

Bush backs limited stem-cell research



President Bush's approval of medical research using embryonic stem cells is limited to those derived from 60 existing stem-cell lines – cells grown from those already taken from human embryos. Each cell can reproduce indefinitely

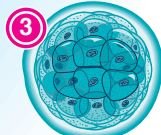
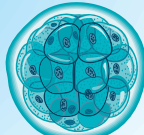
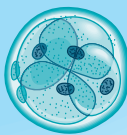
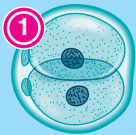
How stem cells are produced

1. Fertilization:

Ova mixed with **sperm**

2. **Zygote:** Fertilized ovum divides repeatedly to form a ball of cells known as the **morula**

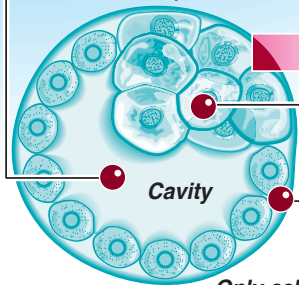
3. **Morula:** Different cell groups emerge – larger **formative** cells surrounded by smaller, **trophoblast** cells



4. **Blastocyst:** Cell types separate and form around fluid-filled cavity

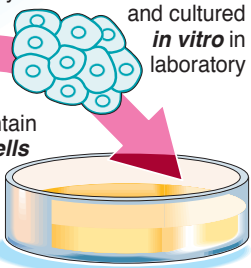
Blastocyst would normally embed itself in wall of uterus after about six days and develop into foetus

5. **Stem cells:** Extracted from inner cell mass and cultured **in vitro** in laboratory



Inner cell mass: **Formative** cells contain **embryonic stem cells**

Trophoblast cells line remainder of blastocyst



Only cells already cultured allowed for research in U.S.

Stem (hES) cell characteristics

Pluripotent: Can form virtually any cell in the body – and thus could theoretically be used to **repair damage in any part of the body**

Self-replicating: Under right conditions, **cells can propagate indefinitely**

Telomerase: Enzyme that allows for cell division. As normal cells age they lose telomerase activity and die. **Stem cells continually express telomerase and are potentially immortal** but do not have 'unusual' features of cancer cells

Chromosomes: All have normal set of chromosomes, including sex chromosomes XX and XY, **even after prolonged growth without any change in their structure**