



## **Unit 1 Paper Summary: “Merits of Embryo Screening Debated.”**

By Brian Vastag. Summarized by Cole Peters and Nathan Zuzow

### **The Strongin Family and PGD**

Henry Strongin was born with a rare genetic disorder called Fanconi anemia. The bone marrow is home to a certain type of stem cells which differentiate into blood cells. In Fanconi anemia, these stem cells die rapidly and fail to differentiate, so the body becomes deficient in its ability to create new blood cells to replace old ones (Wikipedia: Fanconi anemia). To save their son, Henry’s parents knew that they needed a suitable sibling for bone marrow transplant. The couple decided to have another child, in hopes that this child would be free of the disease, so that they might use some of its bone marrow cells to “repair” Henry’s condition.

A new technological advancement gave the couple hope: preimplantation genetic diagnosis (PGD). Researchers use PGD to screen embryos created *in vitro* for genetic defects, in order to have a child with suitable marrow, and disorder free. In the process of *in vitro* fertilization, sperm from the father is mixed with oocytes (eggs) from the mother. The fertilized cells are given two to four days to divide into a cluster of identical cells; then a single cell is selected from the bunch, and its chromosomes are analyzed to identify chromosomal abnormalities—for instance, three copies of chromosome 21 (a hallmark of Down syndrome). In addition to observing whole chromosomes, geneticists can use molecular biology techniques to look at how individual genes are changed in certain diseases, and determine whether these changes are present in a developing embryo.

Unfortunately, due to complications that were inherent to *in vitro* fertilization techniques at the time, the Strongin parents could not produce a viable embryo *in vitro*. Their last hope was that an unmatched bone marrow transplant might help Henry. In 2002, at 7 years of age, Henry passed away after this transplant. Recent advances have increased the likelihood of producing viable embryos *in vitro*, making this technology more effective.

### **Technological Advancements and Ethics**

Advancements in PGD technology not only allow parents to screen for major genetic disorders, it is now possible for parents to choose the sex of their child. As a matter of fact, it is possible for parents to screen embryos to choose the one with the most “desirable characteristics,” ranging from genes variants that reduce the prospective child’s risk for a certain type of cancer, to gene variants that contribute to eye and hair color. Even though PGD is still a relatively new technology, policymakers and medical professionals have an interest in how the public feels about this type of technology eventually having the capacity to be used to create “designer” babies.

These ethical considerations, as well as a lack of Federal regulation or strongly-enforced professional guidelines, have caused some to be wary of this technology. An additional concern is for the creation and destruction of embryos during *in vitro* fertilization and PGD procedures: some consider these acts to be immoral. Regardless, PGD has become increasingly popular over time, but remains expensive and therefore accessible only to the select few who can afford it.

## Sex Selection

The greatest controversy regarding current uses of PGD is that it allows parents to determine the sex of their child much earlier in the pregnancy. At the core of this controversy lies the fact that some cultures place greater value on having children of a particular sex. This type of selection is not a new practice—for instance, in India, ultrasound scans are offered to help a couple determine whether their unborn child is a male or female, presumably with the intention of aborting the fetus if it is a female.

PGD allows sex determination to occur much earlier in the development of the child, with only the embryos of the parents' desired sex (i.e. containing a unique complement of sex chromosomes—XX for females and XY for males) being implanted into the mother.

Sperm sorting, an increasingly popular technique for sex selection, separates sperm cells based on whether they contain an X- or a Y-chromosome. These sperm cells can then be used for *in vitro* fertilization, producing an embryo of the desired sex. However, this technology appears to be significantly less accurate than PGD sex selection.

As it stands now, *in vitro* fertilization specialists determine which embryo appears to be the healthiest, and select it for implantation into the mother's uterus. About one in four embryos implanted in this way develop into successful pregnancies. PGD technology confers a higher degree of accuracy and efficiency to the selection process, making these implantations more likely to be successful.

This powerful technology gives us the ability to screen for genetic abnormalities in a developing embryo. A collateral effect is that this PGD can also be implemented for sex selection or for other, non-medical, purposes. This brings PGD into the spotlight as an example of a technological advancement that will undoubtedly be the source of political and religious debate for years to come.

## Works Cited

Brian Vastag. "Merits of Embryo Screening Debated." *JAMA*. 2004;291:927-929. <http://jama.ama-assn.org/cgi/content/full/291/8/927>

Wikipedia. (2010). Fanconi Anemia.

Retrieved October 13, 2010 from [http://en.wikipedia.org/wiki/Fanconi\\_anemia](http://en.wikipedia.org/wiki/Fanconi_anemia)