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Genetic Engineering

Altering the deoxyribonucleic acid (DNA) and genetic composition of humans appears to be an action that is almost unreal, however it is an existent process known as genetic engineering, and it continues to develop and grow in popularity today. Through the process of genetic engineering, the genetic makeup of humans or other organisms is manipulated through artificial processes which involve the transformation of DNA and genes. This complex, yet potent technological advancement has the potential to save lives and help the global population. However, in spite of all these beneficial findings, opponents of genetic engineering argue that due to such a practice, numerous wrongdoings, such as physical and ethical mishandling, are being committed against all of society. Proponents believe that genetic engineering is the apex of medical success and ingenuity, marketing the strength and vigilance of the human race against the battle of continued existence. Given the countless numbers of benefits genetic engineering has provided to society, advocates believe that this process is an essential piece of technology that is crucial to improve human survival, health care, and disease reduction. However, critics refute their counterparts' altercations by saying that the safety and overall effectiveness of genetic engineering is shrouded in mist, linking to the unethical aspects, decreased genetic diversity and experimentation with an unfamiliar topic.

Through the process of genetic engineering, some of the deadliest and most incurable diseases have the possibility of finally being reduced, or even eradicated, ending the suffering of the many dealing with such mutations. Resistance to diseases, such as human immunodeficiency virus (HIV), can be developed, as “physicians might edit a patient's immune cells to delete the CCR5 gene, conferring the resistance to HIV carried by the 1% of the US population lacking functional copies of this gene" (Friedman). With the advancement of genetic manipulation, this disease, and countless others would no longer exist nor pose a threat to adults, teenagers, and children. HIV is known to be a widespread, common disease among today’s population that may arouse various problems, so the possibility of its eradication opens the door to a pleasant lifestyle for the many suffering from it. Pain and suffering may also be eliminated Hemophilia, a blood disorder in which the body lacks the protein needed to create clots, could also be cured by manipulating blood stem cells. This disease causes bruising, pain, and excessive bleeding, and one in 5,000 babies is born affected in the Unites States of America (Friedman). Similar to HIV, hemophilia is yet another disease among the plethora of others that can be feasibly prevented by genetically engineering specific cells. The horrific pain and discomfort caused by such a disease, not only in adults, but in young, innocent children can be removed from the lives of the victims. Illness can also be eradicated in unborn children, who can then be born healthy and strong. This possibility is one that every parent wishes to become a reality for their developing child. Huntington’s disease is another disease in which there is a 50% risk of a child inheriting it, and a full risk of carrying it. It is impossible to stop children from suffering from such a sickness if they have already been affected. However, genetic engineering can ensure the prevention of carrying the disease to pass on to future generations (“Pros and Cons”). Professional health

administrators state that by avoiding genetic engineering to cease disease, there is more harm being done rather than being eliminated. Future generations can develop and prosper with fewer and fewer counts of disease and deaths due to disease, which will allow for a stronger, healthier global populace. By overlooking the opportunity to genetically alter cells for the better, the disease will spread even further, causing even more inadvertent devastation and hindering the possibility of its total eradication. The human race needs to become accustomed to the unique protection genetic engineering can provide, as even the smallest hiccup in the trail can leave a devastating path of demolition.

Furthermore, allowing for the processes of genetic engineering to be undertaken will yield a longer life span to those suffering with disease, as well as to those who remain healthy today. For example, genetic engineering is therapeutic to "[Cystic Fibrosis] patients [who] also usually die many years before the normal human life span of seventy-plus years" (Resnik). To be suffering from a tormenting disease is a single factor that may ruin one's outlook on life, however knowing that such a disease limits one's lifespan only adds to the devastation. Genetic engineering has the potential to bring about a longer life full of happiness for those who face such pains. Elongating human life not only allows for the development of this joy, but also yields to the possibilities of further developments and advancements in science and technology, as more time allows for more scientific research. By altering cells in order to reverse the body's reasons for a natural decline, lifespan and quality is significantly improved ("Pros and Cons"). Scientists have found that cellular structure and composition may be altered to prevent cellular decomposition within the human body, therefore allowing for a longer lifespan and providing individuals with an endless number of opportunities. A lengthier lifespan positively impacts both

the new and old generations, as it allows the young to mature before experiencing and dealing with cases of familial loss in the older generations. With humans having the ability to prosper for a longer period of time, not only can personal lives be enhanced, but the success and prosperity of the global society can be further developed. One of the greatest global challenges today is that of hunger and malnutrition, however such a problem can be combatted with genetically engineered food, "created by a company called Aqua Bounty Technologies, the AquAdvantage is a transgenic salmon that has had ocean pout and chinook salmon genes spliced into its DNA. The result is a fish that grows to full size in 18 rather than 36 months" (Baratt). The possibility of future food shortages and mass starvation can be fended off with the increasingly rapid production of foods through the manipulation of their genetic development. Many countries today face problems with lack of proper food supply, but this advancement can be a step towards defeating widespread hunger. A larger number of people can be fed in a shorter amount of time. Such a use of genetic engineering makes it clear that the process not only directly impacts human life, but also indirectly, as it allows for vast problems among the population to be prevented. An increase in food supply directly correlates to an increase in the longevity of humans. Overall, genetic engineering enables human life to thrive and develop successfully.

Additionally, genetic engineering helps humans improve their health care plans and health care quality by allowing physicians to examine the specific genetic makeup of patients. For example, a company by the name of Pathway allows physicians and patients to determine their accurate genetic composition. Pathway keeps patients updated on the most recent findings in their genetic makeup, which allows physicians to use such information to improve their health care quality upon patient consultation (Clemmitt). With today's physicians being as

knowledgeable and qualified as they are, enabling them to analyze patient genetic composition only further progresses healthcare treatment options. This additional knowledge allows for medical doctors to provide patients with the most specific and accurate care that they need, based on personal genetic makeup. Personalization of treatment plans yields for more success and efficiency within the medical industry. Today, “already more than 1,000 human genetic tests are available. These enable couples who conceive a child using in vitro fertilization (IVF) to have embryos screened for the genetic mutations that cause cystic fibrosis, sickle cell disease, spinal muscular atrophy, and a range of other conditions” (Baratt). Acquiring this information about one’s future child allows for parents to undergo preparation and possibly consider options for preventing such conditions. Not only does this benefit the parents, but it allows for the prospect of upbringing a strong, healthy being, who could have been negatively affected by such diseases without early screening. Additionally, premature knowledge allows doctors to begin researching possible treatments. Money from the government and patients can be saved this way, as treatment in the later stages may be more expensive. In the long run, genetic screening allows for the world to develop with healthier and happier parents and children. This happiness is not only achieved through early knowledge of disease, but also because physicians are able to gain an insight to human health with genetically engineered testing, as many individuals have actively made changes to their lifestyle with knowledge of their genetic reports, in order to manage disease. A certified physician himself, Dr. Collins, was officially motivated by his genetic testing to make healthy diet and fitness changes in his life (Clemmitt). Not only does genetically engineered testing benefit doctors by allowing early treatment of disease, but with personal knowledge of genetic defects, humans are more motivated to act towards improving their

wellbeing. Change in life does not come without a motivation factor, and genetic reports have proven to serve as one of the greatest factors towards improving human health. Many times when patients learn of diseases at later stages, they refuse to combat those diseases, but with genetic testing, early results may be found and may save lives. Genetic engineering allows for health care plans to be improved upon, benefiting both the doctor and the patient.

However, the process of genetic engineering is often viewed by opponents as one that is unethical, as it forces a stray from natural heritage. Genetic engineering is countered not only by its physical and social effects, but also by the ethical and religious reasoning of "many people who religiously believe in God, or who are born and baptized as Christians… people can be questioned of what gives them the right to manipulate divine laws. It also questions the theory of Darwin, 'the survival of the fittest'" ("Advantages and Disadvantages"). The upbringing of many individuals has been influenced by religious affiliations, which causes them to believe in the ethical harm in altering the genetic composition of humans. As humans who are created through a natural process, many believe it to be against natural law to alter this upbringing and divine development. By genetically altering humans to allow for a more developed lifestyle, the long-known theory of surviving naturally based upon one's own physical abilities is also countered. This is partly why the National Institute of Health limits human embryonic research, as a response to various groups who view research and experimentation with human embryos as unethical (Adams). Upon fertilization, at the very second of embryonic development, many believe human life to have begun, and it is the alteration of any form of human life that is believed to contradict moral and ethical values. In order to preserve the global society as a place with pure and natural genetic composition, genetic engineering must be avoided to combat the

rise of some individuals over others. This possibility of advantage brought upon by genetic engineering disrupts the diversely balanced population, which goes against common religious principles. This strong religious affiliation is clearly seen when scientists test nonviable embryos, "meaning they could never produce live births. But the attempt to genetically alter a human embryo's genome — the genetic makeup of an organism, carried in the DNA — stepped over an ethical boundary that many scientists and ethicists say should never be crossed" (Adams). Humans believe that everyone is made to be who they are for a reason, and the alteration of such traits, whether it be for personal reasons or health issues, does not coincide with what humans are known to be. The original genetic composition of humans defines who a specific person is, and by altering the genome, not only is this composition changed, but so is the person's identity. By genetically engineering genes, humans are permanently transformed from their original state, from their natural heritage.

Additionally, genetic diversity is limited through the manipulation of genes and DNA, causing the human population to become increasingly similar and less unique. Scientists state that genetic engineering poses a detrimental threat to the planet's genetic diversity, similar to the threat posed by the process of cloning. Gene therapy is a procedure only affordable by the rich, which means that traits found among those who earn less money would eventually disappear ("Pros and Cons"). Today's population is composed of a wide variety of people, ethnicities, and classes, however with genetic engineering, critics see the risk of eradicating these differences and creating a uniform world. This disrupts the natural balance of differences found on the planet, which therefore hinders successful human development, as humans would not be able to fully function without the existence of a variety of classes and people. Not only is genetic

diversity limited, but this limitation causes a decrease in the biodiversity of the planet because "DNA, which codes for proteins in an organism, will become more similar between individuals of a species. Genetic diversity is directly related to biodiversity, the variability in the traits of organisms that make up an ecosystem, because diversity in DNA will inform the characteristics of the organisms that make up a population" (Landry). The sole key aspect in achieving environmental and global sustainability is to have biodiversity, however with an increased use of genetic engineering, there will be no biodiversity on the planet, leaving behind a failing global ecosystem. Although genetic engineering may be intended solely for health defects, professionals predict there to be an enormous possibility of it being used for an increasing number of personal reasons, therefore increasing the rate at which biodiversity decreases. Natural hybridization normally has a positive effect on diversity, however if genetically modified genes are introduced through the process of hybridization, they could induce certain advantages in the hybrid species, like that of reproduction. This advantage would result in the resistance of the engineered gene within the population, thus reducing the diversity within the species (Landry). It is clear that in specific populations, genetic modification results in a dominant species outlasting one that is not as dominant due to a lack of modification and physical ability. This can similarly be observed among humans with the continued used of genetic engineering, as it will allow for the growth of richer beings to outlive and outlast those who do not have access to such expensive procedures. Development of stronger, more resilient traits will only be prominent in the more affluent global population, as the process is not one that is economical for everyone. Maintenance of only specific, strong genes within a species does remove weaknesses, but it also

removes genetic multiplicity. The human race will begin to fall apart by losing diversity with an increase in genetic engineering.

Furthermore, genetic engineering is a relatively new topic with many unexplored areas, so experimentation has the potential of being dangerous and could pose threats to human health. The transformation and replacement of genes is a difficult process that involves the "viral vector that carries functional genes inside the human body… There are no clues as to where functional genes are being placed. They may even substitute the important genes, instead of mutated genes" ("Advantages and Disadvantages"). Genetic engineering is currently a topic undergoing heavy research, however because it is actively being researched, there are many unknowns to its entire process, which introduces the likelihood of unintended mistakes during the process. Despite the desired outcome, there is a high possibility of wholly altering human composition for the worse rather than for the better. This possibility poses a great amount of threat to those who are hoping to battle diseases, as worse mutations could come about as a result of such genetic procedures. Scientists continue to experiment with unfamiliar concepts, despite the fact that many variations found between a human's personal genome and the standard for genetic structure are of unknown cause and importance (Jost). Physically investigating variations that may play a vital role for human survival that scientists are clueless about, may bring about serious complications for the trial subjects. It is highly likely that scientists will discover discrepancies between what is known to be a usual genetic structure and the specific individual's screening, causing them to suggest undergoing genetic engineering to fix the discrepancy. However, without having knowledge about the function of specific structures, it is dangerous to alter one's DNA. A specific example of how cloning, a form of genetic engineering has failed is with, "the poor outcomes with

mammals… With mammals, cloning fails more often than it succeeds. Many cloned animals have been born with abnormalities and died within weeks or months. Dolly died at age 6; the average sheep lives 12 years" (Adams). Using the similarity among many mammals and humans as a connecting factor, genetic engineering evidently has the likelihood of damaging one's entire life by shortening lifespans or by imposing unknown diseases or defects, as much is not known about its specific process. Many humans are not willing to risk even their disease-ridden lives for the possibility of its eradication, as death may be a resulting factor. Death is something that humans naturally fear, and it is this fear that explains why genetic engineering is an unsafe process for those who are currently living. Rather than building the human population to become stronger and more successful, genetic engineering has resulted in the destruction of innocent lives that are much needed for a thriving world, due to it being such an unfamiliar topic.

Genetic engineering is the very pinnacle of success for the medical field and for society. However, unsafe practices and misguided decisions can hinder the very thing that has the potential to save millions of lives. To take into account the massive choice one has when making a decision about genetic engineering is a huge covenant. Even though there is scientific data to back up the validity of genetic transformations along with the enormous benefits to humans and society, there is nothing that has been done about taking genetic mutations too far causing defects and reductions in diversity, the main cause of controversy between pro and anti-genetic engineering groups. The proposed and best method to handle a circumstance such as this is to slow down the pace at which genetic research and engineering is being conducted and administered. Considerable amount of thought must be given to genetic engineering, which could be the savior of mankind, but can be the cause of its very own extinction if not paid close enough

attention to. However, there is one thing critics and proponents can come to a census on, and the original idea of this thought still floats around as the basis of genetic engineering; the idea that such a process was made with the intent to provide a risk-free, and safe method to benefit the human population.

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