Assessing selective human genetic engineering selective genetic engineering

Nora Sheskey

Selective Genetic Engineering

For millions of years, genetic selection has been the result of natural selection. Who someone is, natural abilities, physical characteristics, and a wide range of other personal attributes were the result of genetic recombination and accidental mutation. Furthermore, children are often born with hereditary conditions which are set by factors we have no control over. However, the advent of modern medicine has brought us to the brink of a time when we can choose to redirect nature and repair maladies in children, where we can artificially modify the very codes which guide their looks, which diseases they are resistant to, and even their personalities. Considering the facts concerning genetic engineering, the benefits which can be achieved far outweigh the potential risks with regard to both the reduction in human suffering and the likely increase in lifespan.

The opponents of human genetic engineering often refer to a number of dangers involved in artificially manipulating genetic codes which result in such medical issues as Down’s syndrome, Hemophilia, and even anxiety and stress. With the completion of the Genome project, we can now more accurately map the human DNA than ever before, identifying the locations of defects that cause many of the maladies that have plagued mankind for millennia. Opponents of genetic manipulation are quick to point out that a slight error in the manipulation process can result in changing other sequences that could result in unforeseen and undesired effects. For instance, researcher Russell Powell has speculated that human genetic

engineering might result in a lower genetic diversity which could lead to future generations that are more prone to having some types of diseases and which could, potentially, lead to the human race becoming extinct. Part of his research showed how genetic manipulation of crops in order to increase the availability of desirable crops increased the likelihood of catastrophic crop failure due to those crops becoming less genetically diverse over time and having reduced resistance to environmental factors which a wider genetic base would have prevented. He studied how such factors led to the nineteenth century Irish Potato Famine and how the organism Phytophthora was able to decimate much of the potato crop in Ireland due to this reduction in genetic diversity because of the farming methods in use in that region during that period of history. His research demonstrates that by reducing human genetic diversity through such techniques as genetic manipulation those human beings could set themselves up for a similar fate (Powell, R. 2012, pp. 204-5). Also, the work of Charles Gillespie, et. al., into how genetics affect the human stress response found that stress related genetic mutations in developing human fetuses increased the individual’s susceptibility to disorders such as depression and post-traumatic stress disorder later in life. They found that natural genetic manipulation due to a change in the hypothalamic-pituitary-adrenal balance lead to an increase in susceptibility to stress related disorders in the associated human beings (Gillespie, C. F., 2009, p. 990). Opponents of genetic manipulation point out that accidentally manipulating the incorrect gene sequences could result in the same type of condition. Opponents use facts such as these in their outspoken aversion to the practice.

Proponents of genetic engineering rebut the opponents by pointing out that the benefits of curing medical issues like Down’s syndrome and Hemophilia far outweigh the possible risks. They counter the opposition with a number of research studies. As part of his research, Powell determined that human genetic diversity is due to a combination of both mutation and recombination (Powell, R. 2012, pp. 215). He found that a number of different phenotypes can result from a single genotype which led him to conclude that accidental activation of inactive or incorrect sequences is unlikely to produce feared dramatic issues often spoken of by human genetic manipulation opponents. Additionally, he found that focusing on only DNA adaptive variation involved in human genetic manipulation would not result in an extensive homogenization of the human DNA feared by opponents and that other environmental factors play a significant part in human genetic diversity (Powell, R. 2012, pp. 207-8). In addition, Gordon and Hen found that properly utilized genetic manipulation can provide many useful results with an acceptable margin of safety. They studied twins to determine how anxiety response is genetically associated and how DNA sequencing and correction could help to treat the condition. They document that comparisons of fraternal and identical twins showed that 30% to 50% of risk of developing anxiety disorders comes from genetic factors with the remainder being attributed to environmental causes. They also used studies of rats and mice to show that anxiety is a genetic condition and could be treatable using genetic manipulation techniques (Gordon, J. A., & Hen, R., 2004, pp. 195-6)

Opponents of human genetic engineering further turn to natural selection in their opposition to the practice. They point out that altering how nature and

evolution have brought things about can have unintended consequences. As evidence of this, they look at the research of Richard A. Miller. Miller found that manipulating certain genes associated with aging in what he refers to as UM-HET3 mice, a group of 1800 specimens, sometimes actually shortened rather than lengthened the average lifespan as well as hastened the onset of reduced cognitive abilities in the mice which received such treatments. He additionally found that when other specific genetic sequences were modified, the result was an increase in the occurrence of and age at which cancer occurred in some cases. His research also showed that not only could the aging process be sped up due to genetic manipulation but could also increase the severity of old age issues. Additionally, some of the traits which occurred later in life could not be detected in the early stages of life. Miller found that these traits affected a number of aspects such as bones, eyes, hormones, weight, and what kills the individual. Miller eventually admits that there are things which nature has brought about which we cannot yet reproduce in the laboratory and opponents of genetic manipulation question if such research is worth the risks (Miller, R. A., 2005, pp. S284-5) Opponents of genetic engineering also refer to the work of Brown who examined that practice from a viewpoint of Rawlsian Justice. He points out that such a practice still needs to be considered from both a moral and a legal framework. He states that “ The important point is that until now, theories of justice have regarded one’s genetic endowment as a fixed fact of nature rather than as a matter of justice.” He indicates that manipulating individuals alters their right to have an equal claim to the same equalities and fair equalities as others. The opponents of genetic manipulation take the

viewpoint that altering who has what rights is inherently wrong and does not actually improve the overall human condition (Brown, 2007, pp. 83-84)

Proponents of human genetic engineering, on the other hand, believe that we, as human beings, are finally able to improve on that which nature has brought about after millions of years of evolution. They point out that nature has evolved such things as cancer and shortened lifespans in their support for genetic manipulation. They also look to the work of Miller and say that in spite of some cases where the lifespan was indeed shortened that in many other cases the lifespan is nonetheless longer. Their viewpoint is that by performing an analysis of the differences between DNA of the long and short lived mice that researchers will be able to eventually track down which genes do lead to longer lives. Miller himself states that there are genes which influence the age at which the various mice die, such as a pair of genes on chromosomes 2 and 16, which lead to mice living up to 173 days longer than mice that do not have this particular DNA sequence. Likewise, Miller states that there are also DNA sequences which also affect the age at which certain cancers occur in some of the mice in his study. He goes on to say that his research indicates that there may be “ a specific aging process that we can learn enough about to modify or prevent.” Miller ends his paper by stating “ Will genetic manipulation or pharmacologic agents suggested by genetic research offer a realistic possibility of life expectancy at birth of 110 or 120 or more years? Twenty years ago, this was a science fiction question, but no more, and it is interesting to speculate based on current evidence. I believe the answer is yes.” (Miller, R. A., 2005, pp. S284-5)

After having examined information from both those opposed to and those in favor of human genetic manipulation, we can most certainly say that both sides have some strong arguments in favor of their viewpoints. Those opposed to the practice would appear to come from a traditional perspective, fearing the changes necessary in order to make the necessary strides that will be required in order to bring about substantial gains to be realized from genetic engineering. Taking history as a guiding principle, they see how the best intentions often result in severe negative results before gains can be realized. They see in the work of researchers like Gordon and Hen, Miller, Powell, and Gillespie the backing to state that the possible gains are either not possible or are not warranted by the necessary costs that will be imposed. The proponents of the practice of human genetic engineering believe that any time we can relieve human suffering and eradicate disease that the benefits outweigh the costs. They are motivated by the belief that any change which improves the human condition is worth the risks and that any time we can repair genetic defects that we are doing humanity a much needed service, even when that service means that we alter the very codes which determine who a person is. They acknowledge the risks posed but believe that a future without birth defects, without Down’s syndrome, and without other such genetically linked issues is worth risking for. They find in the works of Miller, Powell, Gillespie, and Gordon and Hen an exciting roadmap to a world where human suffering based on the genetic structure has been eliminated.

Personally, I am inclined to agree with those who say that we must go boldly forward and take the necessary risks in order to improve the human

condition in every way possible. History has shown us that such journeys are not without risk but almost always inevitably prove beneficial to future generations. If we are to let fear guide us, we would have never developed such medical miracles as penicillin, the polio vaccine, or the heart transplant. No valiant effort in human history has ever come without costs and moving forward with research in genetic manipulation is sure to impose upon mankind the same kinds of costs imposed by the research of Pasteur, Salk, and Fleming. Mankind has never been the type to simply not advance and the next frontier would appear to be human genetic engineering.

In conclusion, we have finally come to an age in human history where we can choose to modify the very codes that define who we are and how we develop. We can decide whether to allow such disorders as Down’s syndrome, Hemophilia, and severe anxiety to continue to plague the human race. The advent of modern medicine has brought us to the brink of a time when we can choose to redirect nature and repair maladies in children, modifying the very codes which guide their looks, which diseases they are resistant to, and even their personalities. The opponents of genetic manipulation believe that the risks involved far outweigh the potential gains. The proponents believe that we cannot let fear hold us back from improving the human condition in any way we can. So, considering the facts concerning genetic engineering, we can at this point say that based on the research and evidence at hand, the benefits which can be achieved far outweigh the potential risks with regard to both the reduction in human suffering and the likely increase in lifespan.

Works Cited

Brown, J. S. (2001). Genetic Manipulation in Humans as a Matter of Rawlsian Justice. *Social Theory and Practice* , 27(1), 83-110.

Gillespie, C. F, Gillespie, J, Phifer, B, et al. (2009). Risk and resilience: Genetic and environmental influences on development of the stress response. *Depression and anxiety (1091-4239),* 26(11), 984-992.

Gordon, J. A., & Hen, R. (2004). Genetic Approaches to the Study of Anxiety. *Annual Review of Neuroscience* , 27(1), 193-222.

Miller, R A. (2005). Genetic Approaches to the Study of Aging. *Journal of the American Geriatrics Society* , 53S284-S286.

Powell, R. (2012). The Evolutionary Biological Implications of Human Genetic Engineering. *Journal of Medicine & Philosophy* , 37(3), 204-225.