductive cycle, and the levels of miR-25 and Lnc107153 influence how much it is made. During the breeding season, lowering miR-25 or raising Lnc107153 leads to more CHGA expression. This, in turn, causes the release of gonadotropin-releasing hormone (GnRH) and luteinizing hormone (LH), which makes the ovaries work and causes estrus. On the other hand, during the non-breeding season, increased levels of miR-25 or lower levels of Lnc107153 cause less CHGA expression. This leads to less GnRH and LH secretion, which in turn stops ovarian activity and estrus. So, this dynamic control of CHGA by miR-25 and Lnc107153 fine-tunes the seasonal reproductive cycle in sheep, making sure that breeding and reproduction are as efficient as possible. These non-coding RNAs must precisely control the expression of CHGA for seasonal estrus to happen at the right time and last the right amount of time. If this axis is not working right, it could lead to reproductive problems in sheep.

Understanding how miR-25 and Lnc107153 control CHGA could have big effects on sheep breeding and reproduction. By figuring out the molecular reasons behind seasonal estrus, breeders and researchers can come up with new ways to make

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breeding more efficient and change the way animals procreate. For example, genetic selection programs could look for animals with the best miR-25 and Lnc107153 expression profiles. This would make them more fertile and produce more lambs. Also, creating RNA-based medicines or treatments that target the miR-25/Lnc107153/CHGA axis could help control seasonal breeding patterns. This would make lamb production more efficient and lower the costs that come with having babies at certain times of the year. Also, knowing the genetic basis of seasonal estrus could help create genetic tests that can forecast an animal's reproductive capacity. This would help breeders make smart choices about which animals to breed and how to manage their breeding. Overall, what we learn about how miR-25 and Lnc107153 control CHGA could change the way sheep are bred and reproduced, which would make the livestock business more productive and efficient.

CONCLUSION

In conclusion, our study shows that miR-25 and Lnc107153 work together to modulate CHGA expression epigenetically, which is a key part of managing seasonal estrus in sheep. This shows how important epigenetic regulation is in changing reproductive processes and gives us useful information about the molecular mechanisms that cause seasonal breeding patterns. The results have substantial effects on how to improve sheep breeding and reproduction. In the future, more research should focus on figuring out how the miR-25/Lnc107153/CHGA axis can be used as a treatment, how it can be used in different breeds and species, and how to add epigenetic markers to breeding programs to make reproduction more efficient. All of this will help create new ways to improve animal welfare and optimize livestock production.

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