

STEM CELL SCIENCE

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reprogrammed, “induced”, to act and behave like pluripotent embryonic stem cells. When stem cells begin to specialize, certain genes turn off so that only the genes needed for a specific cell type stay active. The iPSCs are reprogrammed by reactivating the genes that have been switched off.

(7) In addition to skipping over the moral dilemma of using embryos, iPSCs also allow for the custom tailoring of stem cell therapies to individual patients. This removes the risk of immune system rejection. For example, if your liver is damaged and you need a new liver, you would have to get a liver transplant. This means you will have to wait for a liver donor whose cells are a match for yours so that your immune system doesn't reject the transplanted organ. However, if healthy cells of your own

body are harvested and turned into iPSCs, these iPSCs in turn can be made into liver cells that form liver tissue that can be transplanted back into you. You will not need to wait for a compatible donor and you will not reject transplanted tissue from our own cells. Though using iPSCs for tissue regeneration is just beginning, there is hope that this type of treatment will become a common reality in the near future.

(8) Another benefit is for drug testing. Many drugs tested on non-human animals harm and kill them. This is often considered a cruel but necessary step in early drug testing, however, testing on human tissues made from iPSCs is a very good alternative. The response of human cells provides more accurate results than using non-human animals and no one is harmed.

Article Questions

- 1) What are three characteristics of a stem cell?
 - 1) They can divide for a very long time.
 - 2) They are not specialized.
 - 3) They have the ability to become more than one cell type. (1)
- 2) What is the ethical controversy over using human embryonic stem cells for research?

Embryonic stem cells need to be harvested from human embryos which ends up destroying them in the process. (2)
- 3) How are most embryos obtained?

Embryos are obtained through the left-over/unused embryos produced through IVF with the consent of the couple. (3)
- 4) What is the difference between a totipotent stem cell and a pluripotent stem cell?

Both can specialize to become any cell type of the body, but only a totipotent stem cell has the ability to form a complete individual when isolated and allowed to divide. (4)
- 5) What is the difference between a pluripotent stem cell and a multipotent stem cell?

A pluripotent stem cell can form any cell type of the body while a multipotent stem cell can only form a limited selection of related cell types. (5)
- 6) What does iPSCs stand for and what are they?

iPSCs stand for induced pluripotent stem cells. They are adult somatic cells which have been reprogrammed to act and behave like stem cells by reactivating genes that were turned off when the cell specialized. (6)
- 7) Name two potential uses of using iPSCs?
 - 1) Used to create custom-made tissues/organs that won't be rejected by organ transplant recipients. (7)
 - 2) Used to test experimental drugs so that fewer non-human animals are used. This decreases cruelty and provides responses from actual human tissues. (8)