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 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.

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."