Read this passage from the text and answer the questions that follow.

Cells

Stem Cells

An unspecialised cell that can divide many times and give rise to different, specialised cells is called a **stem cell**, Zygotes and embryonic cells are both types of stem cells. The stem cells found in embryos can divide indefinitely, can specialise into any cell type and are called **embryonic stem cells**.

Embryonic stem cells are totipotent (capable of giving rise to any cell type or a complete embryo). Undifferentiated cells that are found within the body and that divide to replace dying cells and damaged tissues are called adult stem cells.

Adult stem cells can divide indefinitely, and generate all the cell types of the organ from which they originate. They can potentially re-grow the entire organ from just a few cells. A third type of stem cell is found in blood from the umbilical cord of a new-born baby, and the placenta. These “cord blood stem cells” are considered to be adult stem cells because they cannot generate all body cell types, just different types of blood cells. Therefore, adult stem cells and cord blood stem cells are pluripotent.

Stem Cells in Medicine

Stem cells are of great interest to researchers because of their ability to divide indefinitely, and to differentiate into many cell types. Stem cells have many existing or potential therapeutic applications. Such therapies include treatments for cancer, blood disorders, brain or spinal cord injuries, and blindness.

Embryonic stem cells, are taken from eggs that were fertilised in the laboratory and donated to research. They may have the greatest potential because they are totipotent, and thus have the most potential medical applications. However, embryonic stem cells harvested from a donated embryo differ from a potential patient’s tissue type. Therefore, just as in organ transplantation, there is a risk of a patient’s body rejecting transplanted embryonic stem cells. Some individuals and groups have objections to the harvesting of embryonic stem cells, because harvesting the stem cells involves the destruction of the embryo. Some researchers are looking into methods to extract embryonic stem cells without destroying the actual embryo. Other researchers have claimed success in harvesting embryonic stem cells from the embryonic fluid that surrounds a growing fetus.

Adult stem cells, including cord blood stem cells, have already been used to treat diseases of the blood such as sickle-cell anemia and certain types of cancer. Unlike embryonic stem cells, the use of adult stem cells in research and therapy is not controversial because the production of adult stem cells does not require the destruction of an embryo. Adult stem cells can be isolated from a tissue sample, such as bone marrow, from a person. Scientists have recently discovered more sources of adult stem cells in the body. Adult stem cells have been found in body fat, the inside lining of the nose, and in the brain.

Questions

1. What is the definition of a stem cell?

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2. What can adult stem cells replace?

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3. What is the main difference between embryonic and adult stem cells?

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4. Name two ways in which researchers could harvest embryonic stem cells without destroying the actual embryo.

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5. Name one source of adult stem cells in the human body.

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6. Where are embryonic stem cells taken from?