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Cancer stem cell and treatment of breast cancer

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Abstract:

Cancer stem cell (CSC) has been identified as tumor cell which have the ability to self-renew and to make the heterogeneous ancestries of cancer cells. Cancer has long been observed as a heterogeneous collected cells. Collected evidence has recommended that CSC is talented of self-renewal and differentiation into numerous varieties of cancer cells. Cancer stem cells have many fundamental apparatuses of resistance to chemotherapeutic drugs, new tumor-targeted drugs, and radiation therapy, permitting them to live standard cancer treatments and to initiate tumor metastasis. Numerous molecular complexes and pathways have been discussed in survival cancer stem cells which includes expression of ATP-binding cassette (ABC) drug transporters, the motivation of the Wnt/β- catenin, Hedgehog, Notch. Tumor cells have been recognized and isolated in several cancers which include blood, breast, and pancreas, skin and prostate. It is often associated with chemo-resistance and radio-resistance which cause the failure of current treatment. In this review, we briefly try to present the meaning of cancer stem cell and treatment position of breast cancer.

Keywords: Cancer, Stem cell, Breast

Introduction

In the world, cancer residues a main reason of death. Despite, great developments have been done in understanding the molecular basis of cancer, the development in cancer recognition and therapy, death from cancer is still very high and there is not a treatment in spite of great progress have been completed in treatments. Our findings of cancer and how cancer cells can be created and have been altered radically within the past ten to fifteen years. It is believed that a tumor has its source in CSCs, which made either from improved tissue stem cells or reformed progenitor cells that they have gained self-renewal action. The present therapy for cancer have revealed inadequate survival advantages when used for the most progressive phase of cancers due to these therapies target tumor bulk but not CSCs[1, 2]. Undeniably, straight cancer treatments mark

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neoplastic cells which are mainly fast-growing and it proposes that CSCs might live because of their high resistance to drugs and slower proliferation ratio [3, 4]. Cancer stem cells are supposed to be answerable for cancer beginning, development, metastasis and drug resistance. The cancer stem cell suggestion has newly involved much consideration because of the ability for detection and progress of cancer stem cell which associated to treatments and the documentation of important molecules elaborate in monitoring the exclusive features of cancer stem cell populations. During past times, an incredible amount of energy has been capitalized in the progress of novel drugs. New composites and healing approaches which selectively mark cancer stem cells have been recognized, and some of them have been assessed in preclinical and medical studies [5]. CSCs possess numerous fundamental mechanisms of resistance to conventional chemotherapeutic drugs and new tumor-targeted drugs counting expression of ABC drug transporters [6-8], activation of Hedgehog and Notch signaling pathways, Wnt/β-catenin signaling and Akt/PKB and ATR/CHK1 existence pathways [8-11] improved activity of aldehyde dehydrogenase 1 (ALDH1) and barrier activation and effective repair of DNA and oxidative destruction [8, 11, 12].

Cancer Stem Cells

A lot of studies have recommended that cancer stem cells are well-known tumor-initiating cells which be able to self-renew and have the pluripotent capacity [1]. Cancer stem cells have been recognized in several malignancies, counting leukemia and numerous solid cancers. Because of their amazing features, cancer stem cells are believed to be the basis for tumor initiation and improvement. The first fascinating evidence which shows the existence of cancer stem cells is normally approved by Bonnet and Dick in 1997[13]. In their reports, only the CD34+CD38– cells from acute myeloid leukemia (AML) patients can recruit hematopoietic malignancy in NOD/ SCID mice. Outstandingly, this cell population influenced the capability to self-renew, proliferate and differentiate [5, 13]. Human cancers (HCs) have been identified as a morphologically heterogeneous population of cells [14]. There are two models of cancer growth which can be explained for tumor improvement. The first, it is called the stochastic model, undertakes that every cancerous cell has the capability to widely proliferate and regenerate a tumor. In contrast, the cancer stem cell model undertakes that only a very small subsection of cells in the tumor which its population actually has the ability to recruit and sustain tumor growing [15]. CSCs are cancer cells which have features related to usual stem cells, specifically the capability to increase to all cell categories which found in a specific cancer sample. It is considered to be related with chemo-resistance and radio-resistance which lead to the disappointment of traditional therapy [16]. There appear to be several sources from which cancer stem cells may arise. They may arise from normal ASCs (adipose-derived stromal cells), from more restricted progenitor cells or even from differentiated cells [3, 17]. Cancer stem cells are distinct populations of tumor cells. Cancer stem cells have several exclusive characterization which cause them to be vital for tumor construction. Cancer stem cells are pluripotent and can produce tumor cells with different phenotypes, that outcomes in the growing of the primary tumor and appearance of new tumors [5].

Therapies targeting cancer stem cells in breast cancer

Present beneficial approaches against cancer have severe boundaries that regularly lead to treatment disappointment. A communal cause of therapy failure in several malignancies is resistance to chemotherapy and radiotherapy. Furthermore, various approaches are not adequately selective against cancer stem cells which can be toxic to healthy tissues, and patients typically face the threat of recurrence and metastasis because most treatments cannot eliminate cancer stem cells [18]. Collected evidence has recognized which cancer stem cell populations are more resistant to straight cancer treatments than non- cancer stem cell populations. Consequently, the elimination of cancer stem cells is vital in treating malignant diseases [19, 20]. A summary of new cancer stem cell -targeted therapeutic strategies includes:

1. Targeting cellular external markers: Investigators select ligands or antibodies against tumor external makers to increase the specificity of treatments approaches.

2. Targeting ATP-driven efflux transporters: Anti-tumor drug triggered by ATP-driven pumps which are the major goal for chemo-resistance [5, 18, 20].

3. Targeting crucial signaling cascades: Active anti-apoptotic pathways and equivalent inactive proapoptotic pathways are important fascinating researchers. Monoclonal antibodies targeting Notch signaling have revealed appealing predictions. The reticence of Notch1 can pointedly decrease the CD44+CD24−/low subpopulation and lower the prevalence of brain metastases from a breast cancer cell [5, 21, 22].

4. Targeting the tumor microenvironment: The tumor microenvironment can make a niche to care and protect cancer stem cells from apoptosis induced drug [5].

Salinomycin as a medicine for targeting cancer stem cells

Target class is breast cancer stem cells, breast cancer verified that human mammary epithelial cells eternalized and distorted by retroviral expression of SV40 large T oncogene, hTERT and H-rasV12, and subsequent knockdown of E-cadherin by short hairpin RNA interference. HMLER-shEcad cells show possessions of breast cancer stem cells and had experienced EMT Human SUM159 CSCs. And also, it has different effects and apparatuses such as HMLER-shEcad cells display resistance to the chemo-treatment drugs and cytotoxic mediator paclitaxel and staurosporine. HMLER-shEcad cells are efficiently executed by salinomycin. Salinomycin persuades epithelial differentiation of HMLER cells. Salinomycin prevents tumor-seeding capability of HMLER cells in xenograft mice. Salinomycin induces differentiation, regression [8, 23]. On the other hand, Target confirmed that CD44+ CD24− ALDH1+ cells, and SOX2 and HER2 expressing cells which were isolated from the human breast cancer cell line MCF-7 MCF-7 which it has these effects and apparatuses such as reticence of tumor construction and cloning effectiveness by salinomycin. ALDH1+ and SOX2 expressing are eliminated for breast cancer stem cells by salinomycin [8, 24].

Conclusion

Many composites and procedures have been established to target the CSCs, there still have many

barriers to overcome. Straight treatment for cancers mainly targets the differentiated tumor cells; however, in an important number of patients, CCs will obtain a drug resistant phenotype after typical treatments. Therefore, the future seems to be brighter than before for complete eradication of cancer by using current molecular and understanding of cancer stem cells.

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