The Washington Post

Building Baby From the Genes Up

By Ronald M. Green
Sunday, April 13, 2008

The two British couples no doubt thought that their appeal for medical help in conceiving a child was entirely reasonable. Over several generations, many female members of their families had died of breast cancer. One or both spouses in each couple had probably inherited the genetic mutations for the disease, and they wanted to use in-vitro fertilization and preimplantation genetic diagnosis (PGD) to select only the healthy embryos for implantation. Their goal was to eradicate breast cancer from their family lines once and for all.

In the United States, this combination of reproductive and genetic medicine -- what one scientist has dubbed "reprogenetics" -- remains largely unregulated, but Britain has a formal agency, the Human Fertilization and Embryology Authority (HFEA), that must approve all requests for PGD. In July 2007, after considerable deliberation, the HFEA approved the procedure for both families. The concern was not about the use of PGD to avoid genetic disease, since embryo screening for serious disorders is commonplace now on both sides of the Atlantic. What troubled the HFEA was the fact that an embryo carrying the cancer mutation could go on to live for 40 or 50 years before ever developing cancer, and there was a chance it might never develop. Did this warrant selecting and discarding embryos? To its critics, the HFEA, in approving this request, crossed a bright line separating legitimate medical genetics from the quest for "the perfect baby."

Like it or not, that decision is a sign of things to come -- and not necessarily a bad sign. Since the completion of the Human Genome Project in 2003, our understanding of the genetic bases of human disease and non-disease traits has been growing almost exponentially. The National Institutes of Health has initiated a quest for the "$1,000 genome," a 10-year program to develop machines that could identify all the genetic letters in anyone's genome at low cost (it took more than $3 billion to sequence the first human genome). With this technology, which some believe may be just four or five years away, we could not only scan an individual's -- or embryo's -- genome, we could also rapidly compare thousands of people and pinpoint those DNA sequences or combinations that underlie the variations that contribute to our biological differences.

With knowledge comes power. If we understand the genetic causes of obesity, for example, we can intervene by means of embryo selection to produce a child with a reduced genetic likelihood of getting fat. Eventually, without discarding embryos at all, we could use gene-targeting techniques to tweak fetal DNA sequences. No child would have to face a lifetime of dieting or experience the health and cosmetic problems associated with obesity. The same is true for cognitive problems such as dyslexia. Geneticists have already identified some of the mutations that contribute to this disorder. Why should a child struggle with reading difficulties when we could alter the genes responsible for the problem?

Many people are horrified at the thought of such uses of genetics, seeing echoes of the 1997 science-fiction film "Gattaca," which depicted a world where parents choose their children's traits. Human weakness has been eliminated through genetic engineering, and the few parents who opt for a "natural" conception run the risk of producing offspring -- "invalids" or "degenerates" -- who become members of a despised underclass. Gattaca's world is clean and efficient, but its eugenic obsessions have all but extinguished human love and compassion.

These fears aren't limited to fiction. Over the past few years, many bioethicists have spoken out against genetic manipulations. The critics tend to voice at least four major concerns. First, they worry about the effect of genetic selection on parenting. Will our ability to choose our children's biological inheritance lead parents to replace unconditional love with a consumerist mentality that seeks perfection?

Second, they ask whether gene manipulations will diminish our freedom by making us creatures of our genes or our parents' whims. In his book "Enough," the techno-critic Bill McKibben asks: If I am a world-class runner, but my parents inserted the "Sweatworks2010 GenePack" in my genome, can I really feel pride in my accomplishments? Worse, if I refuse to use my costly genetic endowments, will I face relentless pressure to live up to my parents' expectations?

Third, many critics fear that reproductive genetics will widen our social divisions as the affluent "buy" more competitive abilities for their offspring. Will we eventually see "speciation," the emergence of two or more human populations so different that they no longer even breed with one another? Will we re-create the horrors of eugenics that led, in Europe, Asia and the United States, to the sterilization of tens of thousands of people declared to be "unfit" and that in Nazi Germany paved the way for the Holocaust?

Finally, some worry about the religious implications of this technology. Does it amount to a forbidden and prideful "playing God"?

To many, the answers to these questions are clear. Not long ago, when I asked a large class at Dartmouth Medical School whether they thought that we should move in the direction of human genetic engineering, more than 80 percent said no. This squares with public opinion polls that show a similar degree of opposition. Nevertheless, "babies by design" are probably in our future -- but I think that the critics' concerns may be less troublesome than they first appear.

Will critical scrutiny replace parental love? Not likely. Even today, parents who hope for a healthy child but have one born with disabilities tend to love that child ferociously. The very intensity of parental love is the best protection against its erosion by genetic technologies. Will a child somehow feel less free because parents have helped select his or her traits? The fact is that a child is already remarkably influenced by the genes she inherits. The difference is that we haven't taken control of the process. Yet.

Knowing more about our genes may actually increase our freedom by helping us understand the biological obstacles -- and opportunities -- we have to work with. Take the case of Tiger Woods. His father, Earl, is said to have handed him a golf club when he was still in the playpen. Earl probably also gave Tiger the genes for some of the traits that help make him a champion golfer. Genes and upbringing worked together to inspire excellence. Does Tiger feel less free because of his inherited abilities? Did he feel pressured by his parents? I doubt it. Of course, his story could have gone the other way, with overbearing parents forcing a child into their mold. But the problem in that case wouldn't be genetics, but bad parenting.

Granted, the social effects of reproductive genetics are worrisome. The risks of producing a "genobility," genetic overlords ruling a vast genetic underclass, are real. But genetics could also become a tool for reducing the class divide. Will we see the day when perhaps all youngsters are genetically vaccinated against dyslexia? And how might this contribute to everyone's social betterment?

As for the question of intruding on God's domain, the answer is less clear than the critics believe. The use of genetic medicine to cure or prevent disease is widely accepted by religious traditions, even those that oppose discarding embryos. Speaking in 1982 at the Pontifical Academy of Sciences, Pope John Paul II observed that modern biological research "can ameliorate the condition of those who are affected by chromosomic diseases," and he lauded this as helping to cure "the smallest and weakest of human beings . . . during their intrauterine life or in the period immediately after birth." For Catholicism and some other traditions, it is one thing to cure disease, but another to create children who are faster runners, longer-lived or smarter.

But why should we think that the human genome is a once-and-for-all-finished, untamperable product? All of the biblically derived faiths permit human beings to improve on nature using technology, from agriculture to aviation. Why not improve our genome? I have no doubt that most people considering these questions for the first time are certain that human genetic improvement is a bad idea, but I'd like to shake up that certainty.

Genomic science is racing toward a future in which foreseeable improvements include reduced susceptibility to a host of diseases, increased life span, better cognitive functioning and maybe even cosmetic enhancements such as whiter, straighter teeth. Yes, genetic orthodontics may be in our future. The challenge is to see that we don't also unleash the demons of discrimination and oppression. Although I acknowledge the risks, I believe that we can and will incorporate gene technology into the ongoing human adventure.

Ronald M. Green is a professor of ethics at Dartmouth College. His most recent book is "Babies by Design: The Ethics of Genetic Choice."

The colloquial term "designer baby" refers to a baby whose genetic makeup has been artificially selected by genetic engineering combined with in vitro fertilization to ensure the presence or absence of particular genes or characteristics. - wikipedia. In simpler terms, using biotechnology to choose what type of baby you want.