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Exosomes: Promising biomarkers and targets for cancer

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Abstract

The review article entitled "Exosomes as potential diagnosis and treatment for liver cancer " recently published in *World Journal of Gastrointestinal Oncology* 2022; 14: 334-347 concluded that exosomes can be used as effective biomarkers or therapeutic biotargets in liver cancer. Exosomes are a hot spot in the field of tumor diagnosis and treatment research. We had also previously published a review on exosomes and tumors. In this letter to the editor, we summarize the clinical application prospects and current challenges of exosomes.

Key Words: Exosomes; Cancer; Biomarkers; Diagnosis; Therapy

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Core Tip: Exosomes have been shown to be major transmitters of cell-to-cell communication. Several advantageous features make exosomes effective therapeutic targets for cancer and ideal vehicles for drug delivery. This letter highlights the opportunities and challenges for clinical study and application of exosomes.

TO THE EDITOR

We read with great interest the systematic review "Exosomes as potential diagnosis and treatment for liver cancer" recently published in World J Gastrointest Oncol 2022; 14: 334-347^[1]. The authors conducted a literature search to identify potential diagnostic and therapeutic markers of exosomes in liver cancer. Forty ¹ potential liver cancer biomarkers, 13 potential biotherapeutics and 10 potential hepatocellular carcinoma therapeutic targets were identified, providing future directions for basic research and targeted therapy of liver cancer.

Exosomes, first discovered in 1983, are small lipid bilayer vesicles with a diameter of 40-160 nm, which are found in body fluids such as blood, urine, saliva, and cerebrospinal fluid^[2]. Exosomes contain many biomolecules, including membrane-bound proteins, soluble proteins, lipids, DNA, microRNAs and non-coding RNAs^[3]. In recent years, studies have found that exosomes are involved in intercellular communication in many physiological processes in the body, and play a crucial role in mediating tumorigenesis, development and metastasis^[4-6]. Tumor-derived exosomes convey tumorigenic information and contribute to the tumor microenvironment for tumor proliferation and metastasis, and are a promising biomarker for cancer therapy^[2]. The unique characteristics of tumor cell-derived exosomes make them potential biomarkers for early cancer diagnosis, tracking cancer patient's response to therapy, and detecting mechanisms of resistance to therapy, and making important contributions to precise and personalized cancer therapy.

A variety of cancer cell-specific proteins, lipids, DNA, RNA and metabolites can be isolated from cancer cell-derived exosomes, which can be used as cancer biomarkers^[3]. Studies have reported that ² exosome-associated glypican-1 (GPC1) is a diagnostic biomarker for early pancreatic cancer^[7]. Circulating exosome-derived lncRNA-GC1 can be used as a biomarker to detect early gastric cancer and monitor disease progression^[8]. Tumor cell-specific molecules in exosomes can be used for early diagnosis and detection of cancer recurrence.

Exosomes have natural delivery capabilities as carriers for cancer therapeutics and functional RNAs^[9]. Compared with traditional nanomaterial carriers, exosomes have

the advantages of high bioavailability, non-cytotoxicity and non-immunogenicity. Transmembrane and membrane-anchored proteins within exosomes enhance endocytosis, thereby facilitating transfer of chemotherapeutics. Studies have found that neutrophil-derived exosomes deliver chemotherapeutics across the blood-brain barrier and effectively inhibit tumor growth^[10]. Exosomes have the characteristics of small size, strong penetration and high biological stability. Using exosomes to deliver drugs or adding inhibitory immune checkpoints on the surface of exosomes to further enhance the anti-cancer effect is a new direction for exosomes in cancer treatment. In the future, exosome-based drug delivery systems are expected to be widely used in cancer therapy. (Figure 1)

With the deepening of exosome research, a more comprehensive understanding of exosomes has been achieved, but there are still factors that restrict exosome research and clinical application. For example, the large-scale extraction, isolation and purification of exosomes are limited. At present, the exosome extraction method is mainly ultracentrifugation, but with low yield and high cost, thus it is difficult to achieve industrial production and large-scale clinical application.

In conclusion, much progress has been made in the field of exosome research, but the obstacles hindering the widespread clinical application of exosomes should also be highly concerned. The great prospect of exosomes for cancer diagnosis and treatment is undeniable.

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1	www.wjgnet.com Internet	12 words — 2%
2	Jia-Tao Zhang, Hao Qin, Fiona Ka Man Cheung, Jian Su et al. "Plasma extracellular vesicle microRNAs for pulmonary ground-glass nodules", Journal of Extracellular Vesicles, 2019 Crossref	11 words — 1%