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Stem cells

Different kinds of specialized cells construct the human body such as muscle cell, nerve cell, and skin cells. All these cells in the body come from stem cells, which are undifferentiated cells. Stem cells after their formation or division can either hold the stem cell status or they can go for differentiation in order to convert into specialized cells. This ability of stem cells provides the basis for genetic engineering. Humans and animals both cells are used and propagated in vitro for different biological purposes such as manufacturing of medicines and treating different diseases. This paper will analyze the stem cells, their functions in the human body and their role in genetic engineering.

Mainly there are three types of stem cells; embryonic stem cells, fetal stem cells, and somatic adult stem cells. The source of embryonic stem cells are three to five days old embryos and for adult stem cells, these are different adult tissues, such as bone marrow. Embryonic stem cells are preferred to be used as they have more ability to produce different cells of the body. All these stem cells have outstanding potential for regeneration as well as differentiation. There is no other cell in the body that can naturally regenerate. Moreover, these cells also perform other functions in the body such as internal repairing and replacement of damaged and dead cells. Due to these properties, stem cells can be used in different medical treatments. Adult cells are programmed to show embryonic stem cells properties. These are then used for genetic reprogramming in the treatment of different diseases such as infarcted heart, diabetes, and degenerative neurological disorders. Stem cells are programmed to become the specific cells with the ability of regeneration and repairing damaged tissues (Whitelaw et al.). Today stem cells are used in genetic engineering for the purpose of delivering transgenes into patients. This is due to their self-generation capacity and no need for recurrent administrations of the gene therapy for these cells. Stem cells can remain pluripotent while undergoing genetic modifications. Stem cells genetic modifications are used for research as well as for treatment purposes. For example, the role of a specific gene can be studied for the production of specific human proteins.

In addition, gene studies in living animals involve transgenic animals such as transgenic mice. For this purpose, stem cells are removed from the inner cell mass of the blastocyst. Then an anticipated gene is introduced in a vector along with promoter with the use of recombinant DNA (rDNA). Genes are knocked out and new drug-resistant genes are added. If there are cells that are not taking the vectors inside their cell walls, they are killed by neomycin. After the addition of new genes, cells are then inoculated into a blastocyst and placed in the uterus to produce offspring. Moreover, stem cells can be used to check the drug safety and effectiveness, before its practical applications. For this human stem cells are programmed to become the tissue-specific cells (Burnight et al.). These cells are then further used to test new drugs. For example, nerve cells can be produced to test a new drug. The test results will reveal the results of the use of a new drug. Scientists also use different genes that can encode useful protein products such as hormones and blood proteins. Thus, genetic engineering is allowing the transfer of a gene from one species into cells of another in order to have an encoded gene product. However, there are certain limitations to the use of embryonic stem cells in gene engineering. Stem cells are extracted from donated embryos and can result in immune rejection.

Works Cited

Burnight, Erin R., et al. “Gene Therapy Using Stem Cells.” *Cold Spring Harbor Perspectives in Medicine*, vol. 5, no. 4, 2015, p. a017434.

Whitelaw, C. Bruce A., et al. “Engineering Large Animal Models of Human Disease.” *The Journal of Pathology*, vol. 238, no. 2, 2016, pp. 247–56.