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Stem Cells Cloning Prons & Cons

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Stem Cell Cloning

Over the last several decades, the ideas of both stem cell research and cloning have received significantly more attention than ever before; currently there are 23 open/completed clinical trials, together with a great deal of controversy. This new advances in medical technology had provide scientific with a new view of potential to help people suffering from various diseases as well as to help them recover from certain serious injuries. It is important for people to understand both the cloning and stem cell use process so that they can be better educated about its many pros and cons in the scientific world.

Scientific cloning was first begun in Germany by a scientist named Hans Spemann in 1935. The process of cloning occurs when a living organism reproduces itself asexually, or through the absence of sexual acts. This term is referred to as a somatic cell nuclear transplant. Therapeutic cloning refers to when scientists "kill" the clone in order to harvest the stem cells for other use.

The process of both cloning and stem cell research has provided scientific community with a new era of hope for patients. Cloning allows researchers to create new cells and then extract the stem cells from them, without harming any living organisms. Extracting these stem cells from the cloned cell allows the scientists to produce more stem cells, which can then in turn be used in a number of different surgical procedures [1].

Stem cells can be classified depending on their tissue of origin. The role of adult stem cells is to sustain an established repertoire of mature cell types in essentially steady-state numbers over the lifetime of the organism. Although adult tissues with a high turnover rate, such as blood, skin, and intestinal epithelium, are maintained by tissue-specific stem cells, the stem cells themselves rarely divide. However, in certain situations, such as during tissue repair after injury or following transplantation, stem cell divisions may become more frequent. The prototypic example of adult stem cells, the hematopoietic stem cell, has already been demonstrated to be of utility in gene therapy. Although they are relatively rare in the human body, these cells can be readily isolated from bone marrow or after mobilization into peripheral blood [2,3].

Mesenchymal stem cell have the potential to be used as a vehicle for gene transfer with the ability to form cartilage, bone, adipose (fat) tissue, and marrow stroma (the bone marrow microenvironment). Important latest discovery by scientists are the multipotent adult progenitor cells that had been isolated from bone marrow and could differentiate into multiple lineages, including neurons, hepatocytes (liver cells), endothelial cells (such as the cells that form the lining of blood vessels), and other cell types. Central nervous system stem cells are difficult to be characterized and there are not easily accessible [4,5].

The major cons of these methods are that the therapeutic gene frequently integrates more or less randomly into the chromosomes of the target cell. In principle, this may be dangerous, because the gene therapy vector can potentially modify the activity of neighboring genes (positively or negatively) in close proximity to the insertion site or even inactivate host genes by integrating into them [6]. These phenomena may contribute to the malignant transformation of the targeted cells, ultimately resulting in cancer. Another major limitation of using adult stem cells is that it is relatively difficult to maintain the stem cell state during ex vivo manipulations.

Despite promising scientific results with genetically modified stem cells, some major problems remain to be overcome (i.e. gene frequently integrates more or less randomly into the chromosomes of the target cell). The more specific and extensive the genetic modification, the longer the stem cells have to remain in vitro. Although human embryonic stem cells in the culture dish remain remarkably stable, the cells may accumulate genetic and epigenetic changes that might harm the patient. Additionally undifferentiated embryonic stem cells have the potential to form a type of cancer called a teratocarcinoma. Safety precautions are therefore necessary, and currently, protocols are being developed to allow the complete depletion of any remaining undifferentiated embryonic stem cells [6,7].

Another issue is the patient's immune system response. Strategies to circumvent these problems, such as the expression of immune system-modulating genes by stem cells, creation of chimeric, immunotolerable bone marrow or suppression of HLA genes have been suggested. In this context, nuclear transfer technology has been recently extended to human embryonic stem cells [7].

In conclusion there have been many disputes over the ethics of both cloning and stem cell research. Some claim that scientists are "playing God" by using cloning in their research. Because many stem cells are harvested from umbilical blood, certain groups feel that this is unethical and harmful to the value of life. In addition, some religions feel that both cloning and the use of stem cells are unnatural, and therefore are not in agreement with the natural order. Proponents of cloning and stem cell research feel that it is a new and effective advancement in the ability to cure a number of diseases and injuries. Further research is essential to determine the full potential of both adult and embryonic stem cells in this exciting new field.

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