

Name: _____

STEM CELLS IN HEALTHCARE

Read the scenarios below and answer the questions that follow. Then, use the bold words from each scenario to complete the vocabulary section.

SCENARIO 1:

Lydia, a 28 year-old patient, is diagnosed with leukemia, which is a blood cancer. The bone marrow, which makes red blood cells, starts to make abnormal amounts of white blood cells (leukocytes.) When leukocytes grow out of control and crowd out normal blood cells, it makes it hard for the body to work the way it should. There are so many leukocytes that they do not work correctly. In order to treat the cancer, doctors need to give her **chemotherapy** to destroy the cells. This also destroys her bone marrow. Doctors can give Lydia a bone marrow transplant to help her bone marrow replenish. A bone marrow transplant is an infusion of stem cells that help to make healthy tissue. These stem cells can be either autologous (from her body) or allogeneic (from a donor). Bone marrow is found inside the long bones of the body, such as the pelvis, which means an autologous transplant would require cells to be pulled out from the bone using a long needle. After chemotherapy, stem cells are put back in the body through a catheter in your arm.

1. What is the difference between an autologous and allogenic transfer?

**Autologous transfer uses stem cells from your own body to replenish the bone marrow.
Allogenic transfer uses stem cells from a donor.**

2. What is leukemia?

Leukemia is a condition when your bone marrow starts to make an abnormal amount of white blood cells or leukocytes.

SCENARIO 2:

A 40-year-old tennis player, George, is seeking relief in his shoulder joint. He has had routine injections of steroids over the last several years, but it has not helped. The doctor tells the patient about a clinical trial exploring the use of **adipose**-derived stem cells in joints. The practice of regenerative medicine is growing, and stem cells are a promising part of the field. In this clinical trial, adipose tissue, or fat, is taken from the patient. The adipose tissue is placed in a **centrifuge** and spun into a pellet. The result is a solution that is made of stem cells, other partially differentiated cells, and proteins. The doctor can then use an **ultrasound** to inject the solution into his shoulder, which may start to heal the damaged tendons. George decides to enroll in the clinical trial, which will help to prove the safety of the treatment for others like him.

1. What is adipose tissue?

Adipose is fat tissue.

2. Name 3 ingredients in the solution that is injected into the shoulder.

Stem cells, differentiated cells, and proteins.

SCENARIO 3:

A 12-year-old patient, Claudia, has sickle cell disease. This disease results from a genetic **mutation** that changes the structure of the hemoglobin molecule in red blood cells. **Hemoglobin** is a protein that carries oxygen for red blood cells. This genetic mutation causes red-blood cells to be sickle shaped, which causes blockages in blood vessels and organs. This disease is painful. The doctor recommends Claudia to a clinical trial using stem cell therapy. In this trial, she needed to find a **haploidentical** stem cell donor, which could be a sibling, parent, or child. Doctors identified her sister as a donor. After going through chemotherapy to kill off the unhealthy bone marrow cells, she received an infusion of healthy stem cells. Claudia no longer has the painful symptoms of sickle cell disease.

1. What causes sickle cell disease?

Sickle cell disease is a genetic disease that causes red blood cells to be sickly shaped.

2. Why does a patient need to do chemotherapy before receiving healthy stem cells?

All the bone marrow stem cells need to be killed so that new healthy cells can be made from the stem cell transplant.

VOCABULARY:

Use the bold words from the scenarios above to fill in the blanks.
Then use the boxed letters to solve the final answer.

1. A term describing a donor who is half-matched in protein markers.

HAPLOIDENTICAL

2. A protein found in red blood cells that contain iron. This protein helps to carry oxygen around your body.

HEMOGLOBIN

3. A change in one or many nucleotides in a genome.

MUTATION

4. This tissue is made of large cells, which store fat.

ADIPOSE

5. An imaging test that uses sound waves to create a picture of organs and tissues.

ULTRASOUND

6. A machine that uses a rotating container to spin fluids and apply centrifugal force to the contents.

CENTRIFUGE

7. The use of chemical substances to treat diseases like cancer.

CHEMOTHERAPY

FINAL ANSWER:

This term describes the ability of stem cells to become different types of cells.

POTENCY