Role of Biological Tools in Cancer Therapy

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Editorial

Exosomes have been identified as a potential new therapeutic target in cancer biology and immunotherapy. Exosomes have lately been shown to have potential roles as promising diagnostic tools and prognostic biomarkers for cancer immunotherapy. Exosomes are small extracellular vesicles with a diameter of 30 to 150 nm that come from a single cell type (donor cell) and operate as biological transporters. They carry out biological processes and mediate cell-to-cell communication by carrying cargo, such as DNA, RNA, proteins, or particular medicines, into target or recipient cells. Exosomes are released by a variety of cell types, including tumour and immune cells, and are capable of altering the pathophysiology of receiving cells by transmitting information that govern different biological activities and transduce intercellular signaling.

Exosomes may affect anti-tumor immunity and play a key role in cancer progression, according to mounting data. The cross-talk between tumour cells and immune cells is one of the main topics in tumour immunology that has sparked a lot of attention and transformed the era of cancer immunotherapy. The synthesis of exosomes, their significance in immune regulation and cell-to-cell communication, their future use in cancer immunotherapy, and their prospective role as predictive biomarkers for therapy responses were all covered in detail. The authors compared and contrasted various methods for isolating and purifying exosomes from plasma samples, noting the benefits and drawbacks of each. Ultracentrifugation, density gradient centrifugation, ultrafiltration, an immune affinity-based method, and a Poly Ethylene Glycol (PEG)-based isolation method are among the techniques available. Other biological fluids, such as seminal fluid, cerebral fluid, serum, and urine, can also be used to separate exomes. Exosome isolation and purification procedures vary, and they can be chosen based on the composition and physical qualities of the biological fluid. The methods for determining molecular features, functional qualities, biochemical composition, protein surface expression, and shape of pure exosomes vary by sample. Flow cytometry, Western blotting, the Nano Sight method, transmission electron microscopy, dynamic light scattering, chromatography-mass spectrometry, and immunohistochemistry are some of the techniques used.

The potential benefits of using exosomes as a therapeutic method to help cancer immunotherapy induce robust long-lasting immune responses against tumour cells and overcome tumor-mediated therapy resistance. The advantages of employing exosomes over other nanoparticles, which make them a potential method for cancer immunotherapy, have been examined by the authors; these advantages include exosomes' long circulating half-life, high specificity for target cells, and lower toxicity concerns. Exosomes, particularly DC-derived exosomes, are also beneficial in activating anti-tumor immune responses and reducing tumour growth, according to findings from preclinical models and *in vitro* investigations. The safety and efficacy of exosomes were tested in clinical trials after positive results from preclinical models and *in vitro* research. In metastatic melanoma patients, autologous DC-derived exosomes loaded with MHC II and tumour MAGE peptides were found to be safe but not effective in a phase I clinical trial.

A phase I clinical trial in colorectal cancer patients looked at the effectiveness of combining GM-CSF treatment with ascites-derived exosomes in generating tumor-specific cytotoxic T cell-mediated responses. Another phase I clinical trial established the safety and therapeutic efficacy of autologous DC-derived exosomes pulsed with tumour MAGE peptides in patients with advanced non-small cell lung cancer in enhancing anti-tumor immunity and extending disease stability (NSCLC). Exosomes laden with IFN- and MHC class I and II were given to patients with advanced NSCLC in a phase II clinical trial, and they increased NK cell-mediated anti-tumor immune response and extended overall survival and progression-free survival in 50% of the patients. Furthermore, there is evidence that employing CAR T cell-derived exosomes can help minimise the immune-related adverse event cytokine storm syndrome, which is induced by CAR T cell therapy in cancer patients, as well as improve therapy specificity. As a result, exosomes may be able to improve the clinical response to CAR T cell treatment, making it more palatable and effective. There are currently no phase III clinical trials for exosome-based cancer therapy under progress or registered, and all of them are phase I or II trials.

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