

Cancer Stem Cells: Concept and Impact

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The cell of origin of cancer has been a strongly debated topic through out the history of cancer research. With the advances in stem cell biology, the concept of carcinogenesis is rapidly evolving. The possibility that cancers may rely on "cancer stem cells" that share the self-renewal feature of normal stem cells may change the perspective with regard to new approaches for cancer therapy in the future. This review provides a historic framework and a synopsis of how the theories of cancer initiation and progression evolved from early times to the present day. The concept of cancer stem cell and review of the literature supporting the existence of cancer stem cells will be given in this lecture. Also, the role of niche, which is responsible for the regulation of normal stem cells, is also discussed in cancer. The stem cell niche in adult somatic tissues plays an essential role in maintaining stem cells or preventing tumorigenesis by providing primarily inhibitory signals for both proliferation and differentiation. The balance between proliferation-inhibiting and proliferation-promoting signals is the key to stem cell maintenance versus tissue regeneration. Loss of the niche can lead to loss of stem cells, indicating the reliance of stem cells on niche signals. Therefore, cancer stem cells may arise from an intrinsic mutation, leading to self-sufficient cell proliferation, and/or may also involve deregulation or alteration of the niche by dominant proliferation-promoting signals. Furthermore, the molecular machinery used by normal stem cells for homing to or mobilizing from the niche may be "hijacked" by cancer stem cells for invasion and metastasis. Together, the concept of cancer stem cells enables the explanation of many paradoxical phenomena observed between in vitro experiments and clinical results. Also, cancer stem cells may be the real targets of cancer therapy.