

[The Use of Stem Cells on Cancer Treatment]

Author: America Cardoza

Major: Biology Pre-Health

Department of Microbiology and Molecular Genetics, Oklahoma State University, Stillwater, OK 74078, USA

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Cancer is an ongoing cause of death in the United States. Whether its skin cancer, liver cancer or lung cancer, millions of people have died from it. Over the past decades with technologies advancements stem cell therapy have provided new potential approaches to cure cancer patients. Stem cell therapy is an ongoing clinical study for cancer treatments due to its side effects, ethical considerations and how it does not directly target the cancer. Through these studies many different types of stem cell therapies were used for trials such as Pluripotent Stem Cells (PSCs), Embryonic stem cells, and Cancer stem cells. Stem cells are cells in our body that help rebuild damaged tissue but when it comes to targeting cancer it's a difficult approach. A few studies have been broken down with their findings and progresses to figure out if the use of stem cells on cancer patients could be beneficial or not. The studies talk about their approaches, clinical trials, and possibly future methods. When going through these studies a couple questions were raised. What are the long-term effects for a stem cell therapy? Why is the use of stem cell in cancer treatment not talked about much? Could stem cells really be a cure to cancer patients?

Introduction

[Stem cell therapy is one of the many cancer treatments offered to cancer patients. Especially when cancer the second leading cause of deaths in the United States (CDC, 2020). When it comes to types of treatments it all depends on the cancer type and progression of that cancer. Stem cells can come from you or a donor, they have

provided new approaches to cure cancer patients. Stem cells are cells in our body that help rebuild and can develop into many different types of useful cells in the body. Their main function is to serve as a repair system for the body. Stem cells can divide and renew themselves over a long time. They also have the potential to become

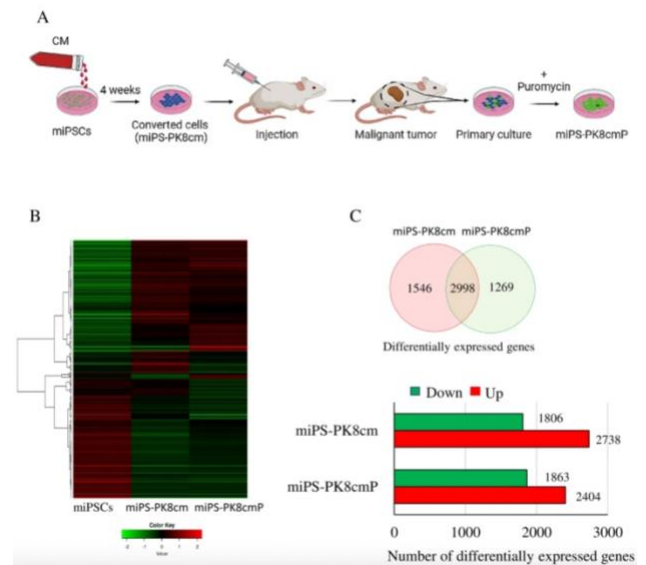
specialized cells like muscle cells, blood cells and brain cells. Due to their ability to become specialized cells and repair damage tissues they have provided good and bad challenges for cancer treatments. Some good advancements for the use of stem cells in cancer treatments are the unique biological actions they have such as self-renewal, ability to relocate and differentiation. Bad challenges some studies have come across with are that stem cells can cause blood system disorders, formation of an entire tumor tissue and its long-term side effects.]

Recent Progress

[In a recent study in February 2020, the use of stem cells has provided a hopeful option in treating cancer patients. The different types of stem cells used in this study stem could improve the therapeutic efficacy of other therapies from other cancer treatment targets. The use of embryonic stem cells (ESC) could isolate itself from inner tumor mass and possess the ability to rebuild all types of cells within. With embryonic stem cells it brings up ethical questions so clinical trials are restricted. Hematopoietic stem cells (HSC) commonly used in cancer treatments, are founded in bone marrow, and can form mature blood cells in the body. Hematopoietic stem cells are the only stem cells that have been approved by FDA to treat multiple treatments like leukemia and blood system disorders

(Chu,2020). Thus, this study concluded that the use of stem cell therapy and HSC transplantation could be used for therapeutic carriers, generation of immune effector cells, and vaccine production (Chu, 2020).

In another study, cancer stem cells were studied because of its self-renewal and different abilities to drug resistance. Cancer stem cells were isolated from patient tumors to see its state by itself, but it required ongoing observation of early tumor events. The method would use tissue-specific factors that mimic cancer inducing environments. Models for lung, liver and pancreatic were generated for this study (Hassan, 2022). The pancreatic model was used to see the expression of genes with mimic like cancer environments on rats.



[Figure 1. (A) Shows how miPSCs were converted into cancer stem cells then injected into mice. Cancer stem cells were then isolated

from the primary culture of tumors. (B) Is a heat map of gene expressions of miPSCs cells. (C) Venn diagram of the number of differentially expressed genes compared to miPSCs cells.]

The study was able to demonstrate how pancreatic cancer stem cells (ones derived from tumor) were able to self-renewal and form abilities (Hassan, 2022). Even though they were able to cultivate the stem cells it only lasted for a couple trials.

In another stem cell in cancer treatment study, microvesicles were identified to play a role in stem cell use. Microvesicles have a membrane-derived vesicles (EVs) that direct from plasma membrane. Stem cells are a source of EVs and play a role in stem cell phenotype. Another role of Evs is the transferring of genetic information between cells. The exchange of genetic information can be good and bad. Good in cell activation and growth. Another good thing to Evs is that they act as signaling cells, transfer membrane receptors between cells, deliver proteins and modify genetic information (Turturici, 2014). Since genetic exchange occurs, Evs can be dangerous in the release of harmful molecules such as caspases and oxidized phospholipids thus trigger both cell apoptosis and detachment. This makes it resistant to chemotherapy.

Discussion

[Stem cell treatments and transplant are produces that are to be believed that rebuild damaged cells in cancer patients. Cancer patient's cells that been destroyed by the long timeline of chemotherapy and radiation. There are three types of stem cell transplants: the first one is autologous. Autologous means the stem cells comes from you directly. The second one is allogenic, which means it comes from a donor. Another one is syngeneic which means the stem cells come from your identical twin. Stem cells do not direct target the cancer but instead produce stem cells. Like any another treatment side effects occur. Some long-term side effects include the formation of an entire tumor tissue, stem cells being exposed to external conditions, destruction genetic expression, abnormal immune responses and many more. Even though stem cell is not talked much about the process for it takes a while. The process begins with treatment of high doses of chemotherapy and radiation therapy. And even after all this treatment stem cells do not cure cancer. These studies are still ongoing since stem cell therapy have not yet been proven or approved by FDA to cure cancer patients, but new approaches are being made every day for it.]

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