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Editorial

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An Opportunities of Stem Cells in Cancer Therapy

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Due to the uniqueness of the biological structures of stem cells, and having special properties, such as remarkable affinity and migrating to cancers cell, producing and pouring bioactive factors, as well as theimmunosuppression characteristics, all make stem cells ready to playing extensive role in tumor targeting process. Applications of preclinical stem cells in cancer therapies witnessed significant progress and have lots of promises. Recently stem cell therapy in cancers management revealed several advantages, opportunities, and potential challenges.

Stem cells Self-differentiation and renew, migratory properties, self-differentiation and -renewal capabilities. Immunosuppression, antitumor activity by expressing growth factors and cytokines are among other important characteristics of stem cells, all these features contribute to regulating host innate and cellular immune pathways. Stem cells can secret factors, like as CCL2/MCP-1, and physically interact with tumor cells, Many human stem cells have intrinsic tumor-tropic properties which Originating from chemokine-cancer cell interactions. Migratory capabilities exhibited in xenograft mouse models, manifested as tumor-homing abilities. This processes Starting with NSC migration to tumor foci when triggered by hypoxia, ikewise phenomena activates expression of chemo attractants Directional HSC migration , based on the interaction at chemokine, CXCL12, and its receptor, CXCR4 A variety of MSC-expressed chemokine and growth factor receptors which participate in tumor homing, aging, co-cultured tumor cell phenotypes as well as exerting intrinsic antitumor effects.

Stem cells Defined to: 1) form single cell-derived clonal cell populations, 2. self-renew indefinitely, and 3) differentiate into various cell types. Stem cells shall be categorized as 'embryonic' (ESCs) or 'somatic' (SSCs). SSCs (adult stem cells), which are multipotent and having the capacity of differentiating into any cell type with a specific lineage, like neural stem cells (NSCs), (MSCs) mesenchymal stem cells, hematopoietic stem cells (HSCs), endothelial progenitor cells (EPCs), and many others in many cases, cancer stem cells (CSCs) are driving tumor genesis and disease.

Self-renewal in resident stem cell pools plays key roles in tissue regeneration and homeostasis. Variety of MSC-expressed chemokine and growth factor receptors may participate in tumor homing .The factor 1 (SDF1)/CXCR4 axis (stromal cell-derived) plays a tremendous role in the migration of various stem cells. Stem cells have been engineered with higher levels of chemokine receptors to improve directed homing, or manipulated to release more chemokines. It has been reported that CXCR4-overexpressing MSCs migrated toward glioma cells more effectively than control MSCs in vitro and in a xenografted mouse model of human glioma. Enhances recruitment of stem cells made by Controlled release of a chemokine from various biomaterials towards them. The two strategies can be combined to increase homing efficiency and improve treatment outcomes.Stem cells, especially NSCs and MSCs, can be manipulated and modified by multiple procedures to be used in cancer treatments. The best modifications may include producing therapeutic enzyme system, oncolytic virus delivery at the tumor site or nanoparticle.

Engineering of NSCs and MSCs to express enzymes that convert non-toxic prodrugs into cytotoxic products is one of the strong potentials in cancer therapy. A modified stem cells can be transplanted into tumor-bearing models, and localize to tumor tissues, thus, exogenous enzyme converts the prodrug into a cytotoxic molecule, eventually damaging the tumor cells. As a result, the amount, timing, and location of drug release can be precisely controlled. Enzyme/prodrug treatment is some time called suicide gene therapy, it was among the first engineered NSC treatment applications and the first to enter clinical trials. One of the major enzyme/prodrug therapies is Cytosine deaminase (CD), to convert prodrug, 5-fluorocytosine (5-FC), into the toxic variant, 5-fluorouracil. It has been recently reported on combination of CD-bearing mouse NSCs and 5-FC inhibited glioblastoma (GBM) cell growth, and tumor growth remarkably suppressed by Injecting CD-expressing MSCs into the brain with 5-FC.

As for cytotoxic treatment, human HB1.F3 cells are engineered to express CD (HB1.F3.CD) safely and effectively. Herpes simplex virus-thymidine kinase (HSV-TK) recently utilized in suicide gene therapy, where .HSV-TK phosphorylates the prodrug, monophosphorylate ganciclovir (GCV), to produce cytotoxic triphosphate ganciclovir (GCV-TP). GCV-TP composed into the DNA of close cells during division, which leads to cell death through DNA polymerase inhibition.

Future perspectives for Stem cell application in cancer therapy is promising ,and investment in developing effective applications will be high return long term investment worldwide, likewise stem cells will be the treatment of choice for most types of cancer due to their excellent efficacy in penetration, specific retention and killing of

tumor cells/CSCs. Nevertheless, there are still many issues that must be addressed in priority to ensure the maximum benefit from the recent advancements in this field. Using of multidisciplinary tactics for the enhancement of the efficiency of the laboratory research at molecular biology level associated with cyto pharmacokinetics base would be substantial asset. In brief, stem cells applications in cancer management is the future of cancer treatment and would require more in-depth knowledge to improve the existing barriers in this field further.

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