Unit 1 Paper Summary: "Ethical Implications of a New Application of Preimplantation Diagnosis."

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Making use of advancements in molecular biology techniques, as well as a better understanding of the human genome, researchers have identified numerous alleles (gene variants) which are associated with certain diseases. In familial cases these problematic alleles are passed on from parent to offspring. Recently, couples have elected to undergo Preimplantation Genetic Diagnosis (PGD) in order to ensure they do not pass on such alleles to their children. In this procedure, an embryo is produced *in vitro* using the mother's egg and the father's sperm.

The embryo allowed to grow over three days; its cells divide into identical copies of one another through the process of mitosis. One of these cells is extracted from the embryo by researchers, who then use molecular biology techniques to detect certain genetic abnormalities. If this one cell "passes the test," and is free of any harmful genetic mutations, it can be inferred that the rest of the cells in the embryo are healthy as well. The developing embryo can then be implanted into the mother's uterus, where it will hopefully develop into a fetus as though it were conceived naturally. The process of embryo selection and discard, however, raises several ethical issues (Damewood, 2001). They include the following:

1. Determination of the beginning of human life

There has been ongoing debate about when, precisely, a human life starts. For instance, while some argue that life begins at the moment egg is fertilized by sperm, others believe life begins when the heart begins to beat. Many members of the scientific community consider the embryonic stage (the stage at which PGD takes place) to precede the beginning of human life.

The reasoning behind this is that embryos are regularly discarded in natural processes, such as the menstrual cycle (Damewood, 2001). As a result, many scientists do not consider discarding an embryo with a detected genetic disease to be an unethical act. There are those, however, that argue an embryo contains the soul of an individual; as such, discarding an embryo, diseased or not, could be equated to killing a human (Damewood, 2001).

2. Selection based on medical traits for others' use

This article discusses a case study in which a couple used PGD to select an embryo which was not only free of a harmful mutation that they were both carriers for, but also for medical traits to save their first-born child, who was already suffering from the disease: Fanconi anema. 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).

In order to treat the couple's first born child, doctors needed to obtain blood stem cells which had the same HLA type as the child's cells. HLA refers to "human leukocyte antigens," which are proteins that reside on the surface of blood cells. The reason that the donor cells must

be of the same HLA type is that the immune system uses these proteins differentiate between cells that are 'self' and 'nonself' so that it can determine which cells are not welcome in the body (Wikipedia: human leukocyte antigen).

Using PGD, these parents were able to select an embryo that, in addition to not being affected by Faconi anemia, but would also develop into a fetus of the same HLA type as it's sibling. Once the second child was born, some of its bone marrow stem cells could then be harvested and donated to the first born child, repairing the child's ability to produce new blood cells. Siblings such as these are termed "savior siblings," because they have the same HLA type—so one can "save" the other if they require a transplant or transfusion, for instance. This study raises some ethical issues about whether it is right or wrong to conceive children for a specific medical purpose.

3. Selection based on nonmedical traits

Using PGD, parents could theoretically "design" their embryo's nonmedical traits, such as eye color, skin color, gender, and so forth. The possibility of parents having such control over the genetics of their offspring generates many theological and ethical questions. For instance, in the above case regarding Fanconi anemia, parents selected an embryo based on its ability to "save" their other child already suffering from the disease. But what if this couple decided to select a fetus with a low likelihood of heart disease? What about hair or eye color? Where does one draw the line?

Abuse of this technology could lead to a decrease in population diversity. Another possibility is that unhealthy or otherwise disabled children will have prejudice directed towards them for not being "designed correctly" (Damewood, 2001). One exception that many doctors support is the selection of a child's gender in order to avoid a sex-linked genetic disease.

For many couples, the positive aspects of PGD outweigh the negative ones, such as in helping reduce the number of abortions, and increase the likelihood of the couple having a healthy child. Some ethical issues such as ethical and religious inquiries as to whether removal and discard of embryos is tantamount to taking a human life, as well as the possibility of designer genetics producing a market for parents eager to influence their child's appearance. In its current use, couples must balance their ethical and religious concerns with PGD in order to make the decision for themselves whether they are willing to use this technology to help their future child live disease-free.

Works Cited

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