**TITLE: Unraveling the Genetic and Epigenetic Landscape Governing Intramuscular Fat (IMF) Deposition in Rabbits: Insights and Implications**

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## ABSTRACT

Intramuscular fat (IMF) content is a predominant factor recognized to affect rabbit meat quality, directly impacting flavor, juiciness, and consumer preference. Despite its significance, the major interplay of genetic and epigenetic factors regulating IMF in rabbits remains largely unexplored. This review sheds light on this critical knowledge gap, offering valuable insights and future directions.

We delve into the potential role of established candidate genes from other livestock (e.g., PPARγ, FABP4, SCD) in rabbits, while exploring the identification of novel candidates through differential gene expression analysis. Furthermore, we explored the quantitative trait loci (QTL) studies in rabbit IMF and Genomic selection approaches for improving IMF content in rabbits.

Beyond genetics, this review unveils the exciting realm of epigenetic mechanisms modulating IMF deposition. We explore the potential of DNA methylation patterns histone modifications, and Non-coding RNA-mediation as fingerprints for selecting rabbits with desirable IMF levels. Additionally, we explored the possibility of manipulating the epigenetic landscape through dietary interventions or nutraceuticals to promote favorable is discussed.

Furthermore, the review provides a comparative analysis of genetic and epigenetic mechanisms governing IMF in rabbits compared to other livestock species. Highlighting species-specific differences and their potential evolutionary underpinnings offers valuable context for future research.

By comprehensively unraveling the genetic and epigenetic landscape of IMF regulation in rabbits, this review unlocks untapped area of knowledge for enhancing rabbit meat quality. It paves the way for targeted breeding programs, optimized nutritional strategies, and the development of novel tools for manipulating gene expression and epigenetic modifications. Ultimately, this will open the gaps for more research directions targeting the improvement and control over IMF content and

aid the producers to deliver superior quality rabbit meat, meeting consumer demands and boosting market competitiveness. It will also create a research gap in the biomedical field for fat-based diseases like diabetes and cardiac diseases.

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Mode of Presentation: Oral

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