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Targeting the PI3K/Akt/mTOR Signaling Pathway in Colorectal Cancer Treatment: Current Insights and Future Perspectives

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Abstract

Colorectal Cancer (CRC) remains a significant global health burden, necessitating the development of novel therapeutic strategies. The PI3K/Akt/mTOR signaling pathway has emerged as a promising target in CRC due to its pivotal role in regulating cell proliferation, survival, and metabolism. This article provides a comprehensive overview of the dysregulation of the PI3K/Akt/mTOR pathway in CRC and discusses the therapeutic potential of targeting this pathway for CRC treatment. We explore the preclinical and clinical evidence supporting the efficacy of PI3K/Akt/mTOR inhibitors in CRC, highlighting ongoing challenges and future directions in harnessing this pathway for improved patient outcomes.

Keywords: Cancer • Therapeutic potential • Patient

Introduction

Colorectal Cancer (CRC) ranks among the most prevalent malignancies globally, representing a major cause of cancer-related morbidity and mortality. Despite advances in early detection and treatment modalities, the management of advanced CRC remains challenging, necessitating the exploration of novel therapeutic approaches. The PI3K/Akt/mTOR signaling pathway has emerged as a key regulator of cellular processes implicated in CRC pathogenesis, making it an attractive target for therapeutic intervention. In this article, we delve into the intricate mechanisms underlying PI3K/Akt/mTOR dysregulation in CRC and discuss the therapeutic strategies aimed at exploiting this pathway for effective CRC treatment [1].

Literature Review

The PI3K/Akt/mTOR pathway plays a central role in orchestrating cellular responses to extracellular stimuli, including growth factors, hormones, and cytokines. Dysregulation of this signaling cascade is frequently observed in CRC and contributes to tumor initiation, progression, and metastasis. Aberrant activation of PI3K/Akt/mTOR signaling can occur through various mechanisms, including genetic mutations, amplifications, and loss of tumor suppressor function, leading to sustained proliferation, evasion of apoptosis, and enhanced metastatic potential in CRC cells. Moreover, crosstalk between the PI3K/Akt/mTOR pathway and other oncogenic signaling pathways further potentiates its oncogenic effects in CRC [2-4].

Given its critical role in CRC pathogenesis, the PI3K/Akt/mTOR pathway represents an attractive therapeutic target for CRC treatment. Small molecule inhibitors targeting different components of this pathway have been developed and evaluated in preclinical and clinical studies. These inhibitors exert their antitumor effects by inhibiting cell proliferation, inducing apoptosis, and suppressing tumor angiogenesis and metastasis. However, the clinical utility of PI3K/Akt/mTOR inhibitors in CRC has been limited by intrinsic and acquired resistance mechanisms, toxicity profiles, and suboptimal patient selection strategies.

Discussion

Preclinical studies have demonstrated the efficacy of PI3K/Akt/mTOR inhibitors as single agents or in combination with standard chemotherapy or targeted therapies in CRC models. These studies have provided valuable insights into the molecular mechanisms underlying PI3K/Akt/mTOR inhibitor resistance and have identified potential predictive biomarkers to guide patient selection and treatment strategies. In clinical trials, PI3K/Akt/mTOR inhibitors have shown varying degrees of activity in CRC, with some patients exhibiting durable responses, while others experience disease progression or intolerable toxicities. Notably, the identification of predictive biomarkers, such as PIK3CA mutations, PTEN loss, and mTOR pathway activation, has enabled more personalized approaches to PI3K/Akt/mTOR inhibitor therapy in CRC patients [5].

Despite the promise of PI3K/Akt/mTOR inhibitors in CRC treatment, several challenges remain to be addressed. These include overcoming resistance mechanisms, optimizing drug combinations, and identifying reliable predictive biomarkers to guide patient selection and treatment response monitoring. Furthermore, the development of novel agents targeting specific isoforms or downstream effectors of the PI3K/Akt/mTOR pathway may offer improved efficacy and reduced toxicity compared to pan-pathway inhibitors. Additionally, the integration of PI3K/Akt/mTOR inhibitors with immunotherapy or other targeted therapies holds potential synergistic benefits for CRC patients [6].

Conclusion

The PI3K/Art/mTOR signaling pathway represents a promising therapeutic target in CRC, offering the potential to improve patient outcomes through targeted inhibition of key oncogenic drivers. Despite challenges and limitations, ongoing research efforts continue to unravel the complexities of PI3K/Akt/mTOR dysregulation in CRC and pave the way for the development of more effective and personalized treatment strategies. By elucidating the molecular mechanisms underlying PI3K/Akt/mTOR inhibitor response and resistance, as well as identifying predictive biomarkers, we can harness the full therapeutic potential of targeting this pathway in CRC management.

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Conflict of Interest

None.

References

1. Kumar, Anup, Roger Smith and Vipul R. Patel. "Current status of robotic simulators in acquisition of robotic surgical skills." *Curr Opin Urol* 25 (2015): 168-174.
2. Lee, Darrin J. and Andres M. Lozano. "The future of surgical treatments for Parkinson's disease." *J Parkinsons Dis* 8 (2018): S79-S83.
3. Jovic, Thomas H, Emman J. Combellack, Zita M. Jessop and Iain S. Whitaker. "3D bioprinting and the future of surgery." *Front Surg* 7 (2020): 609836.
4. Tarassoli, Sam P. "Artificial intelligence, regenerative surgery, robotics? What is realistic for the future of surgery?." *Ann Med Sur* 41 (2019): 53-55.
5. Moritz, William R, Shreya Raman, Sydney Pessin and Cameron Martin, et al. "The history and innovations of blood vessel anastomosis." *Bioeng* 9 (2022): 75.
6. Gettman, Matthew and Marcelino Rivera. "Innovations in robotic surgery." *Curr Opin Urol* 26 (2016): 271-276.

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