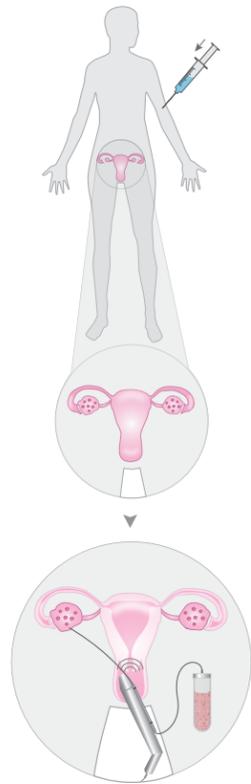


EMBRYO . IVF . Extranumerary Embryo in vitro

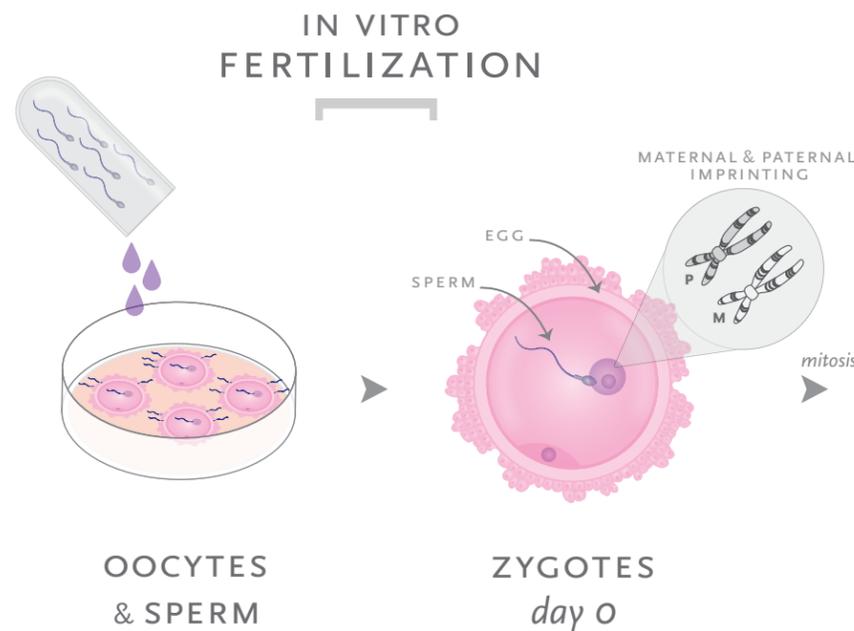
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OOCYTE PROCUREMENT

Hormones are injected into a person with ovaries to mature multiple oocytes (eggs) *in vivo*, which are then surgically removed. This process poses a risk of ovarian hyperstimulation syndrome (OHSS), with symptoms ranging from mild to severe and in rare cases can result in death. Long-term health consequences are unknown.



In Vitro Fertilization (IVF): IVF is an assisted reproductive technology that involves creating embryos in a Petri dish. Sperm that have been screened for viral infection and washed are introduced to mature oocytes.

Nuclear Fusion: Fusion of egg and sperm provides a complete human genome (two sets of nuclear DNA). Upon fertilization, calcium ions flood the egg cytoplasm and trigger fusion of egg and sperm nuclei. The zygote (fused sperm and egg) is cultured in a Petri dish with growth factors and placed in an incubator that mimics the uterine environment.

TOTIPOTENT cells



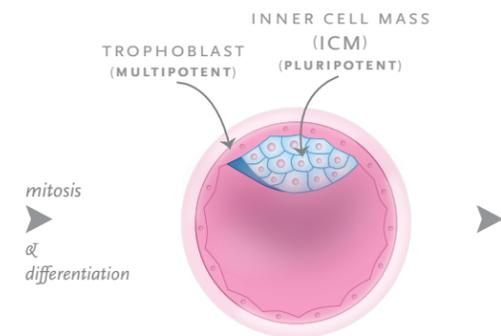
BLASTOMERES
day 3
8 cells



Embryo Development and Screening:

In response to cell culture conditions, the zygote undergoes mitotic cell division and at day 5 begins to differentiate. To increase the chance of successful pregnancy and decrease the number of IVF cycles and potential physical and psychological risks to parents, embryologists select embryos with high probability of continued development. Blastomeres can be graded on the number of cells (0-8) and the timing of cell division (A-C) via an Embryoscope. Monitoring continues through the blastocyst stage, where both the Inner Cell Mass (ICM) and the trophoblast are graded. Embryos that appear “dead” or in mitotic arrest can resume mitosis via scientific manipulation to create stem cell lines.

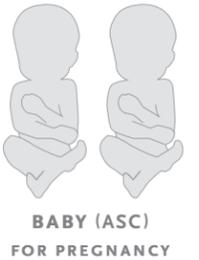
PLURIPOTENT & MULTIPOTENT cells



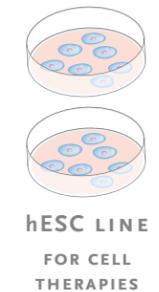
BLASTOCYSTS
day 5
~150 cells



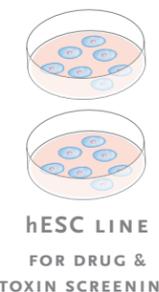
1-2 blastocysts
transferred to uterus



extra blastocysts
ICM cultured



“dead” blastocysts stimulated
ICM cultured



Stem Cell Lines:

As IVF can result in the generation of extra embryos, some can be used later or donated to achieve pregnancy, and others can be used to derive pluripotent human embryonic stem cell lines (hESCs) capable of regeneration and induced differentiation. These cell lines can be used to explore the effects of environmental toxins, to screen new drugs, and to develop cell transplant therapies.

▶ **EXTRANUMERARY EMBRYOS:** In 2010, Edwards received the Nobel Prize for IVF. In 1998, Thomson isolated the first human embryonic stem cells from “surplus” IVF embryos. Since 1996, in the U.S., the Dickey-Wicker Appropriations Rider prohibits federal funds for research resulting in the creation or destruction of embryos. In 2005 and 2007 President Bush vetoed a congressional bill that would override the Dickey-Wicker Rider.