Unlocking the potential: integrating traditional Chinese medicine and modern technology for enhanced cancer treatment strategies

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Based on the unique therapeutic advantages of traditional Chinese medicine (TCM) and its integration with modern scientific technology, the exploration of more effective strategies for cancer treatment holds great significance. The utilization of TCM in modern applications and the selection of drugs and drug delivery systems for cancer treatment demonstrate promising potential.

In accordance with TCM theory, a strong spleen and stomach support the overall well-being of the five zang organs. During cancer treatment, TCM often reinforces healthy Qi (Qi refers to the basic substance that constitutes the human body and maintains life activities, and is the unity of substance and function) to eliminate pathogenic factors, safeguard the spleen and stomach, and strengthen vital Qi. This approach aims to remove toxins and regulate and harmonize the balance of Qi, blood, Yin (in Chinese philosophy, the female, latent, passive principle, characterized by dark, cold, wetness, passivity, disintegration, etc.), Yang (in Chinese philosophy, the masculine, active and positive principle, characterized by light, warmth, dryness, activity, etc.), and organ functions.

Many scholars have incorporated TCM into adjuvant chemotherapy regimens for cancer patients with the hope of effectively inhibiting tumor growth, promoting apoptosis of tumor cells, regulating patients’ immune responses, mitigating adverse effects of chemotherapy, and reducing the risk of tumor recurrence. Additionally, individualized TCM formulations, tailored to patients’ constitutional and disease characteristics, synergistically combine modern spectrum-based anticancer Chinese herbs. Reinforcement and elimination in combination and therapy with syndrome differentiation, these formulations stimulate positive factors within the body, enhance immune function, fortify the body’s resistance, and improve patients’ quality of life.

In the context of modern medical advancements, an increasing number of active compounds from TCM have been identified for their potent anti-tumor activities. These compounds intervene in critical signaling pathways, exhibiting noticeable inhibitory effects on tumor progression.

The selection of drug delivery systems is paramount in determining the efficacy of cancer treatment. Hydrogel systems, functioning as reservoirs for drugs, enable controlled and sustained drug release, enhance drug accumulation at target sites, minimize drug circulation, and reduce required drug dosages, thereby decreasing systemic exposure and toxicity. Hydrogels with superior mechanical characteristics and biocompatibility are more easily absorbed by the body. The application of hydrogel-based local drug delivery at tumor sites holds extensive promise. Numerous hydrogels with excellent biocompatibility and degradability have been widely utilized in tissue engineering, biomedicine, and other domains, displaying outstanding drug-loading capabilities and anticancer activities.

Contemporary research underscores the synergistic potential of combining TCM with Western medicine, achieving enhanced therapeutic effects with reduced toxicity. Simultaneously, the effective integration of active ingredients from traditional Chinese herbs with modern molecular targeted drugs, coupled with advanced pharmaceutical formulation techniques, facilitates the development of novel drug delivery systems and treatment regimens, offering more effective options for cancer therapy. Such approaches yield significant benefits in mitigating adverse reactions from radiotherapy and chemotherapy, regulating patients’ immune functions, preventing recurrence and metastasis, and extending patient survival.

Competing interests
The authors declare no conflicts of interest.

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Abbreviations
TCM, traditional Chinese medicine.

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