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Understanding & targeting cancer stem cells

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Cancer stem cells (CSCs) comprise a cell population within a tumor that, among other factors, is responsible for cancer initiation, propagation, metastasis and recurrence. It is known that solid tumors are composed of heterogeneous cell populations with different phenotypic characteristics at different stages of development, with variable abilities to proliferate. However, only the CSC population is clonogenic in vitro and in vivo, suggesting that these cells are the only ones with the highest tumorigenic potential. The existence of a subset of cancer cells that possesses an extensive proliferative capacity was reported in leukemia and multiple myeloma in the 1970s. In both cancer types, only a cell population derived from a tumor was able to grow in clonogenic assays, where they formed spherical colonies, and induce tumors in mice that recapitulated the original tumor. At that time, the most reliable criterion for CSC identification was the capacity of these cells to produce colonies. The first CSCs were isolated from acute myeloid leukemia (AML) by transplantation into severe combined immune-deficient (SCID) mice. They were identified as CD34+CD38- cells and named AML-initiating cells because of their ability to establish human leukemia in SCID mice. Since the identified CD34+CD38- cells were less differentiated than colony-forming cells, a hierarchy or heterogeneity in AML was proposed. Later, in 1997, the model was reproduced in non-obese diabetic mice with severe combined immunodeficiency disease (NOD/SCID) mice, where CD34+CD38- CSCs were capable of differentiating into leukemic blasts in vivo, supporting the existence of a hierarchy in leukemia.

What are cancer stem cells (CSCs) recent studies have suggested that CSCs are immortal tumor-initiating cells that can self-renew and have pluripotent capacity. CSCs have been identified in multiple malignancies, including leukemia and various solid cancers. Due to their extraordinary characteristics, CSCs are thought to be the basis for tumor initiation, development, metastasis and recurrence. In 1963, Bruce et al observed that only 1%–4% of lymphoma cells (not all cancer cells) can form colonies in vitro or initiate carcinoma in mouse spleen. However, the first compelling evidence proving the existence of CSCs is generally acknowledged to have been provided by Bonnet and Dick in 1997. In their reports, only the CD34+CD38– cells from acute myeloid leukemia (AML) patients could initiate hematopoietic malignancy in NOD/SCID mice. Importantly, this cell population possessed the ability to self-renew, proliferate and differentiate. The first report of CSCs in solid cancer came in 2003 from Al-Hajj, who demonstrated the presence of CSCs in breast cancer. To date, CSCs have been discovered in a broad spectrum of solid tumors, including lung cancer, colon cancer, prostate cancer, ovarian cancer, brain cancer, and melanoma, among others.

Biography

Mohit Vijay Rojekar is working as an Assistant Professor in the Department of Biochemistry, Rajiv Gandhi Medical College, Kalwa, Thane, India. He has presented so many poster presentations. He has attended and gave presentations in many conferences also.

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