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Cancer Suicide Gene Therapy

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The NCI predicts that 1,638,910 men and women will be diagnosed with cancer in the USA in 2012. Nearly 577,190 patients will die of **cancer of all sites** that year. Patients undergoing current systemic therapies will suffer multiple side effects from nausea to infertility. Potential parents, when diagnosed with cancer, will have to deposit oocytes and sperms prior to starting systemic radiation or chemotherapy for the future genetic testing and in vitro fertilization, while avoiding risks of mutations in their germ cells. Otherwise, children, of parents treated with systemic therapies, will be at high risk of developing genetic disorders [1,2].

Cancer is a genetic disease; therefore rapid progress in genomics and proteomics is critical for identifying the molecular causes of these diseases. In general, therapeutics aimed to cure patients diagnosed with cancer, should have no iatrogenic effects. As unfortunately, it is not the case with the current systemic therapies, the demand for the side-effects-free therapy is enormous. One of the most promising therapeutic strategies in this regard is cancer suicide gene therapy (CSGT).

The therapeutic success is primarily contingent upon precision in delivery of the therapeutic transgenes to the cancer cells only. This is addressed by discovering and targeting unique or / and over-expressed biomarkers displayed on the cancer cells and cancer stem cells. Specificity of cancer therapeutic effects is further enhanced by designing the DNA constructs, which put the therapeutic genes under the control of the cancer cell specific promoters. The delivery of the suicidal genes to the cancer cells involves viral, as well as synthetic vectors, which are guided by cancer specific antibodies and ligands. The delivery options also include engineered stem cells with tropisms towards cancers. Main mechanisms, inducing cancer cell death, include transgenic expression of thymidine kinases, cytosine deaminases, intracellular antibodies, telomeraseses, caspases, and DNases. Precautions are undertaken to eliminate the risks associated with transgenesis.

In the forthcoming issue of the Journal of Genetic Syndromes and Gene Therapy, the experts in cancer suicide gene therapy will share their experience from research and clinical trials, as well as plans for the future endeavors.

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Conflict of Interest

The author declares no conflict of interest.

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