

Stem Cells and Potency

Potency	What can they become?	When do they occur?	Where do they come from?	What are they referred to?
Totipotent (Toti=total)	Able to make all the cells in the human body	Before 3 days	From cells of first few cell divisions	Blastomeres
Pluripotent (Pluri=more)	Able to make most of the cells in the human body, with the exception of placental tissues	3-14 days (before 'gastrulation', the development of 3 germ layers in the embryo)	From inner cell mass of blastocyst	Embryonic stem cells (if cultured <i>in vitro</i>) Pluripotent stem cells (cells within the inner cell mass)
Multipotent (Multi=many, much)	Able to make a range of cells within a particular tissue type (such as blood)	After 14 days (There is some evidence for pluripotent cells in the adult)	From cells of the developing individual as well as adult	Cord blood stem cells Adult stem cells

Adult vs. Embryonic Stem Cells

Type	Where are they obtained?	How flexible are they?	Advantages	Disadvantages
Embryonic	From inner cell mass of blastocyst of: <ul style="list-style-type: none"> Donated fertilized eggs (IVF) or donated eggs fertilized by researchers Product of "Somatic Cell Nuclear Transfer" (genetically identical to donor nucleus) 	Pluripotent* *very early embryonic cells are totipotent, but these are not used to make stem cell lines	<ul style="list-style-type: none"> Can become most cells/tissues of the body Easier to culture in lab Great potential for developing future therapies to cure diseases 	Potentially ethically problematic: blastocyst must be destroyed when cells are removed, egg donation also an issue.
Adult	Often from adult tissues/organs (note: this term is also often used for multipotent cells found in fetuses or younger individuals)	Multipotent* *some studies suggest certain adult stem cells may be able to become pluripotent, but it has been difficult to replicate these studies	<ul style="list-style-type: none"> Less ethically problematic - no destruction of blastocyst involved Already used in therapies (bone marrow transplants) 	<ul style="list-style-type: none"> Hard to culture in lab Most are limited to become specific tissue types