Stem Cells and Cancer Research

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11/04/2009

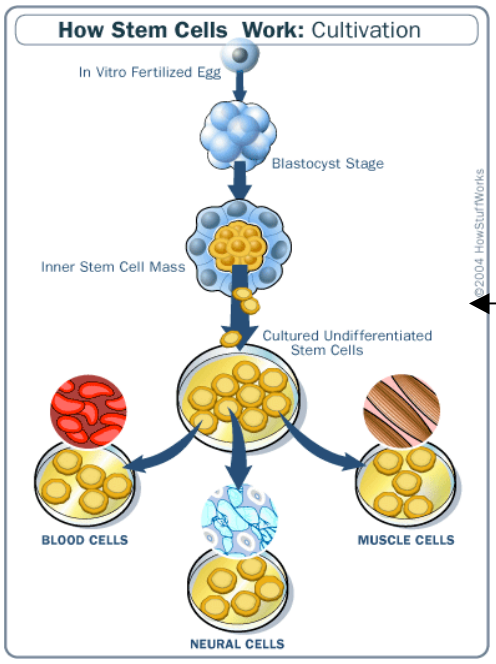
Stem cells are cells which are undifferentiated and have not yet developed into any particular type of cell. Stem cells are generally classified into two main types: embryonic and adult. These two types differ in their ability to differentiate into different types of cells. Adult stem cells are found in the brain, blood, muscles, skin, and liver and remain undifferentiated until disease or injury occurs. Most embryonic stem cells are taken from unused in vitro fertilization embryos that are in their forth of fifth day of development. The embryonic cells are characterized as Pluripotent, meaning that they have the potential to differentiate into almost any type of cell, making them the most useful.

The most common use for stem cells today is for bone marrow transplants which can be used to treat leukemia, some cancers, or blood disorders. In this case the stem cells are extracted from the bone marrow, but this method can be very painful or uncomfortable for the donor. Stem cells can also be found and extracted in small amounts from the bloodstream, causing much less pain than the bone marrow transplants; but there is also a much smaller amount available. In recent years stem cells from umbilical cord blood have been used more frequently. There are currently about 80 life-threatening conditions which can be treated with cord blood stem cells. Since umbilical cords are generally disposed of after birth, there are no negative side effects or pain associated with extracting their stem cells. Research has also showed that these stem cells are the least likely to be rejected by the body, which could be due to the fact that they have not yet developed any features that would be recognized by the patient's immune system. Umbilical cord stem cells can also be stored and readily available for many years, and be used on the child, another family member, or other unrelated patients.

In 2006 Professor John Eaton with the Kentucky Lung Cancer Research Program began research on a possible vaccine using embryonic stem cells, which could potentially prevent cancer in humans. The vaccine would prevent hereditary cancers such as breast and colon cancer, as well as those caused by outside factors such as smoking or environmental pollutants. The initial testing was done using mice, and yielded very promising results. The mice were injected with a combination of both embryonic stem cells (ESC) and cultured fibroblast cells which produce (GM-CSF); a growth factor made by white blood cells which "supercharges" the immune system's response to cancer. When injected with this treatment, and later given lung cancer in the form of a transplant, the vaccine was 100% effective in preventing tumor growth. In another test a set of mice was exposed to a carcinogen know to cause lung cancer and 90% of those treated remained tumor free, while all the untreated mice developed some type of tumor.

Now, in 2009, scientists have revealed new developments in using embryonic stem cells to create an anti-tumor response for colon cancer patients. In their research, Dr. Bei Liu and Dr. Zihai Li of China have found that by injecting the cancer patient with stem cells they could trick their immune system into recognizing them as cancer cells and then triggering a "tumor-combating immune program". After injecting lab mice with human embryonic stem cells (hES) they consistently found that the immune system worked to attack the cancerous colon cells and there were huge drops in the amount of tumor growth in these mice. These scientists also found that artificially generated cells did not yield these results, meaning that these vaccines could only be generated with real embryonic stem cell – which goes against the previous belief that the artificially created cells would replace the embryonic cells.

Both of these possible vaccines are very important for the future fight against cancer, and will likely lead to treatments for other types of cancers.



What are Stem Cells?
http://www.medicalnewstoday.com/info/stem_cell/whatarestemcells.php
STEM CELL THERAPIES TODAY
http://learn.genetics.utah.edu/content/tech/stemcells/sctoday/
Marrow rebuilt with umbilical-cord blood.
http://www.thefreelibrary.com/Marrow+rebuilt+with+umbilical-cord+blood-a08124443
Human umbilical cord mesenchymal stem cells and the treatment of spinal cord injury
http://www.cmj.org/Periodical/AbstractList.asp?titleid=LW20091195998812 06142
Stem Cell Breakthrough: New Method For Creating Stem Cells
http://www.sciencedaily.com/releases/2009/03/090301181423.htm

Stem Cells Which 'Fool Immune System' May Provide Vaccination For Cancer
http://www.sciencedaily.com/releases/2009/10/091007223724.htm

Vaccination With Embryonic Stem Cells Prevents Lung Cancer In Mice
http://www.sciencedaily.com/releases/2006/11/061108101513.htm