

Human genetic engineering has always been the stuff of science-fiction novels and blockbuster Hollywood films. Except that it is no longer confined to books and movies.

Scientists and doctors are already attempting to genetically alter human beings and our cells. And whether you realize it or not, you and your children are being bombarded in popular media with mixed messages on the ethics surrounding human genetic engineering.

So what does the Church say about the genetic engineering of humans?

The majority of Catholics would likely say that the Church opposes any genetic modification in humans. But that is not what our Church teaches. Actually, the Church does support human genetic engineering; it just has to be the right kind.

Surprised? Most Catholics probably are.

To understand Catholic Church teaching on genetic engineering, it is critical to understand an important distinction under the umbrella of genetic engineering: the difference between therapy and enhancement. It is a distinction that every Catholic should learn to identify, both in the real world and in fiction. Gene therapy and genetic enhancement are technically both genetic engineering, but there are important moral differences.

For decades, researchers have worked toward using genetic modification called gene therapy to cure devastating genetic diseases. Gene therapy delivers a copy of a normal gene into the cells of a patient in an attempt to correct a defective gene. This genetic alteration would then cure or slow the progress of that disease. In many cases, the added gene would produce a protein that is missing or not functioning in a patient because of a genetic mutation.

One of the best examples where researchers hope gene therapy will be able to treat genetic disease is Duchenne Muscular Dystrophy or DMD. DMD is an inherited disorder where a patient cannot make dystrophin, a protein that supports muscle tissue. DMD strikes in early childhood and slowly degrades all muscle tissue,

including heart muscle. The average life expectancy of someone with DMD is only 30 years.

Over the last few years, researchers have been studying mice with DMD. They have been successful in inserting the normal dystrophin gene into the DNA of the mice. These genetically engineered mice were then able to produce eight times more dystrophin than mice with DMD. More dystrophin means more muscle, which, in the case of a devastating muscle-wasting disease like DMD, would be a lifesaver.

Almost immediately after the announcement of this breakthrough, the researchers were inundated with calls from bodybuilders and athletes who wanted to be genetically modified to make more muscle.

The callers essentially wanted to take the genetic engineering designed to treat a fatal disease and apply it to their already healthy bodies.

Genetically engineering a normal man who wants more muscle to improve his athletic ability is no longer gene therapy. Instead, it is genetic enhancement.

Genetic enhancement would take an otherwise healthy person and genetically modify him to be more than human, not just in strength, but also in intelligence, beauty or any other desirable trait.

So why is the distinction between gene therapy and genetic enhancement important? The Catholic Church is clear that gene therapy is good, while genetic enhancement is morally wrong.

Why? Because gene therapy seeks to return a patient to normal human functioning. Genetic enhancement, on the other hand, assumes that man's normal state is flawed and lacking, that man's natural biology needs "enhancing." Genetic enhancement would intentionally and fundamentally alter a human being in ways not possible by nature, which means in ways God never intended.

The goal of medical intervention must always be the natural development of a human being, respecting the patient's inherent dignity and worth. Enhancement

destroys that inherent dignity by completely rejecting mankind's natural biology. From the "Charter for Health Care Workers" by the Pontifical Council for Pastoral Assistance:

"In moral evaluation, a distinction must be made between strictly 'therapeutic' manipulation, which aims to cure illnesses caused by genetic or chromosome anomalies (genetic therapy), and manipulation, 'altering' the human genetic patrimony. A curative intervention, which is also called 'genetic surgery,' will be considered desirable in principle, provided its purpose is the real promotion of the personal well-being of the individual, without damaging his integrity or worsening his condition of life.

"On the other hand, interventions which are not directly curative, the purpose of which is 'the production of human beings selected according to sex or other predetermined qualities,' which change the genotype of the individual and of the human species, 'are contrary to the personal dignity of the human being, to his integrity and to his identity. Therefore, they can be in no way justified on the pretext that they will produce some beneficial results for humanity in the future.' 'No social or scientific usefulness and no ideological purpose could ever justify an intervention on the human genome unless it be therapeutic; that is, its finality must be the natural development of the human being.'"

So genetic engineering to cure or treat disease or disability is good.

Genetic engineering to change the fundamental nature of mankind, to take an otherwise healthy person and engineer him to be more than human is bad.

There is much misinformation surrounding the Catholic Church's teaching on human genetic engineering. One example is in a piece in *The New York Times* by David Frum. Frum states that John Paul II supported genetic enhancement and, therefore, the Church does as well. Frum performs a sleight of hand, whether intentional or not. See if you can spot it:

“The anti-abortion instincts of many conservatives naturally incline them to look at such [genetic engineering] techniques with suspicion — and, indeed, it is certainly easy to imagine how they might be abused. Yet in an important address delivered as long ago as 1983, **Pope John Paul II argued that genetic enhancement was permissible — indeed, laudable — even from a Catholic point of view, as long as it met certain basic moral rules.** Among those rules: that these therapies be available to all.”

Frum discusses enhancement and therapy as if they are the same. He equates them using the words “therapies” and “enhancement” interchangeably. Because John Paul II praised gene therapy, the assumption was that he must laud genetic enhancement as well. This confusion is common because, many argue, there is not a technical difference between therapy and enhancement, so lumping them together is acceptable.

Catholics must not fall into this trap. Philosophically, gene therapy and genetic enhancement are different. One seeks to return normal functioning; the other seeks to take normal functioning and alter it to be abnormal.

There are practical differences between therapy and enhancement as well. Genetic engineering has already had unintended consequences and unforeseen side effects. Gene-therapy trials to cure disease in humans have been going on for decades. All has not gone as planned. Some patients have developed cancer as a result of these attempts at genetically altering their cells.

In 1999, a boy named Jesse Gelsinger was injected with a virus designed to deliver a gene to treat a genetic liver disease. Jesse could have continued with his current treatment regime of medication, but he wanted to help others with the same disorder, so he enrolled in the trial. Tragically, Jesse died four days later from the gene therapy he received.

In 2007, 36-year-old mother Jolee Mohr died while participating in a gene-therapy trial. She had rheumatoid arthritis, and just after the gene therapy (also using a virus for delivery) was injected into her knee, she developed a sudden infection that

caused organ failure. An investigation concluded that her death was likely not a direct result of the gene therapy, but some experts think that with something as treatable as rheumatoid arthritis she should never have been entered into such a trial. They argued that, because of the risks, gene therapy should only be used for treating life-threatening illness.

In other words, genetic engineering should only be tried in cases where the benefits will outweigh the risks, as in the treatment of life-threatening conditions. Currently, gene therapy is being undertaken because the risk of the genetic engineering is outweighed by the devastation of the disease it is attempting to cure. With the risks inherent in genetic modification, it should never be attempted on an otherwise healthy person.

You may be thinking that such risky enhancement experiments would never happen. Scientists and doctors would never attempt genetic modifications in healthy humans; human enhancements only exist in science fiction and will stay there. Except science and academia are already looking into it.

The National Institutes of Health (NIH) has awarded Maxwell Mehlman, director of the Law-Medicine Center at Case Western Reserve University School of Law, \$773,000 to develop standards for tests on human subjects in genetic-enhancement research. Research that would take otherwise normal humans and make them smarter, stronger or better-looking. If the existing human-trial standards cannot meet the ethical conditions needed for genetic-enhancement research, Mehlman has been asked to recommend changes.

In a recent paper in the journal *Ethics, Policy & Environment*, S. Matthew Liao, a professor of philosophy and bioethics at New York University, explored ways humanity can change its nature to combat “climate change.” One of the suggestions Liao discusses is to genetically engineer human eyes to be like cat eyes so we can all see in the dark. This would reduce the need for lighting and reduce energy usage. Liao also discusses genetically modifying our offspring to be smaller so they eat less and use fewer resources.

Of course, Liao insists these are just discussions of possibilities, but what begins as discussions among academics often becomes common among the masses.

Once gene therapy has been perfected and becomes a mainstream treatment for genetic disease, the cries for genetic enhancement will be deafening. The masses will scream that they can do to their bodies as they wish — and they wish to no longer be simply human. They wish to be “super” human.

And with conscience clauses for medical professionals under attack, doctors and nurses may be unable to morally object to genetically altering their perfectly healthy patient or a parent’s perfectly healthy child.

It is important for Catholics to not turn their backs on technical advancements in biotechnology simply because the advancements are complex.

We can still influence the public consciousness when it comes to human genetic engineering. We are obliged to loudly draw the line between therapy and enhancement — otherwise, society, like Frum, will confuse the two.

It is not too late to make sure medically relevant genetic engineering does not turn into engineering that forever changes the nature of man.

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