ER3

Stem Cell Research Marking Key

Unique properties of all stem cells (at least 3)

* Capable of continual division, replicating themselves, proliferating
* Unspecialised – do not have any tissue specific structures
* Can differentiate into specialised cell types

Differences between adult and embryonic stem cells (at least 3)

Current sources of adult and embryonic stem cells (at least 4)

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| --- | --- |
| Adult Stem Cells | Embryonic Stem Cells |
| Found in differentiated tissues, but they remain undifferentiated | Found in the three germ layers of the embryo |
| Cannot be differentiated into any kind of a specialised cell, thus they are multipotent  Can only develop into the tissue or organ they cam from | Potential of differentiation into various cell types, thus they are pluripotent |
| Adult stem cell-based therapies (ACT) have more advantages compared to embryonic stem cell-based therapies | Embryonic stem cell-based therapies are not as safe as ACT since embryonic stem cells are more prone to develop into cancerous cells |
| Stem cells in bone marrow are the most studied type of cells | Various types of stem cells are studied in the embryo |
| Can be found in skeletal muscle, liver, pancreas, brain, eye, dental pulp, skin, bone marrow, blood and the lining of the gastrointestinal tract in humans | Inner cell mass of the embryo contains embryonic stem cells, which give rise to the three germ layers. |

The potential uses of human stem cells in biomedical research (at least 2) and medicine (at least 2)

Renewable source of replacement cells and tissues to treat diseases including macular degeneration, spinal cord injury, stroke, burns, heart disease, diabetes, osteoarthritis, rheumatoid arthiritis.

Replace or rejuvenate damaged tissue

Understand disease and find drugs that might treat it

Bone marrow transplantation

Challenges facing stem cell research (at least 5)

* Identification of stem cells in adult tissues
* Integration of stem cells into the patient
* Immunological rejection – immune system attacks newly transplanted cells, require immunosuppressive drugs to reduce chances of rejection, can make patient vulnerable to infection
* Ability to foster tumour growth

Methods by which scientists harvest and use stem cells

* Usually collected from the blood
* May be collected from the bone marrow

Arguments for using stem cells in biomedical research and medicine

* Potential for treating different diseases – cancers, Alzheimers, Parkinsons etc
* Potential to learn about human growth – learn how to treat or prevent relevant ailments

Arguments against using stem cells in biomedical research and medicine

* Researchers have the power to ‘play god’, creating and destroying life
* Leads to the death of an embryo, violates some religious and personal beliefs
* When does ‘life’ begin?
* Questions remain whether they could ever be as useful as embryonic stem cells
* Therapeutic cloning
* Black market considerations
* Can lead to continuous proliferation – uncontrolled growth and tumours
* Should they transplant before or after they have differentiated?
* Exploitation of patients

Express your informed personal opinion on this topic supported by evidence and/or examples

* Opinion supported by evidence/examples