Jonathan Barrera
Genomics and Medicine
Fall 2010
Prof. Doug Brutlag

Genetic Engineering and "Designer Babies"

"*[H]ere we are--at this juncture in **our** evolution. We have really only two choices: to proceed with all the wisdom we can develop, or to stagnate in fear and in doubt. There is a consequence to either choice."*

- *Dr. Robert L. Sinsheimer*

With the great modern advances that have been made in biotechnology and our continuously growing understanding of genetics, the prospect of genetically engineering our children is in the process of transitioning from science fiction to reality. The idea of genetically engineering children is not a new one, naturally stemming from the discovery of DNA and molecular genetics, and even before that, as alluded to Huxley's Brave New World (1932), where human embryos were chemically treated to help produce desired characteristics in certain children. This idea, though, has also brought along a lot of unease as people have started to ponder the possible repercussions of the introduction of genetic engineering into our world. In addition, there are also many deep moral and ethical dilemmas to consider as we move into unchartered territory. Genetic engineering is coming, though, so it will become increasingly relevant to discuss this developing and, as we'll see, controversial field. Recent breakthroughs could even lead one to say that genetic engineering is already upon us, but compared to what scientists and researchers are working on now and what they believe will be possible in the not-too-distant future, we have only scratched the surface.

In the case of genetically engineering offspring, so far the only currently operating option is the ability to choose the sex of the child, which can be done by two different methods. The first is Pre-Implantation Genetic Diagnoses, PGD, which consists of having a woman's eggs

removed and then fertilized invitro to produce embryos. The embryos are then differentiated between male and female by examining the chromosomes, and depending on which gender the parents desire, the embryos with the correct chromosomes are then implanted back in the womb. While the cost for this method hovers around a steep $20,000, the success rate is virtually 100% ("Boy or Girl?"). The second method used is Sperm Sorting, where the man's sperm are differentiated between those carrying the X and Y chromosomes. While much cheaper, only about $500 in comparison, this method is also less accurate, with a success rate of 60-85%, depending on what sperm sorting technique was used and other variables ("Gender selection a reality"). Sex selection is the only current form of genetic engineering that is widely available, but its own history indicates that more opportunities and abilities are on the way. PGD, the first sex selection method I brought up, did not first come about to fulfill this role. Instead, it began as a way to increase the chance of ongoing pregnancy in women and also to screen for any genetic disorders in the embryos – strictly medical reasons. It didn't take long, though, for scientists to see the potential for this technique to also offer the non-medical choice of the child's sex. Who knows what current medical technologies might already exist with the potential to decide other non-medical attributes of embryos?

Just with this new ability to choose the sex of our offspring, there has already been a large influx of concern over the possible repercussions. The most obvious of these is the concern over societies that value one sex over the other, and whether this new technology will lead to a gender imbalance in these regions. Just the availability of sex selective abortion and local traditions of infanticide have caused a 'surplus' of young males in certain Asian societies. The technology to choose the sex of their children before the fetus has developed could have the effect of reinforcing this trend and giving these regions yet another method in which to create

more imbalances in their populations (“Surplus Males”). Imbalance between genders in any population is never ideal, so many are asking whether sex selection is desirable in a society, and some countries and organizations have made moves to counter a influx of either gender. The United Kingdom, for example, has made it illegal to choose the sex of a child for any non medical reasons, and although the United States has not passed any legislation concerning this issue, most U.S. clinics only offer sex selection to couples who have already had a child of the opposite sex. In addition to this very practical concern is also the fear that sex selection could reinforce sex discrimination on deeper moral and psychological levels. A sex selection bias towards either gender could possible ascribe a natural inferiority to the other that cannot be said to come from any attribute of the gender other than the most fundamental one: their chromosomes. At least sexism currently derives from the expressed visible differences between men and women, but none of these can be said to be as fundamental as their genetic differences. The issue of continuing and reinforcing discrimination is justifiably a cause of concern for some.

All of this concern has come about over only the simplest form of genetic engineering, and as I said before, this is only scratching the surface. The beginnings of concern for future abilities have already developed as shown in a controversy in 2002 when a deaf lesbian couple willingly chose to have a deaf child for their own personal reasons. Now this wasn’t a true case of genetic engineering because the baby was conceived naturally, using donated sperm from a deaf man with a familial history of deaf (The Guardian). The resulting controversy brought discussion over whether deafness was a handicap or a source of identity and, regardless, whether it was ethical for the parents to willing choose that their child be born deaf. The fundamental question really was: what kinds of reproductive rights do parents have? What if the parents wish

for a child with characteristics others may consider crippling or cruel? Julian Savulescu, a philosopher and bioethicist, proposes this answer:

> *"[W]hat if a couple has invitro fertilization and pre-implantation genetic diagnosis and they select a deaf embryo? Have they harmed that child? Is the child worse off that it would otherwise have been (that is, if they had selected a different embryo)? No--another (different) child would have existed. The deaf child is harmed by being selected to exist only if his or her life is so bad it is not worth living."* (772)

I find this to be an excellent rational answer: the child is not harmed because he or she would have otherwise not been born. Moving beyond this answer, though, even if the parents could be considered as having harmed their child by allowing it to exist in any sort of 'handicapped' state, who gets to determine what is considered handicapped and what is not? The truth is that people hold many different views on what they consider to be handicapped or not normal and nobody can prescribe the attributes that would make the universally perfect child. An issue that will certainly crop up as we gain new ground in this field will be about how much power should the parents hold over the characteristics of their children, both positive and negative, and we will invariably see examples of parents wanting children who are blind, mentally retarded, short, or prematurely grey haired, just to name a few.

The last section was on parents who might choose to 'handicap' their children, but the opposite will also be true and most likely much more widespread; parents will want children who have been engineered to have enhanced characteristics such as higher IQ's or musical/athletic talent. Who wouldn't want to raise the next Jimi Hendrix, Albert Einstein, or Michael Jordan? This is probably the most controversial issue brought up by genetic engineering and for many reasons. The first issue, which I agree would probably present itself very early on and quite evidently, is that genetic engineering could reinforce and widen the gap between the rich and the

poor. As I mentioned earlier, the sex selection method using PGD ran up costs of about $20,000 – not exactly pocket change for most people. Any technology developed that could choose or engineer embryos to have high IQ's or certain talents would be expensive and only available to the upper class. Those upper class children would then be better suited to become successful and then have genetic engineering done to further enhance their own children, thus creating a cycle where the upper class would continue to improve itself and form a fundamentally genetically elite class while the poor are left behind. Michael Sandel, a professor of political philosophy, goes so far as to say that the two classes could become sub-species: "the enhanced and the merely natural" ("The Case against Perfection"). This is starting to sound like the science-fiction world Huxley imagined, but the idea is actually not that far-fetched. Sandel also brings up a much more philosophical point that by offering the ability for people to design their own offspring, the natural process of parenthood and having to accept your children as they are could be in danger. Parents would almost be designing and buying a product instead, which he sees as a consequence of American consumerism (KQED Radio). He believes that the result of all this genetic tinkering and designing would be the dehumanization of the process of raising a child, which he considers special as it is the only relationship a parent cannot choose.

The more one reads on this subject, the more it begins to resemble eugenics, which has been universally considered taboo since the Nazi Holocaust. With the introduction of genetic engineering, though, interest in eugenics has been slowly growing, although it has been termed 'new eugenics' in order to differentiate it from the eugenics of the early 20th century. So what's the difference? New eugenics would voluntary instead of coercive, which some consider to have been the problem of old eugenics. Some believe that the voluntary improvement of the human race would be beneficial as a whole to mankind as undesirable traits are eventually removed

from the population. Instead of killing the undesirables, though, instead their children would be genetically engineered to possess the desired traits. Sandel paraphrases Robert Sinsheimer, a well respected professor of molecular biology, as writing "hopefully of rescuing 'the losers in that chromosomal lottery that so firmly channels our human destinies,' including not only those born with genetic defects but also 'the 50,000,000 'normal' Americans with an IQ of less than 90.'" Sinsheimer furthermore believed that "We [could] be the agent of transition to a whole new pitch of evolution" - quite a heroic vision ("The Case against Perfection"). Depending on one's personal beliefs, this could be either the making of an earthly technological paradise with a super human race of geniuses, athletes, etc., or a dystopia with a performance-obsessed population for whom life is no longer special and mysterious.

These are of course extreme views, but still they are still important to think about as genetic engineering comes closer to reality. There are both practical and philosophical arguments on both sides and we must discuss and debate them as morality tries to catch up with science. Likely, there will be no one answer that everybody agrees upon when this technology's time comes, so there is work to be done to bring this subject to the attention of the public in order to foster discussion. Personally, I came into this topic with what I thought was a well formed opinion in favor of one side, yet this topic has shown to be exceedingly complicated and I am now left with many more questions than answers than when I started.

Work Cited

eMedicine. "Preimplantation Genetic Diagnosis: EMedicine Obstetrics and Gynecology." *EMedicine - Medical Reference*. 2010. Web. <http://emedicine.medscape.com/article/273415-overview>.

Gajilan, A. Chris. "Gender Selection a Reality, but Is It Ethical? - CNN." *Featured Articles from CNN*. CNN, 17 Nov. 2005. Web. <http://articles.cnn.com/2005-11-16/health/pdg.gender.selection_1_pgd-sperm-separation-fertility-institutes?_s=PM:HEALTH>.

Krasny, Michael, dir. "Michael Sandel: Genetic Engineering : Forum." *Forum*. KQED Radio. California, 7 May 2007. *KQED Public Media for Northern CA*. Web. <http://www.kqed.org/a/forum/R705070900>.

"Preimplantation Genetic Diagnosis - The Doctors Lounge(TM)." *Doctors Lounge - Ask a Doctor Free, Online Medical Community, Forum, Encyclopedia*. 22 Jan. 2004. Web. <http://www.doctorslounge.com/fertility/articles/pgd/pgd_technique/index.htm>.

Sandel, Michael. "The Case Against Perfection." *The Atlantic — News and Analysis on Politics, Business, Culture, Technology, National, International, and Food – TheAtlantic.com*. 2004. Web. <http://www.theatlantic.com/past/docs/issues/2004/04/sandel.htm>.

Savulescu, Julian. “Deaf Lesbians, ‘Designer Disability,’ And The Future Of Medicine” *BMJ: British Medical Journal*, Vol. 325, No. 7367 (Oct. 5, 2002), pp. 771-773 <http://www.jstor.org/stable/25452517>

Sinsheimer, Robert L. "Genetic Engineering." *Caltech Library*. Web. <http://calteches.library.caltech.edu/307/1/genetic.pdf>.

"Surplus Males: The Need For Balance." *Bridges* (2000): 32. *Kennedy BYU*. Web. <http://kennedy.byu.edu/bridges/pdfs/bridgesF2000.pdf>.

Teather, David. "Lesbian Couple Have a Deaf Child by Choice." *The Guardian*. 8 Apr. 2002. Web. <http://staff.unak.is/not/kk/Guardian%20Unlimited%20%20The%20Guardian%20%20Lesbian%20couple%20have%20deaf%20baby%20by%20choice.htm>.