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EDITORIAL

Cancer Stem Cell: A Big Hurdle in Cancer Therapy

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SUMMARY

Over the past few decades, our knowledge about origins and biological mechanisms responsible for driving cancer has changed dramatically. Cancer stem cells (CSCs) are responsible for the tumour initiation, metastasis and relapse. Most researchers are now focusing on CSCs identification, isolation and elimination. These results will provide a hopeful outlook in cancer therapy and would translate into clinically useful treatments against cancer.

Keywords: Cancer stem cells, metastasis, tumour recurrence

Despite many advances in diagnosis and treatment, cancer is the second and third leading cause of death in the world and Iran, respectively [1, 2]. CSCs or tumour-initiating cells are a small subpopulation of tumour cells that are responsible for tumour recurrence and resistance to traditional therapies, and should be eliminated for achieving the desired patient outcome [3]. These cells share many characteristics with normal stem cells, including dormant cell-cycle state, high proliferation potential, enhanced DNA repair capacity and high expression of ABC transporters [4]. They are also capable of growing as spheres in serum free medium containing growth factors, and are able to form tumours in NOD/SCID mice [5, 6]. CSCs are produced by deregulation of normal self-renewal pathways in tissue stem cells and cause tumour initiation, development, and metastasis. These cells are also highly aggressive and resistant to apoptosis and chemo/radiotherapy [7]. Enhanced DNA repair capacity and high expression of ABC transporters, lead to resistance of CSCs to many chemotherapeutic agents. The identification of CSC-specific markers and targeting the CSCs using these markers may lead to development of better targeted therapeutic approaches. Some of the latest therapeutic approaches based on CSCs include blocking signalling pathways, targeting the CSCs microenvironment or CSC markers, drug-efflux pumps inhibitors, and targeting CSCs by

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manipulation of miRNAs and siRNAs [4]. Development of targeted therapies that are selectively toxic to CSCs or induce the differentiation in these cells while sparing normal stem cells would lead to more effective methods for eradicating this crucial population of cells [8]. For achieving this purpose, we need to identify CSCs and their roles in various types of tumours, their gene expression patterns and protein profiling compared to stem cells and other cells within the same tissue [9]. Taken together, using strategies that effectively shrink tumour size with CSC specific therapy, without adversely affecting normal stem cells, may provide promising and particularly effective clinical strategies for even curing cancer. More efforts are required to characterise these cells in different populations and even individuals to design the best personalised medicines for eradicating CSCs in people with various cancers.

Conflict of Interest:

Authors declared no conflict of interest between them and with any other person or organization.

References:

1. Marappan, S. and A. Subramaniyan, *Antitumor activiy of methanolic extract of cynodon dactylon leaves against ehrlich ascites induced carcinoma in mice.* J Adv Scient Res, 2012. **3**: p. 105-8.
2. Mousavi, S.M., et al., *Cancer incidence and mortality in Iran.* Ann Oncol, 2009. **20**(3): p. 556-63.
3. Leal, J.A., A. Feliciano, and M.E. Lleonart, *Stem cell microRNAs in senescence and immortalization: novel players in cancer therapy.* Med Res Rev, 2013. **33**(1): p. 112-38.
4. Han, L., et al., *Cancer stem cells: therapeutic implications and perspectives in cancer therapy.*Acta Pharma Sinica B, 2013. **3**(2): p. 65-75.
5. Neuzil, J., et al., *Tumour-initiating cells vs. cancer 'stem' cells and CD133: what's in the name?* Biochem Biophys Res Commun, 2007. **355**(4): p. 855-9.
6. Mather, J.P., *Stem cell culture: methods in cell biology. San Diego, CA: Academic Press, Elsevier.* 2008. *p: 1-254*
7. Sagar, J., et al., *Role of stem cells in cancer therapy and cancer stem cells: a review.* Cancer Cell Int, 2007. **7**: p. 9.
8. Spillane, J.B. and M.A. Henderson, *Cancer stem cells: a review.*ANZ J Surg, 2007. **77**(6): p. 464-8.
9. Soltanian, S. and M.M. Matin, *Cancer stem cells and cancer therapy.* Tumour Biol, 2011. **32**(3): p. 425-40.