its promise, it will mean a cure for many diseases rather than another way to cope with the symptoms.[7]

One fear of gene therapy is that it might move from correcting clearly defective genes, as in the diseases for which it is now being considered, to being used to enhance already existing traits, such as intelligence or height.[8] It could conceivably also be used for eugenic purposes, the creation of a superior race of human beings, a notion virtually universally condemned as immoral, particularly given the Nazi eugenic experience. But it could also be used for parents to select various traits for their children, such as eye and hair color. Some have even suggested that more novel enhancements should be possible, such as genetic interventions to increase our ability to remain alert with less sleep, enhancing our long-term memory, or even enhancing virtues like generosity.[9]

Enhancement Biotechnology

The prospect of gene therapy to do more than simply cure diseases, to also enhance otherwise "normal" traits in a person, raises the broader question of the use of a wide variety of biotechnologies in this way—not only to treat diseases but to make us "better than well."[10] For example, students sometimes take Ritalin, the drug used to treat attention deficit hyperactivity disorder, even though they have no symptoms of ADHD, in order to improve their concentration and what is called "executive function" around final exam time. Another example that is becoming more widespread is for performance artists and even surgeons to take beta-blockers, which are used to treat social anxiety disorders such as extreme shyness, in order to calm their nerves and steady their hands prior to performances or surgery. Further, drugs such as Prozac that treat depression are being used as "mood brighteners" in people who may or may not be clinically depressed.

As argued in chapter 6, use of medical technology to treat disease can be seen as a part of God's general revelation and common grace to human beings to enable them to further fulfill their mandate to exercise dominion over creation. Thus medical technology in general and even gene therapy that corrects genetic defects in particular are clearly within the creation mandate given in Genesis 1–2. After the entrance of sin into the world, exercising dominion became more difficult for humankind and involved alleviating or reversing the effects of sin. Biotechnology used to treat symptoms or cure diseases plainly falls within the mandate given by God to human beings and for which he has given us the tools to effectively carry that out.

At first glance, enhancement therapies seem quite different than those to treat disease, though in many cases, biotechnologies that treat disease can also be used without adaptation to enhance otherwise normal traits, as is the case in the

examples cited above. Enhancing already existing traits does not seem the same as reversing or alleviating the effects of the entrance of sin. Rather, enhancement therapies attempt to improve some already existing condition that falls within the parameters of normal. Using the general criteria—that the goals of medicine are to alleviate the effects of the entrance of sin, which includes disease, decay, and deformity—is a helpful start in attempting to draw some ethical guidelines. But we should admit that this way of stating it, similar to the traditional treatment-enhancement distinction, can be a bit ambiguous when applied to some specific biotechnologies, while accepting those technologies that unambiguously do treat disease.

Think of all the things that parents do for their children that enhance their given traits and tendencies. We send children to school to sharpen their mental capacities, and we even engage a variety of enhancement opportunities for them, such as music lessons and Kaplan courses to prepare for the SAT exam. I doubt there are too many objections to these kinds of *enhancements*, which is what they are, because these involve significant effort and do not become shortcuts for hard work and achievement. Some enhancements are specifically medical or dental. Orthodontics is a cosmetic enhancement, since it is not at all clear that crooked teeth are a result of the entrance of sin into the world. The same could be said for male pattern baldness. It is hard to have a problem with treatments to restore hair growth, though it is not clear that baldness is a result of the entrance of sin into the world. Using this same criteria, it is not difficult to justify many forms of cosmetic surgery that offset the effects of aging, which *is* a result of the general entrance of sin into the world. Yet we are sometimes uneasy with the narcissism that motivates some plastic surgery.

There are, however, some general points of concern when it comes to the widespread use of enhancement biotechnologies.[11] First is the concern about safety of their use. The clearest example of this is the use of anabolic steroids to enhance muscle growth in athletes, which is well known to have some serious side effects. A second concern has to do with fairness, particularly when it comes to the use of biotechnology in competitive situations, such as sports or academics. A related concern has to do with the access to these technologies, a tension that is perhaps clearest when it involves expensive genetic therapies. The use of enhancement biotechnologies runs the risk of widening the gap between the "haves" and "have-nots" and is especially troubling given the inequalities in health-care access that already exist. A fourth concern has to do with the context of personal autonomy and free choice that dominate the cultural landscape today. It may be that use of enhancement therapies begins by free choice but becomes so much a part of the way things are done that participants in certain activities in reality have no choice but to enhance themselves. The prevalence of performance musicians using

beta-blockers to calm their performance anxiety may already be an example of this becoming coercive. And it may be naive to expect parents to resist enhancement therapies that will give their children significant advantages. In fact, failure to take advantage of these therapies could be seen as a form of child neglect.[12] Further concerns include how enhancement "short-cuts" can undercut the notions of hard work and achievement, how disorders are increasingly the object of medical treatment (the medicalization of society), and how enhancement undermines acceptance of the "givenness" of life.

Steroids for the Mind

While the efforts to make sports such as baseball and cycling "clean," that is, free from things like steroids and blood doping, are well publicized, what is quietly growing underneath the radar of public scrutiny are performance-enhancing drugs for executives, students, professional musicians, and even poker players. These brain drugs are known as "cognitive enhancers" and include the ADD drugs Adderall and Ritalin, beta blockers such as Inderal, and Aricept, which is used to treat the memory loss in Alzheimer's patients. Though these drugs have clear clinical uses, such as to treat ADHD, heart conditions, and memory loss, their use is increasing by individuals who have none of those problems. Instead, they are being used by people who want to get heightened brain capacity. For example, ADD drugs increase what is called "executive function," which gives people a temporary increase in concentration. Ritalin is sold on the black market on many college campuses as students look to buy it from ADD patients so they can get an edge on final exams or writing major papers. Beta blockers are used frequently by professional performers who want to steady their nerves. And the Alzheimer's drugs are being used more often by fiftysomething adults who want to combat the memory loss that is a natural part of aging. Even professional poker players take Adderall to enable them to focus on the game for long periods of time. Some surveys indicate that roughly 7 percent of college students have tried ADD drugs to help their concentration, and some professional musicians estimate that approximately 75 percent of musicians take beta blockers prior to performances. Even some physicians report taking beta blockers before major medical presentations. Side effects from long-term use are not clear, and some critics suggest that in competitive contexts such as the SAT exam, the use should be prohibited, just as performance-enhancing drugs are prohibited in sports. But those in professions such as air traffic control, airport screening, and surgery might actually be encouraged to take them.*

*Karen Kaplan and Denise Gellene, "Drugs to Build Up That Mental Muscle," *Los Angeles Times*, December 20, 2007; Benedict Carey, "Brain Enhancement Is Wrong, Right?" *New York Times*, March 9, 2008; David E. Rabie, "Generation Adderall," *Los Angeles Times*, March 10, 2008.

Some aspects of enhancement therapies do seem to be more problematic. Traits like eye color, hair color, height, and gender are God-given, and they are the way God designed particular human beings to look and be. God's sovereignty should not be usurped, and gene therapy should not be used to enhance the genetic endowment he has given to a person.[13] The notion of designer children is troubling because it has the potential to undermine the idea of unconditionally accepting one's children as God's good gift.

Human Cloning

For many years, cloning of human beings was the raw material of science fiction. Now it is in the newspapers. Since 1993 scientists have been able to clone human embryos, essentially reproducing in the lab what occurs in the body when identical twins or triplets are produced.[14] Embryos were cloned originally to make infertility treatments less expensive and less demanding on the infertile wife. Thus, if one views embryos as persons, then technically, since 1993 science has been able to clone persons.

However, when most people think of human cloning, they have in mind cloning a mature adult person, not an embryo, known generally as *procreative cloning*. In this type of cloning, scientists take a cell from an adult person (almost any type of cell will do) and remove the nucleus. They then take a woman's egg that has had its nucleus removed and transfer the adult cell nucleus into the egg. It is then chemically "jump-started" so that it begins to divide and multiply and then is implanted into a woman's womb, where it matures like a normal pregnancy. The result is that the child who is born is the identical twin of the adult from whom the cell was originally taken. The technical term for this process is *somatic cell nuclear transfer*. This is the process that made the headlines in 1997 when Scottish researcher Ian Wilmutt announced that he had cloned an adult sheep, which became well-known in the media by her name, Dolly.[15] It is ironic that this process is called *procreative* cloning, since it represents a further technological move away from the traditional idea of procreation and toward the modern notion of reproduction, a distinction mentioned in chapter 6.

The process was far from perfect, since, in Dolly's case, there were 276 failed attempts at cloning before she was produced. After Dolly was successfully cloned, predictions about a timetable for cloning human beings abounded, but the consensus in the scientific community was that replicating this process with human beings would be more difficult and was years away.

Procreative cloning at this point cannot be achieved without significant risk to the cloned embryo/fetus and perhaps even to the woman who carries the cloned person in pregnancy. The reason for so many miscarriages with Dolly was the

presence of genetic abnormalities that were incompatible with life. That makes the process problematic, irrespective of the reasons why someone would want to engage in this practice. Assuming that those technological hurdles can be overcome, other questions are raised about cloning per se: whether the process is "playing God," and whether or not cloning violates a person's right to his or her unique genetic identity. It is unclear whether the charge of playing God can be maintained, since it is not an accident but under God's sovereignty and common grace that science has developed this technology. Further, the violation of one's unique genetic endowment does occur naturally when identical twins or triplets are produced, and that would not seem to be an absolute. However, the notion of children as begotten and not made suggests that cloning is problematic and deserves further moral reflection before proceeding.

Not only does the process of cloning itself require moral assessment, but the variety of reasons why someone would want to do it should be subject to moral evaluation. Below are some of the reasons why someone would want to engage in procreative cloning, apart from the more obvious reasons, such as curiosity (seeing whether it could be done) and narcissism (the desire to copy oneself and approach something like immortality):

1. Helping to make infertility treatments more efficient and less costly.
2. Providing embryos for research.
3. Being able to provide a person with an exact tissue match should it be necessary to treat a life-threatening disease (as with a bone marrow transplant).
4. Being able to actually replace a child who died prematurely.
5. Offering organ farming, in which the cloned person is used as a source of biological spare parts.
6. Making a profit from selling one's embryos on the open market, in the case of people like athletes or supermodels.

Helping make infertility treatments less costly (reason 1) could possibly be justified as long as there are no embryos left over at the end of the treatments and no embryos are destroyed in the process of cloning. Providing embryos for research (reason 2) is unethical, since either the research kills the embryo or the embryo is discarded at the end of the experimentation. There does not appear to be any reason why it would not be morally acceptable to be able to clone in order to provide a tissue match (reason 3) so that the cloned person could donate renewable tissue such as bone marrow. The notion of replacing a child who has died prematurely (reason 4) is unlikely to be effective, since it could cement the bereaved couple in grief. The reason for this is that the clone could well be a daily, painful reminder of the child who died. Using clones for organs (reason 5) is virtually

universally condemned as a violation of the dignity of the cloned person. Selling cloned embryos on the open market (reason 6) is widely considered problematic, though embryos are sold by some infertility clinics. Further, demand for cloned embryos to produce one's own children is likely to be low, since having one's own child, not someone else's, is highly valued by prospective parents.

Conclusion

The world of biotechnology is here to stay, and the moral dilemmas produced by these sophisticated procedures will only become more complicated. Medical technology can be seen in general as part of God's provision to human beings in enabling them to more effectively exercise dominion over creation, particularly when it comes to confronting the effects of the entrance of sin into the world. The uses of each specific technology must be carefully weighed, and they cannot be exempt from moral scrutiny. The attitude that suggests that a technology must be used simply because it can be used is very problematic. Just because science advances, it does not follow that society is obligated to make every new technology available. Especially in the complex area of biotechnology and human cloning, moral reflection must keep up with scientific progress.

For Further Reading

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Review Questions

1. What was the Human Genome Project? What was its primary goal?