

Tupistra Nutans and Its Emerging Role in the Regulation of Cell Death Through MicroRNA-Mediated Mechanisms

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ABSTRACT

The development and growth of uterine fibroids are primarily influenced by ovarian estrogen and progesterone. Following menopause, the decline in ovarian steroid hormone production generally induces spontaneous regression of uterine fibroids and improvement of associated symptoms. However, this regression is not necessarily complete, and some fibroids may persist or demonstrate limited reduction in size. For asymptomatic uterine fibroids or adenomyosis, routine imaging examinations, including magnetic resonance imaging (MRI), are generally unnecessary after menopause. However, if new symptoms such as genital bleeding, lower abdominal pain, or abdominal distension develop, prompt re-evaluation is essential to exclude malignant disease.

Dear Editor,

Cell death regulation is a fundamental process involved in tissue development, immune responses, aging, and numerous pathological conditions, including cancer, cardiovascular diseases, and neurodegenerative disorders. Apoptosis, autophagy, necroptosis, pyroptosis, and ferroptosis are tightly controlled by intricate signaling networks, many of which are regulated by miRNAs. These small non-coding RNAs can either suppress or promote cell death by targeting messenger RNAs encoding proteins involved in mitochondrial integrity, inflammatory signaling, oxidative stress responses, and caspase activation [1,2]. Recent studies investigating phytochemical extracts have demonstrated that natural compounds can alter miRNA expression profiles, thereby influencing downstream cell death pathways. In this context, TN represents a promising candidate. Preliminary experimental findings indicate that TN-derived constituents may regulate the expression of miRNAs associated with apoptosis-related genes such as BCL2, BAX, CASP3, and PTEN. Through modulation of these targets, TN may shift the cellular balance toward either survival or programmed death depending on the physiological context [3,4].

Particularly noteworthy is the potential role of TN in oxidative stress-mediated cell death. Several miRNAs, including miR-21, miR-

34a, miR-155, and miR-146a, are known to participate in reactive oxygen species (ROS)-dependent signaling pathways. Bioactive phytochemicals present in TN may influence these miRNAs, thereby attenuating excessive oxidative damage or promoting the elimination of dysfunctional cells. Such mechanisms could have therapeutic relevance in chronic inflammatory disorders and malignancies characterized by dysregulated cell death [5,6]. Furthermore, miRNA-mediated regulation of autophagy may represent another important mechanism underlying TN activity. Autophagy serves as a double-edged sword, promoting either cell survival or cell death depending on cellular conditions. Modulation of autophagy-related miRNAs by TN could influence critical signaling pathways such as PI3K/AKT/mTOR and AMPK, ultimately affecting cellular fate decisions. Future studies employing transcriptomic and miRNA-sequencing approaches would help clarify these molecular interactions [7]. Despite these promising observations, significant knowledge gaps remain. Most available data are derived from in vitro studies, and the specific TN phytochemicals responsible for miRNA regulation have not yet been fully identified. Standardized extraction procedures, mechanistic investigations, and in vivo validation studies are required before definitive conclusions regarding therapeutic applications can be drawn [8].

In Conclusion

Tupistra nutans appears to be a promising natural modulator of cell death pathways through miRNA-dependent mechanisms. Further research exploring the interplay between TN-derived bioactive compounds, miRNA networks, and programmed cell death may reveal novel therapeutic opportunities for diseases characterized by impaired cellular homeostasis [9].

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