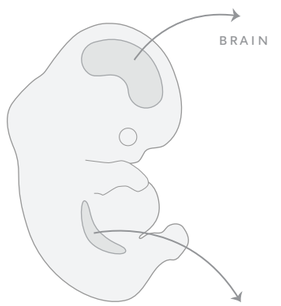
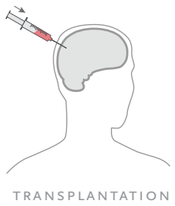
FETUS . *Fetal Tissue*
in vitro



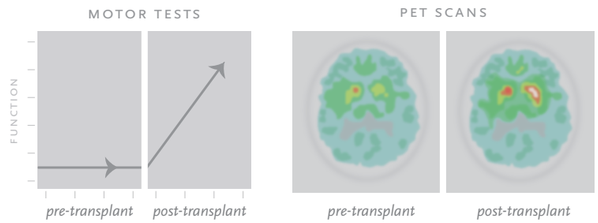
dissection

brain
surgery

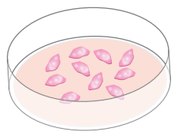


clinical
testing

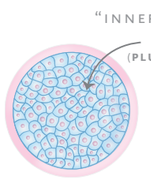
THERAPEUTIC EFFICACY & SAFETY



dissection
& culture

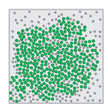


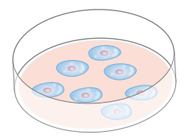
culture



stemness
analysis

PLURIPOTENCY





FETUS

Tissue is obtained from elective or therapeutic abortions after parents provide informed consent. Abortions can be induced via drug administration or surgical procedure, the latter of which can destroy fetal tissue structure and affect the quality of stem cells obtained. Stem cell niches exist in the fetal brain, gonadal ridge, and liver. To treat neurodegenerative diseases, fetal brain tissue is collected from 1-10 fetuses for a single transplant procedure. Some states and nations prohibit the use of fetal tissue to treat family members living with neurodegenerative disease.

TISSUE PREPARATION

Cells must be dislodged from their natural tissue environment (*in vivo*) so that they can respond to molecular signals being introduced in the lab environment (*in vitro*), or in the transplant environment (in situ). Samples are washed, dissected, mechanically disaggregated, and exposed to enzymes that break down the extracellular matrix (ECM).

CELL CULTURE & TRANSPLANTATION

Transplantation: Doctors drill a hole in the patient's skull through which they transplant the fetal tissue. Immunosuppressive drugs are administered pre and post-surgery to reduce transplant rejection.
Embryoid body: Cells regenerate in response to media and growth factors and aggregate forming a three-dimensional embryoid body (EB). Cells in the EB retain stem cell like properties but differ from those of a blastocyst, thus some differentiation paths do not occur.

TESTING

Post-transplant testing: In 1998, Freed et al. and Bjorklund et al. conducted the first human fetal tissue transplants to treat Parkinson's Disease. To monitor transplant efficacy and safety, patients undergo neurological and motor tests. Dopamine activity (DA) is detected via PET scans using 18Flourodopa tracer and CAT scans ensure no tumors have developed. In successful transplant cases, mechanisms behind restored DA are contested, as it is difficult to determine which cells, the fetal or the adult, are responsible for dopamine synthesis.
Pluripotency testing: Using fluorescent protein tags, cells are analyzed for the presence and activity of proteins essential for pluripotency and regeneration. The "gold standard" test for pluripotency is the development of teratomas containing all three germ lineages upon transplantation into a mouse embryo.

Stem Cell Lines and Transplant Therapy: In 1998, Gearhart et al. derived human pluripotent stem cells from fetal primordial germ cells (PGCs). These embryonic germ cell lines (EGCs) can be used for drug and toxin screening, basic scientific research, and transplant therapy. Since 1988, multiple clinical trials have used fetal tissue transplants. Because the procedure is considered experimental, patients are research subjects. Concerned with fraud, the FDA and the International Society for Stem Cell Research (ISSCR) monitor the emerging markets using fetal tissue.

FETAL STEM CELLS: ***In 1962, Hayflick established the first non-cancerous human cell line WI-38,*** *from fetal lung tissue. Fetal stem cell research is contentious because some consider the fetus an unborn life, and because of laws banning the gifting of fetal tissue to kin.*

STEM CELLS ACROSS THE CURRICULUM . www.stemcellscurriculum.org
OPINIONS EXPRESSED HERE ARE SOLELY THOSE OF THE AUTHORS AND DO NOT NECESSARILY REFLECT THOSE OF THE EMPIRE STATE STEM CELL BOARD, THE NEW YORK STATE DEPARTMENT OF HEALTH, OR THE STATE OF NEW YORK.
CONTENT & CONTENT FLOW: KATAYOUN CHAMANY AND LIANNA SCHWARTZ-ORBACH
DESIGN: ART DIRECTION, INFORMATION DESIGN & ILLUSTRATIONS BY JULIA WARGASKI
SUPPORTED BY NYSTEM & THE NEW SCHOOL