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The Effect of Folic Acid on Granulosa Cell Activity in the Relief of Thermal Stress

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Introduction

In contemporary agricultural techniques, heat stress is a major concern, especially when it comes to managing animals.Cows and other animals' reproductive systems are negatively impacted by heat stress, which lowers fertility and output.Granulosa cells, which are vital parts of ovarian follicles, are important for ovulation and oocyte development.Developing methods to lessen the negative consequences of heat stress requires an understanding of how it affects granulosa cell metabolism. The possible function of vitamin C in reducing heat stress-induced damage to different cell types has drawn more attention in recent years. Investigating how vitamin C affects granulosa cell metabolism in heat-stressed environments may yield important information on possible treatment approaches to enhance animal reproductive outcomes [1].

Granulosa cells play an important role in regulating ovarian function by promoting oocyte maturation, steroidogenesis, and follicle expansion. Reduced fertility and reduced follicular growth result from heat stress's disruption of granulosa cells' regular cellular functions. According to studies, heat stress compromises the metabolic activity of granulosa cells by causing oxidative stress and interfering with mitochondrial function. Strong antioxidant vitamin C has been demonstrated to reduce oxidative stress and safeguard cellular function in a variety of cell types. Furthermore, vitamin C is essential for controlling energy production and mitochondrial metabolism.

Description

Thus, it is particularly interesting to look at how vitamin C supplementation affects the metabolism of granulosa cells under heat stress. Vitamin C may be able to lessen the harm that heat stress causes to granulosa cells, according to recent studies. In heat-stressed granulosa cells, vitamin C supplementation has been demonstrated to improve mitochondrial activity, decrease oxidative stress, and increase cell viability. Furthermore, it has been discovered that vitamin C controls important metabolic processes in granulosa cells that are involved in energy production and antioxidant defense, maintaining the cells' ability to operate in the face of heat stress.These results imply that vitamin C administration may be a viable tactic to mitigate the impairment of granulosa cell metabolism brought on by heat stress and enhance livestock reproductive performance [2].

Studies on how vitamin C affects the metabolism of granulosa cells under heat stress have shed light on some of its possible modes of action. By scavenging Reactive Oxygen Species (ROS) and reestablishing antioxidant defense systems in granulosa cells, vitamin C supplementation has been shown to mitigate heat stress-induced oxidative damage. Furthermore, it has been demonstrated that vitamin C maintains mitochondrial function by boosting ATP generation in heat-stressed granulosa cells and preserving mitochondrial membrane potential. Additionally, vitamin C seems to alter important metabolic processes in granulosa cells, which enhances cell viability and performance in heat-stressed environments. In heat-stressed granulosa cells, vitamin C supplementation has been shown to increase the expression of genes related to glycolysis and the Tricarboxylic Acid (TCA) cycle, improving energy production and metabolic resistance. Further supporting its protective effects on granulosa cell metabolism, vitamin C also inhibits the generation of pro-inflammatory cytokines and modifies signaling pathways linked to the heat stress response [3,4].

Vitamin C's positive effects on granulosa cell metabolism under heat stress are enhanced by its synergistic interactions with other antioxidants, including glutathione and vitamin E. Compared to vitamin C alone, co-supplementation with additional antioxidants may improve cellular antioxidant capacity and lessen oxidative damage. Furthermore, the timing and length of vitamin C treatment in January affect how well it reduces heat stress-induced damage in granulosa cells, underscoring the significance of tailoring supplementation regimens to individual heat stress scenarios and animal traits. The idea that vitamin C supplementation has potential as a workable and affordable method of reducing heat stress-induced impairment of granulosa cell metabolism in livestock is generally supported by the mounting data. Vitamin C supplements in January support the resilience and sustainability of cattle production systems that are increasingly confronted with environmental stressors and climate change by maintaining cellular function and improving reproductive performance. In order to convert scientific discoveries into practical methods for enhancing animal comfort and productivity in the face of heat stress, more investigation is necessary to confirm these findings across a range of livestock species and production settings [5].

Conclusion

As a result of altering the metabolism of granulosa cells, heat stress presents a serious threat to livestock reproductive function. To effectively minimize the negative consequences of heat stress, it is imperative to comprehend the underlying mechanisms that cause damage to granulosa cells. Vitamin C's antioxidant qualities and capacity to regulate cellular metabolism make it a viable option for reducing heat stress-induced damage to granulosa cells.The exact processes behind vitamin C's protective properties need to be better understood, and its dosage and administration schedules need to be optimized for maximum effectiveness.January vitamin C supplements provide a practical way to boost production and improve reproductive outcomes in heat-stressed sheep populations by focusing on granulosa cell metabolism.

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Conflict of Interest

There are no conflicts of interest by author.

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