Nat. Volatiles & Essent. Oils, 2021; 8(4): 2289-2294

NVEO
Natural Volatiles &
Essential Oils

STEM CELL THERAPY IN BREAST CANCER

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Abstract

Approximately 213,000 women are diagnosed with breast cancer every year. Breast cancer is a devastating, destructive disease, robbing women and their families of their right to a healthy, happy life. If it isn't caught and treated in time, breast cancer can spread throughout the entire body. While doctors have not yet found the exact cause, it seems that a combination of lifestyle factors, genetic predisposition, and toxins in our environment are all contributing elements to breast cancer.

KEY WORDS: Stem cells, Breast Cancer, Chemotherapy, Micro environment.

Introduction

Breast cancer is the most prevalent type of cancer among women worldwide, with almost 500 million deaths associated with this cancer type alone. The most commonly used treatment methods for breast cancer include surgery, radiotherapy and chemotherapy.

However, many of these treated patients experience disease relapse and metastasis. This aggressive progression and recurrence of this disease has been attributed the presence of a subset of tumor cells known as breast cancer stem cells (BCSCs).

These cells possess the abilities of self-renewal and tumor initiation, allowing them to be drivers of metastases and tumor growth.[3] The microenvironment in which these cells reside is filled with residential inflammatory cells that provide the needed signaling cues for BCSC-mediated self-renewal and survival.

ORIGIN AND CHARACTERISTICS:

Cancer stem cells in breast tumors were first discovered in 2003. Different theories exist on the origins of these cells. Some have suggested that normal cells undergo mutations that result in their transformation into BCSCs, while others believe that these cells come from the misplacement of somatic stem cells de novo.

Breast cancer is a heterogeneous disease that accounts for 30% of all cancers diagnosed in women and over half a million deaths per year. Cancer stem cells (CSCs) make up a small subpopulation of cells within a tumor, are capable of self-renewal and, are responsible for tumor initiation, formation,

and recurrence

Breast cancer attacks the cells of the breast tissue. All cells in the body have built-in mechanisms that guide when and how they will multiply. When the cells are healthy, they perform this function smoothly, multiplying when necessary. When breast cancer strikes breast tissue cells lose their internal stopping mechanism, causing them to multiply indefinitely.

MECHANISM:

Eventually, this leads to a build up of cells that form a tumor and impede normal organ and tissue function. Breast cancer can be overwhelming, sometimes calling for the complete removal of the breast. Current treatment options are invasive and come with serious negative side effects such as extreme weight loss, chronic fatigue, hair loss and nausea. If left untreated, breast cancer will eventually spread throughout the entire body and become fatal.

Components in the area surrounding tumors, called the tumor microenvironment, can directly affect cancer progression and metastasis. Now, the research team believes, they may have found a way to take advantage of the tumor microenvironment.

Researchers have used modified stem cells to deliver a cancer drug selectively to metastatic breast cancer tumors in mice. The stem cells specifically targeted metastatic tumors by homing in on the stiff environment that typically surrounds them.

Compared with non-modified stem cells, the modified stem cell treatment shrank metastatic breast tumors in mice and improved their rate of survival.

The stem cells are typically collected from the bone marrow, fat, or umbilical cord tissue of a patient or an unrelated donor.

The treatment of breast cancer can be broken down into two categories: early stage and advanced stage:.

- Early stage treatment involves tumors that are confined to the breast.
- Advanced stage treatment involves tumors that have spread beyond the breast to other regions of the body.

Treatment options are dependent upon size of tumor, location, physical condition of patient, and stage of cancer.

STEM CELL THERAPIES IN TREATMENT OF BREAST CANCER

Stem cells are the foundation of every other cell in the body. While all other cells have a specific function—breast tissue cells perform the jobs of being breast tissue, for example—stem cells are essentially “blank” cells capable of morphing into any other type of cell and taking on the jobs of those specific cells. Their one and only function is to heal and rebuild damaged areas in the body by mimicking

the cells they're replacing.

Our cells are in a constant process of dying and being replaced. When individual cells mutate and malfunction, they regenerate malfunctioning cells just like themselves. These malfunctions eventually make their way to our larger body, causing us to age or experience disease. Stem cells are fresh new cells without mutations that reorient the affected area of the body toward equilibrium, thus creating healing.

Because cancer is a cellular disease, stem cell therapy offers a new hope for breast cancer patients. Healthy stem cells can be transplanted to the affected breast tissue and used to build healthy, un-cancerous breast cells. Rather than simply getting rid of the tumor and hoping that the cancer won't come back, stem cell therapy cuts the cancer out at the root. Doctors essentially use stem cells to manipulate cancer out of the system.

High-dose chemotherapy with stem cell transplant

High-dose chemotherapy with stem cell transplant is a way of giving high doses of chemotherapy and replacing blood -forming cells destroyed by the cancer treatment. Stem cells (immature blood cells) are removed from the blood or bone marrow of the patient or a donor and are frozen and stored. After the chemotherapy is completed, the stored stem cells are thawed and given back to the patient through an infusion. These re-infused stem cells grow into (and restore) the body's blood cells.

Studies have shown that high-dose chemotherapy followed by stem cell transplant does not work better than standard chemotherapy in the treatment of breast cancer. Doctors have decided that, for now, high-dose chemotherapy should be tested only in clinical trials. Before taking part in such a trial, women should talk with their doctors about the serious side effects, including death that may be caused by high-dose chemotherapy.

TREATMENT FOR BREAST CANCER

At Stem Cell Treatment Institute advanced procedures are performed at some of the most scientifically advanced hospitals in the world.

Breast Cancer patients may require breast or lump removal, then can be treated with a RetroVirus using Stem Cell manipulation and/or a targeted Micro-Chemo treatment in order to avoid the typical chemo-therapy ordeal.

STEM CELL TREATMENT

Typically this is an outpatient procedure. however patients may stay for 4 or 5 nights in our care during the process.

Treatment using autologous (patient source) or donor cells (placenta) are available:

If Autologous Bone Marrow is used bone marrow is collected from the patient's iliac crest (hip

bone) using thin-needle puncture under local anesthesia. Once the bone marrow collection is complete, patients may return to their hotel and go about normal activities.

The stem cells are then transported to and processed in a state-of-the-art local laboratory. Proper care must be taken to preserve the viability of the cells during transport and processing. Our team is closely coordinated with the lab to insure a timely high quality transfer. In the lab, both the quantity and quality of the stem cells are measured. The stem cells are then manipulated to become warrior cells specifically programmed to attack your cancer cells. This is a cancer vaccine. They are then implanted back into the patient where they can attack the cancer..

CONCLUSION: We propose a stem cell gene therapy approach for treatment of breast cancer that uses the pathophysiologic process of recruitment of hematopoietic cells into the tumor. Because long-term presence of genetically modified stem cells is a key component of our strategy to enable control of cancer and to prevent the relapse of tumor growth, our target cells for genetic modification will be hematopoietic stem cells (HSCs). HSCs are able to provide multilineage reconstitution of blood cells and a source for TAMs.

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