

COMPARISON OF DIFFERENT SOURCES OF STEM CELLS

	Embryonic Stem Cells (hESC)	Somatic Cell Nuclear Transfer (SCNT)	Induced Pluripotent Stem Cells (iPS)	Adult Stem Cells (ASC)
How are they produced?	<ul style="list-style-type: none"> ●Cell lines are produced by isolating cells from 5-7 day old embryos that have been left over from in vitro fertilization procedures 	<ul style="list-style-type: none"> ●SCNT involves removing the nucleus of an unfertilized egg and replacing it with the nucleus of an adult cell, like a skin cell ● No sperm is used in the procedure 	<ul style="list-style-type: none"> ●Cell lines are produced by inserting genes into cells taken from an adult ●The genes were identified through research on ESC ●No egg or sperm is used in this procedure 	<ul style="list-style-type: none"> ●Cell lines are not produced ●Some stem cells exist in adult tissue such as blood and bone marrow ●Cord blood stem cells are considered adult stem cells
History	<ul style="list-style-type: none"> ●Has successfully cured diseases in rodents ●First human ESC lines reported in 1998 ●Bush approved federal funding only for hESC cell lines in existence before 2001 	<ul style="list-style-type: none"> ●First successful production of a cell line in primates reported in Nov, 2007 ●Not yet accomplished in humans 	<ul style="list-style-type: none"> ●First successful production of a cell line from humans reported in November, 2007 by scientists in Japan and Wisconsin 	<ul style="list-style-type: none"> ●First demonstration of adult stem cells reported in 1960s ●First successful transplantation of adult stem cells from bone marrow reported in 1983
Potential	<ul style="list-style-type: none"> ●Can produce all cell types ●Easy to identify, isolate, maintain and grow in the laboratory ●Large numbers of “excess” blastocysts from in vitro fertilization clinics normally destroyed as medical waste 	<ul style="list-style-type: none"> ●Can produce all cell types ●Once established, cell lines are easy to identify, isolate and maintain in the laboratory ●Stem cells may be genetically matched to patient, reducing the risk of immunological complications 	<ul style="list-style-type: none"> ●May be able to produce all cell types ● Technically easy to produce cell lines in the laboratory ●Once established, cell lines are easy to identify, isolate and maintain in the laboratory ●Stem cells may be genetically matched to patient, reducing the risk of immunological complications 	<ul style="list-style-type: none"> ●Demonstrated success in treatments related to bone marrow and blood ●Some stem cells may be genetically matched to patient, reducing the risk of immunological complications
Limitations	<ul style="list-style-type: none"> ●Derived from embryos left over from human in vitro fertilization ●Limited number of cell lines currently available if using federal funds ●Risk of creating benign tumors ●Risk of immunological complications following transplantation 	<ul style="list-style-type: none"> ●Technically difficult to successfully transplant somatic cell nuclei at this time ●Risk of creating benign tumors ●Limited number of eggs are presently available 	<ul style="list-style-type: none"> ●Differentiation potential is presently unknown ●Current research models require concurrent and continued use of hESC as a basis for comparison ●Risk of creating a variety of malignant tumors following transplantation 	<ul style="list-style-type: none"> ●Produce limited number of cell types ●Not found in all tissues ●Limited usefulness for many conditions ●Difficult to identify, isolate, maintain and grow in the laboratory ● Risk of immunological complications following transplantation
Ethical Debate	<ul style="list-style-type: none"> ●Requires use of human embryos that would otherwise be destroyed 	<ul style="list-style-type: none"> ●Disagreement about the moral status of the product of SCNT 	<ul style="list-style-type: none"> ●Risk of producing cellular abnormalities related to use of viruses 	<ul style="list-style-type: none"> ●No major ethical concerns have been raised