Journal of Stem Cells & Regenerative Medicine
ISSN 0973 - 7154

EDITORIAL

JSRM Code: 010010100001

Stemness & Niche sans Frontiers – The Cancer Stem Cell myth

The niche or the environment in which the cells reside and/or develop plays a major role in influencing the behaviour and characteristics of those cells. In the case of normal stem cells, the niche acts as a physical anchoring site and the adhesion molecules therein help with their interaction [1]. The niche secretes extrinsic factors that control the self-renewal and lineage differentiation of the stem cells, thus guiding them towards a pre-determined path of differentiation. For eg., stem cells in the corneal limbus give rise to corneal epithelial cells, stem cells in liver give rise to hepatocytes etc., which happen within the same organ or tissue. The bone-marrow stem cells, however, have been found to come out of the marrow into the circulation, reach sites far away from their origin and have been reported to home to the site of injury and help in tissue repair either by direct differentiation to the cells native to the site of injury or by paracrine effect or other mechanisms [2]. In both these examples, the stem cells of relevance tend to differentiate into a mature cells of the surrounding niche/organ. However, when it comes to cancer stem cells, the niche needs to be perceived in a different light. The cancer stem cells possess the ability to mobilize to distant sites and instead of differentiating to the cell-type native to the distant metastasized site, these cancer stem cells either stay in a latent state or establish the tumour there, which makes us hypothesize that they might possess the capacity to modify the environment or the niche at that distant metastasized site. For instance, tumour cells in breast cancer have been found to disseminate to the bone-marrow at a very early stage of cancer and these disseminated tumor cells (DTC) have been found to possess a cancer stem cell phenotype [3]. These DTCs have been reported to persist for long and have been suggested to play a role in cancer recurrence [4]. Also, these DTCs acquire a highly malignant and aggressive metastatic phenotype during their period of latency in the bone-marrow [5]. Based on these findings, it is pessimistically fascinating to wonder how these cancer stem cells are able to maintain their stemness and tissue characteristic properties inspite of moving across environments where the niche characteristics might be drastically different from their site of origin. Also, what is the factor that makes these cancer stem cells different from normal stem cells; is it a component in their cell?; or is it the niche that moulds itself to the tunes of the cancer stem cell, the charmer? The article by Kasai and colleagues in this issue is of high relevance. Here they propose the micro-environment as a 'cancerous niche' and they have discussed its role in the formation and maintenance of cancer stem cells based on recent experimental evidence of creating cancer stem cell models from induced pluripotent stem cells. Elaborate researches are warranted to study the nature of the cancer stem cells in conserving their 'stemness' and their ability to create a niche even at distant sites different from their tissues/organs of origin to endure their viability and propagation.

References:

1. Li L, Neaves WB. Normal stem cells and cancer stem cells: the niche matters. Cancer Res. 2006; 66(9):4553-7.
2. Rennert RC, Sorkin M, Garg RK, Gurtner GC. Stem cell recruitment after injury: lessons for regenerative medicine. Regen Med. 2012; 7(6):833-50.
3. Balic M, Lin H, Young L, Hawes D, Giuliano A, McNamara G, Datar RH, Cote RJ. Most early disseminated cancer cells detected in bone-marrow of breast cancer patients have a putative breast cancer stem cell phenotype. Clin Cancer Res. 2006; 12(19):5615-21.
4. Bidard FC, Kirova YM, Vincent-Salomon A, Alran S, de Rycke Y, Sigal-Zafrani B, Sastre-Garau X, Mignot L, Fourquet A, Pierga JY. Disseminated tumor cells and the risk of locoregional recurrence in non-metastatic breast cancer. Ann Oncol. 2009;20(11):1836-41.
5. Marsden CG, Wright MJ, Carrier L, Moroz K, Rowan BG. Disseminated breast cancer cells acquire a highly malignant and aggressive metastatic phenotype during metastatic latency in the bone. PLoS One. 2012; 7(11):e47587.