

Stem Cell Stem Cell

In mammals, roughly 50 to 150 cells make up the inner cell mass during the blastocyst stage of embryonic development, around days 5–14. These have stem-cell capability. In vivo, they eventually differentiate into all of the body's cell types (making them pluripotent). This process starts with the differentiation into the three germ layers – the ectoderm, mesoderm and endoderm – at the gastrulation stage. However, when they are isolated and cultured in vitro, they can be kept in the stem-cell stage and are known as embryonic stem cells (ESCs). 5085ce2635

Stem-cell line Stem cell lines are derived from either animal or human tissues and come from one of three sources: embryonic stem cells, adult stem cells, or induced pluripotent stem cells. Stem cell lines are derived from either animal A stem cell line is a group of stem cells that is cultured in vitro and can be propagated indefinitely. They are commonly used in research and regenerative medicine. A stem cell line is a group of stem cells that is cultured in vitro and can be propagated indefinitely 5085ce2635

The best-known type of pluripotent stem cell is the embryonic stem cell. However, since the generation of embryonic stem cells involves the destruction (or at least manipulation) of a pre-implantation stage embryo, there has been... 5085ce2635

Induced pluripotent stem cell ". Shinya Yamanaka was awarded the 2012 Nobel Prize along with Sir John Gurdon "for the discovery that mature cells can be reprogrammed to become pluripotent. The iPSC Induced pluripotent stem cells (also known as iPS cells or iPSCs) are a type of pluripotent stem cell that can be generated directly from a somatic cell. The iPSC technology was pioneered by Shinya Yamanaka and Kazutoshi Takahashi in Kyoto, Japan, who together showed in 2006 that the introduction of four specific genes (named c-Myc, Oct4, Sox2 and KLF4), collectively known as Yamanaka factors, encoding transcription factors could convert somatic cells into pluripotent stem cells. pluripotent stem cells (also known as iPS cells or iPSCs) are a type of pluripotent stem cell that can be generated directly from a somatic cell 5085ce2635

Hematopoietic stem cell In vertebrates, the first Hematopoietic stem cells (HSCs) are the stem cells that give rise to other blood cells. Hematopoietic stem cells (HSCs) are the stem cells that give rise to other blood cells. This process is called haematopoiesis. This process is called haematopoiesis. The red bone marrow is derived from the layer of the embryo called the mesoderm. Recent study marks the first global discovery of hematopoietic stem cell (HSC) niches within invertebrate skeletons—overturning the long-held belief that skeletal hematopoiesis is unique to vertebrates. In vertebrates, the first definitive HSCs arise from the ventral endothelial wall of the embryonic aorta within the (midgestational) aorta-gonad-mesonephros region, through a process known as endothelial-to-hematopoietic transition. In adults, haematopoiesis occurs in the red bone marrow, in the core of most bones 5085ce2635

Stem-cell niche Stem-cell niche refers to a microenvironment, within the specific anatomic location where stem cells are found, which interacts with stem cells to regulate Stem-cell niche refers to a microenvironment, within the specific anatomic location where stem cells are found, which interacts with stem cells to regulate cell fate. During embryonic development, various niche factors act on embryonic stem cells to alter gene expression, and induce their proliferation or differentiation for the development of the fetus. The word 'niche' can be in reference to the in vivo or in vitro stem-cell microenvironment. Several factors are important to regulate stem-cell characteristics within the niche: cell–cell interactions between stem cells, as well as interactions between stem cells and neighbouring differentiated cells, interactions between stem cells and adhesion molecules, extracellular matrix components, the oxygen tension, growth factors, cytokines, and the physicochemical nature of the environment including the pH, ionic strength (e. Within the human body, stem-cell niches maintain adult stem cells in a quiescent state, but after tissue injury, the surrounding micro-environment actively signals to stem cells to promote either self-renewal or differentiation to form new tissues. Ca²⁺ concentration) and metabolites, like ATP, are also important. g 5085ce2635

Haematopoiesis is the process by which all mature blood cells are produced. It must balance enormous production needs (the average person

produces more than 500 billion blood cells every day) with the need to regulate the number of each blood cell type in the circulation. In vertebrates, the vast majority of hematopoiesis occurs in the bone marrow and is derived from a limited number of hematopoietic stem cells that are multipotent and capable of extensive self-renewal... 5085ce2635 Pluripotent stem cells hold promise in the field of regenerative medicine. Because they can propagate indefinitely, as well as give rise to every other cell type in the body (such as neurons, heart, pancreatic, and liver cells), they represent a single source of cells that could be used to replace those lost to damage or disease. 5085ce2635 Scientific interest in adult stem cells is centered around two main characteristics. The first of which is their ability to divide or self-renew indefinitely, and the second their ability to generate all the cell types of the organ from which they originate, potentially regenerating the entire organ from a few cells. Unlike embryonic stem cells, the use of human adult stem cells in research and therapy is not considered to be controversial, as they are derived from adult tissue samples rather than human embryos designated for scientific research. The main functions of adult stem cells are to replace cells that are at risk of possibly dying as a result of disease or injury and to maintain a state of homeostasis within the cell. There are three main methods to determine if the adult stem cell is capable of becoming a specialized... 5085ce2635 == Medical uses == 5085ce2635

Cancer stem cell Cancer stem cells (CSCs) are cancer cells (found within tumors or hematological cancers) that possess characteristics associated with normal stem cells, specifically Cancer stem cells (CSCs) are cancer cells (found within tumors or hematological cancers) that possess characteristics associated with normal stem cells, specifically the ability to give rise to all cell types found in a particular cancer sample. Such cells are hypothesized to persist in tumors as a distinct population and cause relapse and metastasis by giving rise to new tumors. Therefore, development of specific therapies targeted at CSCs holds hope for improvement of survival and quality of life of cancer patients, especially for patients with metastatic disease. CSCs are therefore tumorigenic (tumor-forming), perhaps in contrast to other non-tumorigenic cancer cells. CSCs may generate tumors through the stem cell processes of self-renewal and differentiation into multiple cell types 5085ce2635

Stem-cell therapy As of 2024[update], the only FDA-approved therapy using stem cells is hematopoietic Stem-cell therapy uses stem cells to treat or prevent a disease or condition. Research is underway to develop various sources for stem cells as well as to apply stem-cell treatments for neurodegenerative diseases and conditions such as diabetes and heart disease. Stem-cell therapy uses stem cells to treat or prevent a disease or condition. This usually takes the form of a bone marrow or peripheral blood stem cell transplantation, but the cells can also be derived from umbilical cord blood. As of 2024, the only FDA-approved therapy using stem cells is hematopoietic stem cell transplantation 5085ce2635

Adult stem cells are found in a few select locations in the body, known as niches, such as those in... 5085ce2635 == Background == 5085ce2635 == Properties == 5085ce2635

Stem cell controversy Not all stem cell research involves human embryos. Not all stem cell research involves human embryos. For example, adult stem cells, amniotic stem cells, and induced pluripotent stem cells The stem cell controversy concerns the ethics of research involving the development and use of human embryos. For example, adult stem cells, amniotic stem cells, and induced pluripotent stem cells do not involve creating, using, or destroying human embryos, and thus are minimally, if at all, controversial. Most commonly, this controversy focuses on embryonic stem cells. Many less controversial sources of acquiring stem cells include using cells from the umbilical cord, breast milk, and bone marrow, which are not pluripotent. stem cells 5085ce2635

Stem-cell therapy has become controversial following developments such as the ability of scientists to isolate and culture embryonic stem cells, to create stem cells using somatic cell nuclear transfer, and their use of techniques to create induced pluripotent stem cells. This controversy is often related to abortion politics and human cloning. Additionally, efforts to market treatments based on transplant of stored umbilical cord blood have been controversial. 5085ce2635 == Properties == 5085ce2635

Stem cell They are the earliest type of cell in a cell lineage. They are found in both embryonic and adult organisms, but they have slightly different properties in each. They are usually distinguished from progenitor cells, which cannot divide indefinitely, and precursor or blast cells, which are usually committed to differentiating into one cell type. multicellular organisms, stem cells are undifferentiated or partially differentiated cells that can change into various types of cells and proliferate indefinitely In

multicellular organisms, stem cells are undifferentiated or partially differentiated cells that can change into various types of cells and proliferate indefinitely to produce more of the same stem cell 5085ce2635

Embryonic stem cell Embryonic stem cells (ESCs) are pluripotent stem cells derived from the inner cell mass of a blastocyst, an early-stage pre-implantation embryo. Human Embryonic stem cells (ESCs) are pluripotent stem cells derived from the inner cell mass of a blastocyst, an early-stage pre-implantation embryo. Human embryos reach the blastocyst stage 4–5 days post fertilization, at which time they consist of 50–150 cells. Isolating the inner cell mass (embryoblast) using immunosurgery results in destruction of the blastocyst, a process which raises ethical issues, including whether or not embryos at the pre-implantation stage have the same moral considerations as embryos in the post-implantation stage of development 5085ce2635

Adult stem cell Adult stem cells are undifferentiated cells, found throughout the body after development, that multiply by cell division to replenish dying cells and regenerate Adult stem cells are undifferentiated cells, found throughout the body after development, that multiply by cell division to replenish dying cells and regenerate damaged tissues. They are also known as somatic stem cells (from Greek σωματικός, meaning of the body). Unlike embryonic stem cells, they can be found in juvenile and adult animals, including humans 5085ce2635

For over 90 years, hematopoietic stem cell transplantation (HSCT) has been used to treat people with conditions such as leukemia and lymphoma; this is the only widely practiced form of stem-cell... 5085ce2635 Researchers focus heavily on the therapeutic potential of embryonic stem cells, with clinical use being the goal for many laboratories. Potential uses include the treatment of diabetes and heart disease. The cells are studied to be used as clinical therapies, models of genetic disorders, and cellular/DNA repair. However, adverse effects in the research and clinical processes such as tumors and unwanted immune responses have also been reported. 5085ce2635 Existing cancer treatments have mostly been developed based on animal models, where therapies able to promote tumor shrinkage were deemed effective. However, animals do not provide a complete model of human disease. In particular, in mice, whose life spans do not exceed two years, tumor relapse is difficult to study. 5085ce2635 The efficacy of cancer treatments is, in the initial stages of testing, often measured... 5085ce2635

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