EMBRYO TESTING

What is embryo testing?

- Screening embryos before implantation to prevent abnormalities during testing.
- Generally performed with couples who have a high susceptibility to genetic defects or in some cases to implant an embryo that is a match to an existing child

Types of Reproductive Genetic Tests

- Carrier testing
  - Performed to determine whether an individual carries one copy of an altered gene for a particular recessive disease.
- Pre-Implantation testing
  - Used after in vitro fertilization to diagnose a genetic disease or condition in an embryo before implantation
- Prenatal testing
  - Used to diagnose a genetic disease or condition in a developing fetus
- Newborn screening
  - Performed in newborns, usually as a part of a state public program to detect certain genetic diseases for which early diagnosis and treatment are available

What are they testing for?

- Pre-implantation tests:
  - HLA matching
  - Aneuploidy
  - Single gene disorders
  - Chromosome Translocation
- Prenatal tests
  - STD's
  - RH factor
  - Anemia
  - Rubella and Chicken Pox immunity
  - Gestational diabetes

How much does it cost?

- Pre-implantation testing costs depend on which tests are being done. They range from $3,500-$8,000 in addition to the roughly $12,000 for in vitro fertilization.

Benefits

- About 200 inherited defects, including Huntington's disease and the commonest form of cystic fibrosis, can already be identified in embryos using a method called pre-implantation genetic diagnosis (PGD).
- Reduces IVF Miscarriages
- It will also help families at risk of diseases that usually afflict only boys.

http://www.timesonline.co.uk/tol/news/uk/health/article676259.ece

Risks

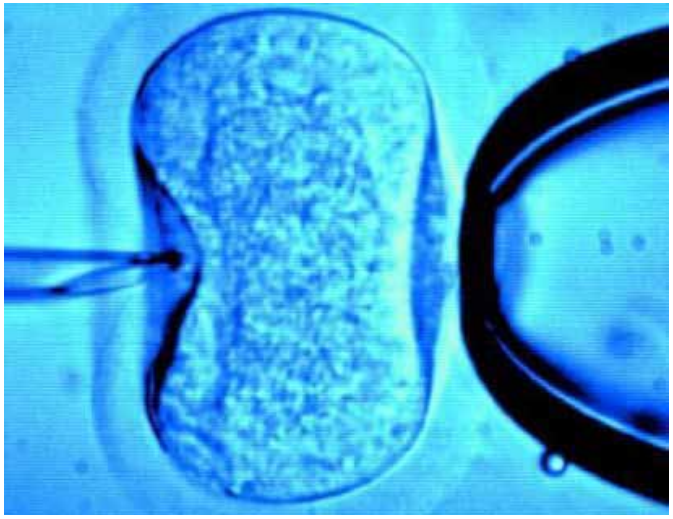
- IVF criticized for low success rates, high treatment costs, and high incidence of multiple births.
- 1% risk of damage to embryo by embryologist.
- 30% more likely to suffer certain birth defects.
- Twice as likely to suffer from heart problems and cleft lip.
- Four times the risk of certain gastrointestinal conditions.
- 10% error rate of misdiagnosis

http://cache.eb.com/eb/image?id=95464&rendTypeId=4

http://4.bp.blogspot.com/_xrmoYitP68I/Left+Cleft+Lip+and+Palate.jpg

Risks

- Those opposed to genetic testing believe it suggests that some are too flawed in their DNA to exists and are unworthy of being born.
- Controversy over who determines what diseases are important enough to test for.
- May lead to the tendency of developing “designer babies.”



http://www.instablogsimages.com/images/2007/12/15/ivf_183.jpg

http://a.abcnews.com/images/Health/nm_embryo_080512_mn.jpg

Ethics: Parents v.s. Children

- **Parents**
  - Bias
    - Put more effort on first child
    - Time arrangement unfair
- **Children**
  - Physically and mentally hurt
    - Feel not like part of the family
    - Become a tool for life support

http://www.ora.ucr.edu/images/pictures/centers/FamilyStudies.jpg

From "*My Sister's keeper*" by Jodi Picoult

Ethics: Government

- **Government fund**
  - The flow of the fund for stem cell research
    - President Bush
      - "Don't fund, don't ban."
    - President Obama
      - Support on embryonic stem cell research
      - Voted for the **Stem Cell Research Enhancement Act of 2005**
- **Stem cell legislation**
  - Agree
    - Cure diabetes, Parkinson's disease, spinal cord injury, and other debilitating condition
  - Disagree
    - Unethical, because deriving the stem cells destroys the blastocyst

http://www.boston.com/news/globe/ideas/articles/2007/04/08/embryo_ethics/
http://pewforum.org/religion08/compare.php?Issue=Stem_Cell_Research

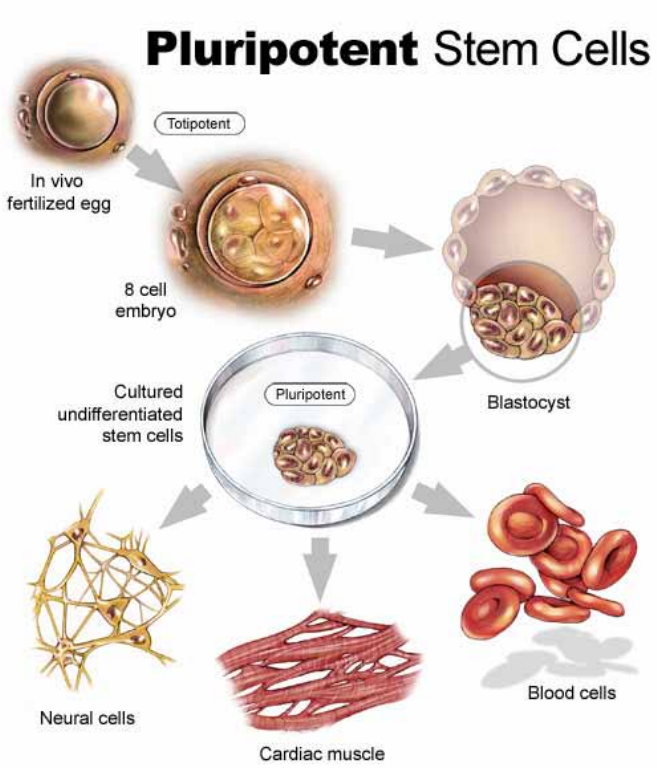
Ethics: Religion

- Different thoughts
  - Concept can be accepted within 40-120 days (Christian, Jews, Muslim)
  - Opposed at any stages (Roman Catholic church, protestant denominations)

http://www.news.harvard.edu/gazette/2007/03.22/09-stemgod.html

Ethics: Scientists

- Have a health baby
  - Detect and prevent a variety of illnesses
- Improve medical technique
  - Stem cell research
  - Umbilical cord blood



http://www.csa.com/discoveryguides/stemcell/images/pluri.jpg

Ethics: Personal View

- Unethical
  - Selecting a perfect baby to save the existing child
- Ethical
  - It's OK to process the PGD.
    - Prevent to have an ill baby
  - It's good to have the stem cell research.
    - Extend human life

http://ublib.buffalo.edu/libraries/projects/cases/genetics/rxmd0.jpg

Case Study

- Lisa
- Spent $80,000 altogether on IVF treatments
- 1st attempt: Failed
- 2nd attempt: Lost a premature baby after 22 weeks
- 3rd attempt: Used a form of preimplantation genetic testing, but did not get pregnant
- 4th attempt: Used a newer preimplantation genetic test and is now pregnant with twins

Case Study

- Lisa and Jack Nash
- Have a daughter with Fanconi Anemia, a deadly blood disease
- 1 out of 4 chance of having kids with the same disease
- Chose to use preimplantation genetic testing in order to have a son free of the disease with the same bone marrow as his sister
- Cells from his umbilical cord were given to his sister, in a procedure that has already improved her blood tests

PGD Alternative

An alternative use for PGD is Advanced Cell Technology (ACT)

- when fertility clinics perform human PGD they could
  - Remove a single cell as usual
  - Allow it to divide into two cells
  - Use one of the cells to test for genetic problems
  - This would allow the stem cells to be created as a byproduct of the existing PGD test,
  - no embryo would be killed in the process. They hope that this would be acceptable to the pro-life community.

Conclusion- Why

- Pre-implantation testing is typically done when people that are ill or dying from illness or diseases; such as leukemia, aplastic anemia or other life threatening blood diseases.
- For most of these diseases a donor is needed, they do this by creating a child who is a match.

Conclusion- The process

- The Mother will go through the process of a standard IVF procedure
- The ova are harvested and fertilized with the father's sperm.
- They take 8 cell embryos and go through the PGD procedure to test the embryos.
- If the embryo is a match they

  implant the embryo into the mother's uterus.
- If the process is successful the infant is born.
- Stem cells from the infants umbilical cord or other body components can also be harvested.