

Role of modified stem cells in the treatment of breast cancer

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Stem cells are specialised cells in the body that can divide to form more cells called daughter cells. Other cells in the body do not have this natural ability to generate new cell types. Stem cells can be modified to deliver drugs to cancer patients in order to improve the survival rate. The stem cells specifically target and migrate to metastatic tumours. This process, where one type of cell surrounds the other, is called homing. Modified stem cells improve the rate of survival when compared to non-modified stem cells. The components in the area surrounding the tumours can directly affect cancer progression and metastasis. The microenvironment of the tumour may help in the development of the mesenchymal stem cells, which in turn helps in repairing injured tissues. To manipulate the stem cells for delivering the cancer therapy to tumours, the cells can be modified so that they can express the gene that codes for a key enzyme, cytosine deaminase, only when they encounter a microenvironment. Cytosine deaminase helps in converting flucytosine into the chemotherapy drug called fluorouracil. Fluorouracil is commonly used to treat breast cancer but it can also damage healthy tissues and lead to toxicity when given systemically, like other chemotherapeutic drugs. If the modified stem cells can express cytosine deaminase, then the activated flucytosine reduces the tumour size and this will hence improve the rate of survival. The stem cells can be modified to express cytosine deaminase only in the tumour microenvironment so that the chemotherapy drug can be activated specifically near tumours. This kills the cancer cells and reduces the damage of normal healthy cells, thereby improving the effectiveness of chemotherapy.

Keywords: Stem cells, Metastasis, Chemotherapy, Cytosine deaminase, Flucytosine, Fluorouracil

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