Genetic Engineering – A Christian Scientist's Perspective

Dr. Ray Bohlin examines the rapidly moving world of genetic engineering from a Christian worldview perspective. He explains that most genetic engineering attempts to make more efficient changes similar to those previously done through selective breeding and other conventional techniques. However, those working in the field need to be aware of the ethical and religious issues that arise in this area of science.

What Is Genetic Engineering?

Our culture teeters on the edge of a steep and dangerous precipice. New technologies will soon allow us to change, radically and permanently, the world in which we live. Indeed, we will hold in our hands the capability of directly and purposefully changing who we are as human beings. The technology I am speaking of is genetic engineering.{1} Ethical and technical questions swirl around discussions of genetic engineering like the wall clouds of the eye of a hurricane. Many in society seem to be bracing themselves for the disappearance of the calm of the eye and the coming of the full force of a powerful and destructive combination of new plants and animals unleashed on an unsuspecting environment, with new and improved humans designed to succeed.

Before your alarm buttons go on overload, let me say that I hope to lend a reassuring voice with a dose of sober realism. Genetic technology will undoubtedly unleash great power to change our world forever, but should it, and will it? In this article I want to explore just a few of the technical and ethical questions we face as a society. The time to discuss

these issues is now, while we still have time to think without simply reacting.

The phrase *genetic engineering*, unfortunately, often conjures up images of macabre experiments resulting in Frankenstein-like monsters and the cold-hearted use of genetic information to create new social classes depending on our genes, as in the 1997 film *Gattaca*.{2} However, genetic engineering can simply be defined as the manipulation or alteration of the genetic structure of a single cell or organism.

Sometimes the manipulation of an organism's genome, the totality of all its genes, can simply refer to the project of identifying its complete DNA sequence in order to gain information for future study and potential alteration. The Human Genome Project is therefore, in a sense, a form of genetic engineering because the human genome must be broken up and manipulated in order to gain the desired information.

Ordinarily, genetic engineering refers to the direct addition, deletion, or intentional mutation of an organism's DNA sequence to produce a desired effect. Knockout experiments in mice seek to determine the effects of eliminating a particular gene from the mouse genome. Recombinant DNA experiments usually take a gene found in one organism and place the gene into another organism. These animals can be of the same or different species.

Sometimes researchers will simply change the DNA sequence in a gene to study what effect the specific change has on the gene or its protein product. All of these alterations fall under the umbrella of genetic engineering. In this broad definition, genetic engineering is neither good nor evil. The nature of the experiments themselves will determine if they are moral or immoral.

Why Are There Genetic Illnesses?

The initial thrust of genetic research is the treatment and potential cure of genetic illnesses. Therefore, we must explore why genetic illnesses occur at all. “Why questions” within science usually occur on two levels and are notoriously difficult. The first level and usually the easier of the two are the scientific. The “why” is best changed to “how.” For our purposes this means, How do genetic illnesses arise? The second, more difficult question asks on a moral basis, Why do genetic illnesses occur?

The answer to the first question, How do genetic illnesses arise?, is simply, mutations. Mutations are mistakes in the DNA sequence. Sometimes a mutation is simply the substitution of one nucleotide for another.

Mutations can also result from a piece of DNA being deleted. This may cause one or more codons to disappear. In cystic fibrosis (CF), codon 508 out of 1,480 is missing, causing one amino acid to be removed from the resulting protein. This causes the severe respiratory and digestive problems of CF patients that are usually lethal before their 30th birthday.

So far, genes for more than 1,200 human disorders have been identified, which are found over all twenty-three pairs of human chromosomes. Some estimate that there may be as many as 3,000 to 4,000 human genetic disorders that are due to defects in a single gene. Most disorders, however, will be due to mutations in a host of genes.

The moral question is perhaps not so difficult in its answer, but in our acceptance of the answer. Mutations exist as a result of the Fall. We know the serpent was cursed, Eve was cursed, and Adam was cursed (Gen. 3:14-19). But Romans 8:18-22 also tells us that all creation was subjected to futility, groans and suffers, and eagerly awaits the revealing of the sons of God so it may be set free from its slavery to

corruption. This world is not as God intended.

Asking why someone suffers from a genetic disease is no different than asking why someone was killed in a traffic accident when others walked away. We know our suffering is temporary. We know that God will somehow work it all out for good (Rom. 8:28). But in 2 Corinthians Paul tells us we suffer so we can comfort those who suffer after us (1:4), so other sufferers will know they are not alone (1:6), and, principally, we suffer so we will trust in God and not ourselves (1:9).

Part of the Christian mission has always been to alleviate suffering where possible. While Jesus' miracles clearly were part of fulfilled prophecy, they were also about relief from suffering. Genetic engineering, while possessing a power that can be used for evil, which we will discuss, also at least has the potential to relieve the suffering from, if not even cure, genetic disease.

Could Changing Genetic Material Produce a Dangerous Superbug?

One concern that many people have about genetic engineering is the possibility of unintentionally creating a superbug or a damaging plant or animal whose destructive nature is only discovered after the fact. After all, our knowledge of the workings of genes and proteins is still growing. We hear constantly how complex everything is. What makes us think we can tinker with this incredible biological reservoir of information without making some incredible blunder from which there is no turning back?

When genetic engineering in bacteria was first discovered and introduced (Recombinant DNA technology), many scientists had this very fear. This was partially the reason for the self-imposed moratorium and four levels of containment in the early 1970s. But geneticists and molecular biologists found that

dangerous, unintentional consequences were virtually nonexistent. Enforcement of the guidelines eventually relaxed and soon became outdated and ignored. What this means is that researchers were quite convinced that transferring DNA of known sequence and function into bacterial chromosomes and plasmids did not result in unforeseen consequences. The procedure became routine and straightforward.

This does not mean that someone, somewhere, won't use biotechnology to produce a superbug intentionally. Certainly this technology can be used to produce even more powerful and resistant agents of biological warfare. Some even speculated that HIV (human immunodeficiency virus), the virus that causes AIDS, was intentionally produced. Though this hypothesis has been successfully refuted, the prospect remains that DNA recombinant technology has opened up a new field that can be used for evil.

However, we must be clear that this is not the fault of the technology itself. It is entirely human to shrink with fear away from things that we don't understand. The first predictable reaction of tribal societies when faced with modern technology was to cower in fear. Something dreadful was about to descend upon them. Usually this didn't happen and, with some education and familiarity, fear dissipated. But only human agents alone can make evil choices. Fire will heat our homes and cook our food, but it can also kill indiscriminately in the hands of an arsonist. But fire itself is not evil.

What should concern us more than the advent of biotechnology is the growing popularity of a totally secular and naturalistic worldview. Naturalism contends that humans are just complicated animals. The end result of this assumption is that ethics becomes an exercise in simply determining what works, not what is right.

Biotechnology is powerful, indeed, but we cannot put the genie back in the bottle. Therefore we must engage the discussion as

to how this technology can be used to cure disease and not become another snare to degrade and dehumanize people's lives.

Are We Playing God by Creating Organisms That Never Existed Before?

Unfortunately, the concept of playing God means different things to different people.{3} For some it may have nothing to do with God at all. They are simply expressing awe and wonder at the power that humans can wield over nature.

For some Christians, however, the notion of playing God carries a pietistic view of God's realm of activity versus that of the human race. In this context, playing God means performing tasks that are reserved for God and God alone. If this is what genetic technology does, then the concerns about playing God are justified. But what is often being reflected in this perspective is that God acts where we are ignorant and it should stay that way.

What is really at stake is fear, fear of what we may learn, fear of what new responsibility this new knowledge will put on our shoulders, and fear that this new knowledge will be used to harm us and not for the common good. The point was made that technology itself is not evil. Any technology can be used to further God's purposes or hinder them. People make those decisions, not technology.

By the very fact that we are called to be stewards of God's creation (Gen. 1:26-28), we need to expand our knowledge of what God has made in order to better rule over His creation. Part of being made in God's image is our creativity. In this sense we "play God" by imitating Him. Our works of art, buildings, management of natural parks, and care for the poor, sick, and disadvantaged all imitate God for the good of His creation.

But we are still creating new creatures that did not exist

before. Isn’t God the only Creator in that sense? We seldom realize that we are hard-pressed to find in nature today the ancestors of nearly all the plants and animals we use for food or service. Our current varieties of corn, wheat, flowers, cattle, dogs, horses, etc., bear little resemblance to the original stock in nature. That is because we have selected and manipulated them over the millennia for our own purposes. We have already created animals and plants that never existed before. Genetic technology has greatly increased the specificity and power of our abilities, but the nature of what we can do is the same as before.

If we are to play God in the sense of imitating Him as we apply the truth of being created in His image and in exercising our appointment as stewards over all He has made, then we need to do so with humility and compassion. Our creative abilities should be used to enhance the condition of men and women as we struggle in a fallen world. Genetic technologies can and should be used to help alleviate or even cure the effects of genetic disease.

Is It Wrong to Combine Genes from Different Species?

Have you ever wondered if we should be transferring genes from one species to another at all? Does this in itself violate some ethical principle? One gene does not define a species. Bacteria are composed of thousands of genes and it is estimated that humans possess as many as 100,000 genes. Therefore, transferring one gene from one organism to another does not create a hybrid in the traditional sense. Genes, remember, are composed of DNA. DNA is a molecule; it is not living in and of itself.

If the idea of adding something foreign to an organism is troublesome, just realize that we do this all the time when we take antibiotics, over the counter pain medications, and other

synthetic medications. Our bodies would never come across most of these substances in nature.

What is different is that with genetic engineering, we have added something to a cell or organism that will change the composition of that cell or organism, possibly for as long as it lives, and is potentially passed on to future generations. It is reasonable to ask if we have the wisdom even to try to make these kinds of changes. No doubt, genetic technology provides a power never before possessed by human beings: to design intentionally or create a new variety of organism by altering its genetic structure.

Once again, the issues are, Which genes are actually being transferred? and, For what purpose? These questions, asked case by case, should rule our choices, not the inherent legitimacy of genetic engineering itself. Creating crops internally resistant to disease, particularly to help developing countries better feed their people, is a goal worthy of God's image-bearers.

However, intentionally manipulating the gene of a known pathogenic and deadly bacterium with the expressed intent of creating a biological weapon that is untreatable and incurable is a hideous evil. Kerby Anderson also warns that we need to consider the extent that genetic manipulation may cross over barriers God instituted in the created kinds.{4} If God felt it important to create boundaries of reproduction that his creatures were to stay within, we ought not cross over them ourselves (Gen. 1:11, 12, 21, 24, 25).

It is certainly possible for genetically modified organisms created for agricultural and medical purposes to develop in ways not planned or foreseen. Therefore, it is necessary that proper and extensive tests be performed to assure, as much as possible, that no unnecessary harm will come to the environment or to humans. As vague as this prescription is, it only serves to reinforce the necessity of further education on

the part of everyone to ensure that this powerful technology is used responsibly. We simply cannot afford to be ignorant of genetic issues and technologies and expect to contribute to the necessary discussion that lies ahead.

Notes

1. An excellent resource for Christians on this topic is *Genetic Engineering: A Christian Response*, Timothy J. Demy and Gary P. Stewart, eds. (Grand Rapids, MI: Kregel Publications, 1999)
2. *Gattaca*, a film by Andrew Niccol, A Jersey Films production, distributed by Columbia Pictures, 1997.
3. Allen D. Verhey, "Playing God," in *Genetic Ethics: Do the Ends Justify the Genes?* (Grand Rapids, MI: Eerdmans Publ. Co., 1997), 60-74.
4. J. Kerby Anderson, "The Ethics of Genetic Engineering and Artificial Reproduction," in *Genetic Engineering: A Christian Response*, Timothy J. Demy and Gary P. Stewart.

Cloning and Genetics: The Brave New World Closes In

Is Dolly Really a Clone?

When the creation of Dolly, the first mammal cloned from adult cells, was first announced in February of 1997 there was a storm of publicity and controversy. While many wondered about the purpose of animal cloning and the possibilities such a success held for further animal applications, others were more

concerned about the possible application to human beings. If we can clone sheep, can we clone humans? Should we clone humans? Why should we clone humans? Should humans be cloned to provide a baby for childless, infertile couples? Should we clone humans for embryo research? Should we clone humans to make extra copies of people with good genes? Would clones have a soul? While I answered these and other questions about human cloning in my article Can Humans Be Cloned Like Sheep? in retrospect, there was one question that was virtually ignored at the outset: Was Dolly a true clone?

Looking back, this appears to be a legitimate question that should have been more obvious. After all, Dolly was the only success amid 276 failures. There were 277 cell fusions made, with only 29 growing as embryos. All 29 were implanted into 13 ewes with only one pregnancy and one live birth. Dolly really beat the odds. There was also the fact that Dolly was not cloned from a currently living adult. Dolly's older twin had been dead for several years. Some of her tissues were harvested and kept frozen in the lab, so there was no live animal with which to compare Dolly.

Dolly's authenticity was formally challenged in a January 30, 1998 letter to the editor of the journal *Science*{1}. The authors offered seven reasons for skepticism concerning Dolly's identity as a clone of an adult cell. Among them was the fact that Dolly was alone and not yet joined by another adult clone from the Roslin Institute or any other laboratory. Also, though omitted by the original paper, it had been learned that the original sheep had been pregnant when the tissues were removed, raising the possibility that Dolly was cloned from a fetal cell rather than an adult cell. In addition, the questioning scientists called for additional genetic tests to establish Dolly's identity.

Although Ian Wilmut, the Scottish scientist who is Dolly's co-creator, admitted that Dolly might be a one in a million fluke, he and others were busy performing genetic tests to

fully establish that Dolly was an authentic clone from an adult cell. Other labs had so far failed to duplicate Wilmut's success after hundreds of tries. This may not be so unusual since Dolly was the only success out of 300 nuclear transfers and the real odds may be as high as one in 1000. There was no way to know for sure. Wilmut may have gotten lucky indeed to achieve success after only 300 tries.{2}

A pair of papers in the British journal *Nature*{3} remedied much of the concern over Dolly's authenticity. DNA microsatellite and DNA fingerprinting analyses conclusively demonstrated that Dolly was an identical DNA copy of the cells of a 6-year-old ewe and not a clone of the fetus carried inside that ewe.

Cloning Mice Makes Cloning Humans More Feasible

Even with the clear success of cloning sheep, which Dolly's appearance and confirmation make plain, many doubted that the technology used to produce Dolly could be applied to humans. This skepticism was largely due to the universal failure to clone mice from adult cells.

Mice have a number of advantages as experimental animals for cloning. The gestational time in mice is very short—a matter of weeks, their embryos are easier to manipulate than sheep and cows, and their genetics are already well understood.{4} But it was widely recognized that the early development of mice and sheep is significantly different. In sheep, the DNA in the newly formed nucleus remains dormant for several days. This was suspected to provide time for the DNA to be reprogrammed from its original function to embryonic functions. Mice, on the other hand, begin using the DNA in the newly formed nucleus after just 24 hours. It was thought that this might prove to be insufficient time for the DNA to be reprogrammed.

However, this too has been overcome, and in dramatic fashion. In July of 1998, *Nature* published results by T. Wakayama, working in Hawaii, documenting the cloning of mice.{5} And not just one mouse, but over 50 mice. Three successive generations were cloned, raising the conundrum that the "grandmother" was the twin sister of the "granddaughters."{6}

But what did Wakayama and his colleagues do that was different to bring about success? Strangely enough, no one is really sure. Apart from a few tricks of timing, the major difference seems to be that they used a cell type that no one had used before, and it worked! As an aside, Wakayama tried other adult mouse cells (neurons and testicular cells) that only brought about the usual negative results.

But they also tried cumulus cells. Cumulus cells are a non-growing group of cells that surround an egg cell after it is released from the ovaries. This served to confirm the suspicion that adult cells need to be quiescent, or non-growing, to be successful in cloning experiments. Still, the nuclear transfer technique employed by Wakayama was successful between 2 and 3% of the time using cumulus cells. This rate of success is ten times better than the technique that led to Dolly, but still very low, making the process tedious.

The success with cumulus cells is why the first cloned mouse was named Cumulina. It is also interesting that only cells from females have been successful in cloning attempts thus far. This could be problematic. For, you see, if all you need is a quiescent adult cell, an egg, and a womb, well, male involvement isn't really necessary. Perhaps it's best not to speculate what, if anything, this may mean in the future.

For many, the real significance of successful mouse cloning techniques is its application to humans. The early stages of embryonic development are very similar in mice and humans. Therefore, many believed that since cloning mice seemed next to impossible because of the early onset of DNA activity in

mice and humans, cloning humans would also remain technologically impossible. Cumulina and her sisters have changed all that.

What Will Animal Cloning Be Used For?

So now we can clone sheep and mice. Apart from the possibilities for humans, what's the big deal? Why are scientists and pharmaceutical companies spending so much time and money trying to clone animals? Quite simply, the combination of the possible relief of human suffering from genetic disease with the potential to turn a handsome profit makes animal cloning nearly irresistible.

In the December 1998 issue of *Scientific American*, Ian Wilmut spells out some of the potential uses of animal cloning.{7} Principally, cloning will be used to create large numbers of what are called transgenic animals. Transgenic animals are genetically engineered to contain genes from another species. Wilmut and his colleagues created Dolly in an attempt to discover a more reliable method of reproducing transgenic sheep.

Creating transgenic animals is very tedious, difficult, and risky work. The Roslin Institute and PPL Therapeutics, for whom Wilmut works, transferred into sheep the gene for human factor IX, a blood- clotting protein used to treat hemophilia. With the proper genetic enhancement, sheep will produce this blood-clotting factor in their milk, which can then be harvested and sold on the market. The first transgenic sheep produced this way, Polly, was born in the summer of 1997. It is actually simpler to clone Polly than it would be to create another transgenic sheep through gene transfer.

Cloning offers many other possibilities for reproducing other kinds of transgenic animals. One is the production of animals containing transgenic organs suitable for organ transplants into humans. Pig organs are just about the right size for

transplantation into humans. However, a pig heart, or liver, or kidney, would be severely and quickly rejected by our immune system. However, if the right human genes could be transferred into pigs, the organs they produce would be recognized as a human organ and not a pig organ. There would still be the problems associated with any organ transplant between humans, but these are much more manageable than cross-species immune rejection. At present, thousands die every year waiting for organs to become available. Cloning such transgenic animals could create a large and renewable source of organs for transplant.

Transgenic animals could also be created for research purposes to study human genetic diseases. Transferring defective human genes into appropriate animal hosts could produce more workable research vehicles for discovering new treatments and cures not possible using human subjects. Cloning of transgenic animals may also prove useful to create cells helpful in treating human diseases such as Parkinson’s disease, diabetes, and muscular dystrophy. In addition, cloning could be used to produce highly productive herds of sheep, cows, and pigs from animals that are already known to be excellent milk, meat, and leather producers.

Obviously, the uses of animal cloning seem limited only by our imaginations. Of course, if you are already opposed to the use of animals in experiments, or even in their use for food, these ideas are fraught with ethical difficulties. As a Christian, however, I have answered this question. The Lord Himself produced the first skins for humans in Genesis 3:21 and later after the flood, the Lord allowed animals to be used for food (Gen. 9:2-4). While the utmost of care needs to be given to ensure that God’s creatures, for whom we have been given responsibility (Gen. 1:26-28), do not suffer needlessly, the Lord clearly allows animals to be used to enhance our own lives, even if it costs them theirs.

New Uses for Human Embryo Research?

What if I told you that recent breakthroughs in human genetic research might make it possible to dramatically treat patients with Alzheimer's, Parkinson's, heart disease, diabetes, spinal cord injury, and a host of other degenerative diseases? In some cases, these treatments may actually cure many of these diseases and would not require the use of cells obtained from aborted fetuses. Hopefully, I've got your attention.

The November 6, 1998 issue of Science{9} announced the first successful attempts to cultivate human embryonic stem cells that have the potential to treat all the above diseases and more. However, they come with their own set of difficult and perhaps more serious ethical concerns.

First, just what are embryonic stem cells? Stems from plant seedlings give rise to all sorts of different structures such as trunks, branches, leaves, flowers, and eventually seeds and fruits. Animal embryonic stem cells do much the same thing. Stem cells have the potential to grow into just about any tissue that is present in the adult organism. Researchers call this potential totipotency, meaning they are potent to produce all tissues. Embryonic stem cells have been isolated from mice since the early '80s. Such research has been impossible in humans for ethical reasons. Stem cells only come from embryos in the earliest stages of development.

No one was willing to simply use embryos to obtain stem cells, thus killing the embryo, every time stem cells were needed. But, if stem cells could be isolated and cultivated in the laboratory so they could grow and divide and maintain their stem cell functions, then a continual supply could be maintained without risk to further embryos. What is called a stem cell line would effectively be created that could be used indefinitely. This research was greeted with such comments as "extremely important," "very encouraging," and "a major technical achievement with great importance for human

biology."{10}

What you may have noted in the above description is that a human embryo must still be used to create this stem cell line. In fact, the study reported in Science indicates that thirty-six embryos obtained from in vitro fertilization clinics in Madison, Wisconsin and Israel were used to create five stem cell lines. The embryos were obtained with the consent of the individuals whose eggs and sperm were used to create them and the approval of the local institutional review board.

The major concern expressed so far is for the legality for other labs to use these cells. Since there is a ban on the use of federal funds for research involving tissues derived from human embryos, this research was carried out using private funds from Geron Corporation, a Menlo Park, California biotechnology firm. The availability of these stem cell lines now raises the question of whether these cells can be used by other labs currently funded by government grants. Predictably, one researcher is applying for grant money to use these stem cells to deliberately test, and hopefully repeal this restriction.{11}

Proponents of stem cell research criticize the federal ban by suggesting that this leaves the government out of the regulatory picture since no guidelines have been issued for private research. I agree that the lack of guidelines for private industry is an oversight, but opening up government funding is not the answer. The ban should remain in force. Guidelines need to be issued that forbid this important work as long as human embryos are sacrificed to produce these cell lines. Research in animals should be encouraged to see if stem cells could be produced by other means. The end does not justify the means.

The Prospects for Human Cloning: The

Enigma of Dr. Richard Seed

I am frequently asked how soon I think the first human clone will be produced. I usually respond that somewhere in the world within the next five to ten years, someone will announce the creation of the first human clone. But if we are to believe Dr. Richard Seed, the first human clone will appear before the year 2001. In December 1997, Dr. Richard Seed, physicist turned fertility specialist, announced that he intends to clone human beings. He said, "I know of at least fifteen people who want to clone humans, but haven't got quite up the nerve to do it."{12} When asked if he had the nerve, Seed replied, "I have the nerve."

Richard Seed appeared in the news again in September of 1998 when he announced his plans to clone himself in two years and that his wife agreed to carry the baby!{13} Seed reported that he had received hundreds of calls from individuals that want either themselves or their dying children cloned. Seed thinks this is a first step to human immortality. On January 7, 1998 Seed affirmed on ABC News Nightline his remarks from a National Public Radio interview, that cloning technology will allow us to "become one with God. We are going to have almost as much knowledge and almost as much power as God."{14}

Right now you're probably thinking this guy is a kook. Why worry about him? Well, that's precisely why we need to pay attention to him. He has the ability; he perfected embryo transfers in humans. He certainly has the motivation and nerve, and he is still seeking the cash to carry it out. But if he is accurate in the number of calls he has received, money may not be a problem for long. And even if the U.S. Congress passes a bill banning human cloning, Seed has said he will move his operation to Tijuana, Mexico.

People like Richard Seed fully explain why I believe someone, somewhere in the world will produce a human clone very soon. The question is, Are we going to just throw up our hands and

surrender, or will we continue to stand up for the sanctity of human life and the sacredness of the human embryo?

If we don't think this through carefully and organize a cogent response to this threat to human dignity, the attitude of people like Prof. James Robl at the University of Massachusetts at Amherst will prevail. He said:

> *There is no clear-cut definition for what is life. And this is something, I think, that society is going to have to think about, is going to have to make some definitions, and those definitions may not be permanent, they may change as new technologies are developed. There is a fine line, and the line, at the early stages, is really based on your intentions of what they are to be used for as opposed to necessarily what they are. So the question of what is life seems to change, I think, in people's minds based on what their concerns are or their own interests are in how we might use whatever it is we are producing.{15}*

What Professor Robl calls for is an entirely utilitarian ethic. We define life, he says, based solely on what new technologies we develop. If a new technology, such as cloning or human stem cell production from human embryos becomes available, yet this technology threatens human dignity, we simply redefine human life to encompass the new technology. This is the frightening specter of a brave new world. We must oppose it and we must articulate why.

Notes

1. Vittorio Sgaramella and Norton D. Zinder, "Letters," *Science* 279, 30 January 1998, 635-636.
2. J. Madeleine Nash, "Was Dolly a mistake?" *Time*, 2 March 1998, 65.
3. D. Ashworth, M. Bishop, K. Campbell, A. Colman, A. Kind, A. Schnieke, S. Blott, H. Griffin, C. Haley, J. McWhir, and I. Wilmut, "DNA microsatellite analysis of Dolly" *Nature* 394, 23

July 1998, 329. E. Signer, Y. Dubrova, A. Jeffreys, C. Wilde, L. M. B. Finch, M. Wells, and M. Peaker “DNA Fingerprinting Dolly” *Nature* 394, 23 July 1998, 329-330.
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6. Rachel K. Sobel, “Copying a Multitude of Mice: Cloning is No Fluke; Wooly Mammoths Next?” *U. S. News and World Report*, 3 August 1998, 52.
7. Ian Wilmut, “Cloning for Medicine” *Scientific American* 279, no. 6 (December 1998): 58-63.
8. James A. Thomason, J. Itskovitz-Eldor, S. Shapiro, M. Waknitz, J. Swiergiel, V. Marshall, and J. Jones. “Embryonic Stem Cell Lines Derived from Human Blastocysts” *Science* 282, 6 November 1998, 1145-1147.
9. Declan Butler, “Breakthrough Stirs US Embryo Debate” *Nature,* 396, 12 November 1998, 104.
10. Ibid.
11. Dr. Richard Seed, Quoted on the Fox News Channel program, Trends, 8 December 1997.
12. http://www.boston.com/dailynews/wirehtml/250/Chicago_physicist_says_he_ll_clone_.shtml. 9/8/98.
13. Dr. Richard Seed, Quoted on ABC News *Nightline,* 7 January 1998.
14. James Robl, Quoted in *The Cloning Revolution,* Films for the Humanities and Sciences (1998), Box 2053, Princeton, NJ 08543-2053.

Euthanasia: A Christian Perspective

Kerby Anderson looks at euthanasia from a distinctly Christian perspective. Applying a biblical view gives us clear understanding that we are not lord of our own life or anyone elses.

 *This article is also available in Spanish.*

Debate over euthanasia is not a modern phenomenon. The Greeks carried on a robust debate on the subject. The Pythagoreans opposed euthanasia, while the Stoics favored it in the case of incurable disease. Plato approved of it in cases of terminal illness.(1) But these influences lost out to Christian principles as well as the spread of acceptance of the Hippocratic Oath: "I will neither give a deadly drug to anybody if asked for it, nor will I make a suggestion to that effect."

In 1935 the Euthanasia Society of England was formed to promote the notion of a painless death for patients with incurable diseases. A few years later the Euthanasia Society of America was formed with essentially the same goals. In the last few years debate about euthanasia has been advanced by two individuals: Derek Humphry and Dr. Jack Kevorkian.

Derek Humphry has used his prominence as head of the Hemlock Society to promote euthanasia in this country. His book *Final Exit: The Practicalities of Self-Deliverance and Assisted Suicide for the Dying* became a bestseller and further influenced public opinion.

Another influential figure is Jack Kevorkian, who has been instrumental in helping people commit suicide. His book *Prescription Medicide: The Goodness of Planned Death* promotes

his views of euthanasia and describes his patented suicide machine which he calls “the Mercitron.” He first gained national attention by enabling Janet Adkins of Portland, Oregon, to kill herself in 1990. They met for dinner and then drove to a Volkswagen van where the machine waited. He placed an intravenous tube into her arm and dripped a saline solution until she pushed a button which delivered first a drug causing unconsciousness, and then a lethal drug that killed her. Since then he has helped dozens of other people do the same.

Over the years, public opinion has also been influenced by the tragic cases of a number of women described as being in a “persistent vegetative state.” The first was Karen Ann Quinlan. Her parents, wanting to turn the respirator off, won approval in court. However, when it was turned off in 1976, Karen continued breathing and lived for another ten years. Another case was Nancy Cruzan, who was hurt in an automobile accident in 1983. Her parents went to court in 1987 to receive approval to remove her feeding tube. Various court cases ensued in Missouri, including her parents’ appeal that was heard by the Supreme Court in 1990. Eventually they won the right to pull the feeding tube, and Nancy Cruzan died shortly thereafter.

Seven years after the Cruzan case, the Supreme Court had occasion to rule again on the issue of euthanasia. On June 26, 1997 the Supreme Court rejected euthanasia by stating that state laws banning physician-assisted suicide were constitutional. Some feared that these cases (*Glucksburg v. Washington* and *Vacco v. Quill*) would become for euthanasia what Roe v. Wade became for abortion. Instead, the justices rejected the concept of finding a constitutional “right to die” and chose not to interrupt the political debate (as *Roe v. Wade* did), and instead urged that the debate on euthanasia continue “as it should in a democratic society.”

Voluntary, Active Euthanasia

It is helpful to distinguish between mercy-killing and what could be called mercy-dying. Taking a human life is not the same as allowing nature to take its course by allowing a terminal patient to die. The former is immoral (and perhaps even criminal), while the latter is not.

However, drawing a sharp line between these two categories is not as easy as it used to be. Modern medical technology has significantly blurred the line between hastening death and allowing nature to take its course.

Certain analgesics, for example, ease pain, but they can also shorten a patient's life by affecting respiration. An artificial heart will continue to beat even after the patient has died and therefore must be turned off by the doctor. So the distinction between actively promoting death and passively allowing nature to take its course is sometimes difficult to determine in practice. But this fundamental distinction between life-taking and death- permitting is still an important philosophical distinction.

Another concern with active euthanasia is that it eliminates the possibility for recovery. While this should be obvious, somehow this problem is frequently ignored in the euthanasia debate. Terminating a human life eliminates all possibility of recovery, while passively ceasing extraordinary means may not. Miraculous recovery from a bleak prognosis sometimes occurs. A doctor who prescribes active euthanasia for a patient may unwittingly prevent a possible recovery he did not anticipate.

A further concern with this so-called voluntary, active euthanasia is that these decisions might not always be freely made. The possibility for coercion is always present. Richard D. Lamm, former governor of Colorado, said that elderly, terminally ill patients have "a duty to die and get out of the way." Though those words were reported somewhat out of

context, they nonetheless illustrate the pressure many elderly feel from hospital personnel.

The Dutch experience is instructive. A survey of Dutch physicians was done in 1990 by the Remmelink Committee. They found that 1,030 patients were killed without their consent. Of these, 140 were fully mentally competent and 110 were only slightly mentally impaired. The report also found that another 14,175 patients (1,701 of whom were mentally competent) were denied medical treatment without their consent and died.(2)

A more recent survey of the Dutch experience is even less encouraging. Doctors in the United States and the Netherlands have found that though euthanasia was originally intended for exceptional cases, it has become an accepted way of dealing with serious or terminal illness. The original guidelines (that patients with a terminal illness make a voluntary, persistent request that their lives be ended) have been expanded to include chronic ailments and psychological distress. They also found that 60 percent of Dutch physicians do not report their cases of assisted suicide (even though reporting is required by law) and about 25 percent of the physicians admit to ending patients' lives without their consent.(3)

Involuntary, Active Euthanasia

Involuntary euthanasia requires a second party who makes decisions about whether active measures should be taken to end a life. Foundational to this discussion is an erosion of the doctrine of the sanctity of life. But ever since the Supreme Court ruled in *Roe v. Wade* that the life of unborn babies could be terminated for reasons of convenience, the slide down society's slippery slope has continued even though the Supreme Court has been reluctant to legalize euthanasia.

The progression was inevitable. Once society begins to devalue the life of an unborn child, it is but a small step to begin

to do the same with a child who has been born. Abortion slides naturally into infanticide and eventually into euthanasia. In the past few years doctors have allowed a number of so-called "Baby Does" to die—either by failing to perform lifesaving operations or else by not feeding the infants.

The progression toward euthanasia is inevitable. Once society becomes conformed to a "quality of life" standard for infants, it will more willingly accept the same standard for the elderly. As former Surgeon General C. Everett Koop has said, "Nothing surprises me anymore. My great concern is that there will be 10,000 Grandma Does for every Baby Doe."(4)

Again the Dutch experience is instructive. In the Netherlands, physicians have performed involuntary euthanasia because they thought the family had suffered too much or were tired of taking care of patients. American surgeon Robin Bernhoft relates an incident in which a Dutch doctor euthanized a twenty-six-year-old ballerina with arthritis in her toes. Since she could no longer pursue her career as a dancer, she was depressed and requested to be put to death. The doctor complied with her request and merely noted that "one doesn't enjoy such things, but it was her choice."(5)

Physician-Assisted Suicide

In recent years media and political attention has been given to the idea of physician-assisted suicide. Some states have even attempted to pass legislation that would allow physicians in this country the legal right to put terminally ill patients to death. While the Dutch experience should be enough to demonstrate the danger of granting such rights, there are other good reasons to reject this idea.

First, physician-assisted suicide would change the nature of the medical profession itself. Physicians would be cast in the role of killers rather than healers. The Hippocratic Oath was written to place the medical profession on the foundation of

healing, not killing. For 2,400 years patients have had the assurance that doctors follow an oath to heal them, not kill them. This would change with legalized euthanasia.

Second, medical care would be affected. Physicians would begin to ration health care so that elderly and severely disabled patients would not be receiving the same quality of care as everyone else. Legalizing euthanasia would result in less care, rather than better care, for the dying.

Third, legalizing euthanasia through physician-assisted suicide would effectively establish a right to die. The Constitution affirms that fundamental rights cannot be limited to one group (e.g., the terminally ill). They must apply to all. Legalizing physician-assisted suicide would open the door to anyone wanting the "right" to kill themselves. Soon this would apply not only to voluntary euthanasia but also to involuntary euthanasia as various court precedents begin to broaden the application of the right to die to other groups in society like the disabled or the clinically depressed.

Biblical Analysis

Foundational to a biblical perspective on euthanasia is a proper understanding of the sanctity of human life. For centuries Western culture in general and Christians in particular have believed in the sanctity of human life. Unfortunately, this view is beginning to erode into a "quality of life" standard. The disabled, retarded, and infirm were seen as having a special place in God's world, but today medical personnel judge a person's fitness for life on the basis of a perceived quality of life or lack of such quality.

No longer is life seen as sacred and worthy of being saved. Now patients are evaluated and life-saving treatment is frequently denied, based on a subjective and arbitrary standard for the supposed quality of life. If a life is judged not worthy to be lived any longer, people feel obliged to end

that life.

The Bible teaches that human beings are created in the image of God (Gen. 1:26) and therefore have dignity and value. Human life is sacred and should not be terminated merely because life is difficult or inconvenient. Psalm 139 teaches that humans are fearfully and wonderfully made. Society must not place an arbitrary standard of quality above God's absolute standard of human value and worth. This does not mean that people will no longer need to make difficult decisions about treatment and care, but it does mean that these decisions will be guided by an objective, absolute standard of human worth.

The Bible also teaches that God is sovereign over life and death. Christians can agree with Job when he said, "The Lord gave and the Lord has taken away. Blessed be the name of the Lord" (Job 1:21). The Lord said, "See now that I myself am He! There is no god besides me. I put to death and I bring to life, I have wounded and I will heal, and no one can deliver out of my hand" (Deut. 32:39). God has ordained our days (Ps. 139:16) and is in control of our lives.

Another foundational principle involves a biblical view of life- taking. The Bible specifically condemns murder (Exod. 20:13), and this would include active forms of euthanasia in which another person (doctor, nurse, or friend) hastens death in a patient. While there are situations described in Scripture in which life-taking may be permitted (e.g., self-defense or a just war), euthanasia should not be included with any of these established biblical categories. Active euthanasia, like murder, involves premeditated intent and therefore should be condemned as immoral and even criminal.

Although the Bible does not specifically speak to the issue of euthanasia, the story of the death of King Saul (2 Sam. 1:9-16) is instructive. Saul asked that a soldier put him to death as he lay dying on the battlefield. When David heard of this act, he ordered the soldier put to death for "destroying

the Lord's anointed." Though the context is not euthanasia per se, it does show the respect we must show for a human life even in such tragic circumstances.

Christians should also reject the attempt by the modern euthanasia movement to promote a so-called "right to die." Secular society's attempt to establish this "right" is wrong for two reasons. First, giving a person a right to die is tantamount to promoting suicide, and suicide is condemned in the Bible. Man is forbidden to murder and that includes murder of oneself. Moreover, Christians are commanded to love others as they love themselves (Matt. 22:39; Eph. 5:29). Implicit in the command is an assumption of self-love as well as love for others.

Suicide, however, is hardly an example of self-love. It is perhaps the clearest example of self-hate. Suicide is also usually a selfish act. People kill themselves to get away from pain and problems, often leaving those problems to friends and family members who must pick up the pieces when the one who committed suicide is gone.

Second, this so-called "right to die" denies God the opportunity to work sovereignly within a shattered life and bring glory to Himself. When Joni Eareckson Tada realized that she would be spending the rest of her life as a quadriplegic, she asked in despair, "Why can't they just let me die?" When her friend Diana, trying to provide comfort, said to her, "The past is dead, Joni; you're alive," Joni responded, "Am I? This isn't living."(6) But through God's grace Joni's despair gave way to her firm conviction that even her accident was within God's plan for her life. Now she shares with the world her firm conviction that "suffering gets us ready for heaven."(7)

The Bible teaches that God's purposes are beyond our understanding. Job's reply to the Lord shows his acknowledgment of God's purposes: "I know that you can do all things; no plan of yours can be thwarted. You asked, 'Who is

this that obscures my counsel without knowledge?' Surely I spoke of things I did not understand, things too wonderful for me to know" (Job 42:2-3). Isaiah 55:8-9 teaches, "For my thoughts are not your thoughts, neither are your ways my ways, declares the Lord. As the heavens are higher than the earth, so are my ways higher than your ways and my thoughts than your thoughts."

Another foundational principle is a biblical view of death. Death is both unnatural and inevitable. It is an unnatural intrusion into our lives as a consequence of the fall (Gen. 2:17). It is the last enemy to be destroyed (1 Cor. 15:26, 56). Therefore Christians can reject humanistic ideas that assume death as nothing more than a natural transition. But the Bible also teaches that death (under the present conditions) is inevitable. There is "a time to be born and a time to die" (Eccles. 3:2). Death is a part of life and the doorway to another, better life.

When does death occur? Modern medicine defines death primarily as a biological event; yet Scripture defines death as a spiritual event that has biological consequences. Death, according to the Bible, occurs when the spirit leaves the body (Eccles. 12:7; James 2:26).

Unfortunately this does not offer much by way of clinical diagnosis for medical personnel. But it does suggest that a rigorous medical definition for death be used. A comatose patient may not be conscious, but from both a medical and biblical perspective he is very much alive, and treatment should be continued unless crucial vital signs and brain activity have ceased.

On the other hand, Christians must also reject the notion that everything must be done to save life at all costs. Believers, knowing that to be at home in the body is to be away from the Lord (2 Cor. 5:6), long for the time when they will be absent from the body and at home with the Lord (5:8). Death is gain

for Christians (Phil. 1:21). Therefore they need not be so tied to this earth that they perform futile operations just to extend life a few more hours or days.

In a patient's last days, everything possible should be done to alleviate physical and emotional pain. Giving drugs to a patient to relieve pain is morally justifiable. Proverbs 31:6 says, "Give strong drink to him who is perishing, and wine to him whose life is bitter." As previously mentioned, some analgesics have the secondary effect of shortening life. But these should be permitted since the primary purpose is to relieve pain, even though they may secondarily shorten life.

Moreover, believers should provide counsel and spiritual care to dying patients (Gal. 6:2). Frequently emotional needs can be met both in the patient and in the family. Such times of grief also provide opportunities for witnessing. Those suffering loss are often more open to the gospel than at any other time.

Difficult philosophical and biblical questions are certain to continue swirling around the issue of euthanasia. But in the midst of these confusing issues should be the objective, absolute standards of Scripture, which provide guidance for the

Notes

1. Plato, *Republic* 3. 405.

2. R. Finigsen, "The Report of the Dutch Committee on Euthanasia," *Issues in Law and Medicine*, July 1991, 339-44.

3. Herbert Hendlin, Chris Rutenfrans, and Zbigniew Zylicz, "Physician-Assisted Suicide and Euthanasia in the Netherlands: Lessons from the Dutch," *Journal of the American Medical Association* 277 (4 June 1997): 1720-2.

4. Interview with Koop, "Focus on the Family" radio broadcast.

5. Robin Bernhoft, quoted in *Euthanasia: False Light*, produced by IAETF, P.O. Box 760, Steubenville, OH 43952.

6. Joni Eareckson, *Joni* (Grand Rapids: Zondervan, 1976).

7. Joni Eareckson, *A Step Further* (Grand Rapids: Zondervan, 1978).

Genetic Engineering

Kerby Anderson provides a biblical look at genetic engineering. Christians would be wise to distinguish between two types of research: genetic repair (acceptable) and the creation of new forms of life (unacceptable).

Genetic Diseases

The age of genetics has arrived. Society is in the midst of a genetic revolution that some futurists predict will have a greater impact on the culture than the industrial revolution. So, in this essay we are going to look at the area of genetic engineering.

The future of genetics, like that of any other technology, offers great promise but also great peril. Nuclear technology has provided nuclear medicine, nuclear energy, and nuclear weapons. Genetic technology offers the promise of a diverse array of good, questionable, and bad technological applications. Christians, therefore, must help shape the ethical foundations of this technology and its future applications.

How powerful a technology is genetic engineering? For the first time in human history, it is possible to completely redesign existing organisms, including man, and to direct the genetic and reproductive constitution of every living thing. Scientists are no longer limited to breeding and cross-pollination. Powerful genetic tools allow us to change genetic structure at the microscopic level and bypass the normal processes of reproduction.

For the first time in human history, it is also possible to make multiple copies of any existing organism or of certain sections of its genetic structure. This ability to clone existing organisms or their genes gives scientists a powerful tool to reproduce helpful and useful genetic material within a population.

Scientists are also developing techniques to treat and cure genetic diseases through genetic surgery and genetic therapy. They can already identify genetic sequences that are defective, and soon scientists will be able to replace these defects with properly functioning genes.

At this point, let’s take a look at the nature of genetic diseases. Genetic diseases arise from a number of causes. The first are single-gene defects. Some of these single-gene diseases are dominant and therefore cannot be masked by a second normal gene on the homologous chromosome (the other strand of a chromosome pair). An example is Huntington’s chorea (a fatal disease that strikes in the middle of life and leads to progressive physical and mental deterioration). Many other single-gene diseases are recessive and are expressed only when both chromosomes have a defect. Examples of these diseases are sickle-cell anemia, which leads to the production of malformed red blood cells, and cystic fibrosis, which leads to a malfunction of the respiratory and digestive systems.

Another group of single-gene diseases includes the sex-linked diseases. Because the Y chromosome in men is much shorter than

the X chromosome it pairs with, many genes on the X chromosome are absent on the homologous Y chromosome. Men, therefore, will show a higher incidence of genetic diseases such as hemophilia or color blindness. Even though these are recessive, males do not have a homologous gene on their Y chromosome that could contain a normal gene to mask it.

Another major cause of genetic disease is chromosomal abnormalities. Some diseases result from an additional chromosome. Down's syndrome is caused by trisomy-21 (three chromosomes at chromosome twenty-one). Klinefelter's syndrome results from the addition of an extra X chromosome (these men have a chromosome pattern that is XXY). Other genetic defects result from the duplication, deletion, or rearrangement (called translocation) of a gene sequence.

Genetic engineering offers the promise of eventually treating and curing these genetic defects. Although this is a promise in the future, we are already involved in genetic counseling and the significant ethical concerns it presents. Let's turn now to look at the topic of genetic counseling.

Genetic Counseling

As scientists have learned more about the genetic structure of human beings, they have been able to predict with greater certainty the likelihood of a couple bearing a child with a genetic disease. Each human being carries approximately three to eight genetic defects that might be passed on to their children. By checking family medical histories and taking blood samples (for chromosome counts and tests for recessive traits), a genetic counselor can make a fairly accurate prediction about the possibility of a couple having a child with a genetic disease.

Most couples, however, do not seek genetic counsel in order to decide if they should have a child, but instead seek counsel to decide if they should abort a child that is already

conceived. In cases in which the mother is already pregnant, the focus is not whether to prevent a pregnancy but whether to abort the unborn child. These circumstances raise some of the same ethical concerns as abortion.

Major deformities can be discovered through many advanced new techniques. One is ultrasound, which uses a type of sonar to determine the size, shape, and sex of the fetus. An ultrasound transducer is placed on the mother's abdomen and sound waves are sent through the amniotic sac. The sonar waves are then picked up and transmitted to a video screen that provides important information about the characteristics of the fetus.

Another important tool is laparoscopy. A flexible fiber optic scope is inserted by the doctor through a small incision in the mother's abdomen. This tool allows the doctor to probe into the abdominal cavity.

Genetic defects can be detected in the womb through various prenatal tests. These tests can detect approximately two hundred genetic disorders. In the mid-1960s physicians began to use amniocentesis. A doctor inserts a four-inch needle into a pregnant woman's anesthetized abdomen in order to withdraw up to an ounce of amniotic fluid. As the fetus grows, cells are shed from the skin of the fetus, and these can be collected from the fluid and used to discover the sex and genetic make-up of the fetus.

For years, doctors used this procedure to identify congenital defects by the twentieth week of pregnancy. Now more doctors use another technique called chorionic villus sampling (CVS), which can produce the same information at ten weeks. Doctors also use a blood test known as maternal serum alfa-fetoprotein (MSAFP). This test, usually done between the fifteenth and twentieth week, can detect a neural tube defect of the spinal cord or brain, such as spina bifida or Down's syndrome.

The newest procedure is called BABI (blastomere analysis

before implantation). Using reproductive technologies, a couple can conceive several embryos in test tubes and discard those exhibiting known defects. A doctor gives a woman a drug to stimulate ovulation, then extracts eggs from her ovaries and mixes them with her husband’s sperm. So far, the procedure has been used to test embryos for such hereditary diseases as Tay-Sachs and Duchenne muscular dystrophy.

Using these techniques to give genetic information to couples is not wrong in itself. But, since most of these genetic diseases cannot be cured, the tacit assumption is that abortion will be used if any defects are found. Many doctors and clinics will not do genetic tests unless a couple gives prior consent to abortion. Thus genetic counseling can often raise ethical questions, and this is especially true when abortion is involved.

Next, we’ll look at the future promise of genetic engineering found in gene splicing.

Gene Splicing: Scientific Benefits and Concerns

For the remainer of this essay, I would like to focus on the issue of gene splicing, also known as recombinant DNA research. This new technology began in the 1970s with new genetic techniques that allowed scientists to cut small pieces of DNA (known as plasmids) into small segments that could be inserted in host DNA. The new creatures that were designed have been called DNA chimeras because they are conceptually similar to the mythological Chimera (a creature with the head of a lion, the body of a goat, and the tail of a serpent).

Gene splicing is fundamentally different from other forms of genetic breeding used in the past. Breeding programs work on existing arrays of genetic variability in a species, isolating specific genetic traits through selective breeding. Scientists using gene splicing can essentially “stack” the deck or even

produce an entirely new deck of genetic “cards.”

But this powerful ability to change the genetic deck of cards also raises substantial scientific concerns that some “sleight-of-hand” would produce dangerous consequences. Ethan Singer said, “Those who are powerful in society will do the shuffling; their genes will be shuffled in one direction, while the genes of the rest of us will get shuffled in another.” Also there is the concern that a reshuffled deck of genes might create an Andromeda strain similar to the one envisioned by Michael Crichton is his book by the same title. A microorganism might inadvertently be given the genetic structure for some pathogen for which there is no antidote or vaccine.

In the early days of this research, scientists called for a moratorium until the risks of this new technology could be assessed. Even after the National Institute of Health issued guidelines, public fear was considerable. When Harvard University planned to construct a genetic facility for gene splicing, the mayor of Cambridge, Massachusetts, expressed his concern that “something could crawl out of the laboratory, such as a Frankenstein.”

The potential benefits of gene splicing are significant. First, the technology can be used to produce medically important substances. The list of these substances is quite large and would include insulin, interferon, and human growth hormone. Gene splicing also has great application in the field of immunology. In order to protect organisms from viral disease, doctors must inject a killed or attenuated virus. Scientists can use the technology to disable a toxin gene, thus yielding a viral substance that triggers the generation of antibodies without the possibility of producing the disease.

A second benefit is in the field of agriculture. This technology can improve the genetic fitness of various plant

species. Basic research using this technology could increase the efficiency of photosynthesis, increase plant resistance (to salinity, drought, or viruses), and reduce a plant's demand for nitrogen fertilizer.

Third, gene splicing can aid industrial and environmental processes. Industries that manufacture drugs, plastics, industrial chemicals, vitamins, and cheese will benefit from this technology. Scientists have already begun to develop organisms that can clean up oil spills or toxic wastes.

This last benefit, however, also raises one of the greatest scientific concerns over genetic technology. The escape (or even intentional release) of a genetically engineered organism might wreak havoc on the environment. Scientists have created microorganisms that dissolve oil spills or reduce frost on plants. Critics of gene splicing fear that radically altered organisms could occupy new ecological niches, destroy existing ecosystems, or drive certain species to extinction.

Gene Splicing: Legal and Ethical Concerns

Now, we want to focus on the legal and ethical concerns of gene splicing.

Legal concerns also surround genetic technology. The Supreme Court ruled that genetically engineered organisms as well as the genetic processes that created them can be patented. The original case involved a microorganism designed to eat up oil-slicks; it was patented by General Electric. Since 1981 the U.S. Patent and Trademark Office has approved nearly 12,000 patents for genetic products and processes. Scientists have been concerned that the prospects of profit have decreased the relatively free flow of scientific information. Often scientists-turned-entrepreneurs refuse to share their findings for fear of commercial loss.

Even more significant is the question of whether life should

even be patented at all. Most religious leaders say no. A 1995 gathering of 187 religious leaders representing virtually every major religious tradition spoke out against the patenting of genetically engineered substances. They argued that life is the creation of God, not humans, and should not be patented as human inventions.

The broader theological question is *whether* genetic engineering should be used and, if permitted, *how* it should be used. The natural reaction for many in society is to reject new forms of technology because they are dangerous. Christians, however, should take into account God's command to humankind in the cultural mandate (Gen. 1:28). Christians should avoid the reflex reaction that scientists should not tinker with life; instead Christians should consider how this technology should be used responsibly.

One key issue is the worldview behind most scientific research. Modern science rests on an evolutionary assumption. Many scientists assume that life on this planet is the result of millions of years of a chance evolutionary process. They conclude, therefore, that intelligent scientists can do a better job of directing the evolutionary process than nature can do by chance. Even so, many evolutionary scientists warn of this potential danger. Ethan Singer believes that scientists will "verify a few predictions, and then gradually forget that knowing something isn't the same as knowing everything. . . . At each stage we will get a little cockier, a little surer we know all the possibilities."

Some evolutionary scientists have always believed they could control evolution. In essence, gene splicing gives them the tools they have wanted. Julian Huxley looked forward to the day in which scientists could fill the "position of business manager for the cosmic process of evolution." Certainly this technology enables scientists to create new forms of life and alter existing forms in ways that have been impossible until now.

How should Christians respond? They should humbly acknowledge that God is the sovereign Creator and that man has finite knowledge. Genetic engineering gives scientists the god-like technological ability, but without the wisdom, knowledge, and moral capacity to behave like God.

Even evolutionary scientists who deny the existence of God and believe that all life is the result of an impersonal evolutionary process express concern about the potential dangers of this technology. Erwin Chargaff asked, “Have we the right to counteract, irreversibly, the evolutionary wisdom of millions of years, in order to satisfy the ambition and curiosity of a few scientists?” His answer is no. The Christian’s answer should also be the same when we realize that God is the Creator of life. We do not have the right to “rewrite the sixth day of creation.”

But can gene splicing be used responsibly? We’ll address that question next as we attempt to put forward a biblical framework for genetic engineering.

A Biblical Framework for Genetic Engineering

When faced with the complexities of modern life, and especially with modern technology, many tend to exert the mental reflex of condemning all forms of genetic engineering. So the obvious first question is whether genetic engineering should be used at all. Then, if it is permissible, we should ask how it should be used.

Christians must resist the tendency to reject technology merely because it is foreign or merely because it is technology. God’s command to humankind in the cultural mandate (Gen. 1:28) instructs us to develop and use technology wisely. Christians should avoid the reflex reaction that scientists should not tinker with life; instead Christians should develop a biblical framework to guide responsible use of this technology.

In developing this framework, I believe we must distinguish between two types of research. The first could be called genetic repair. This research attempts to remove genetic defects and develop techniques that will provide treatments for existing diseases. Applications would include various forms of genetic therapy and genetic surgery as well as modifications of existing microorganisms in order to produce beneficial results.

The Human Genome Project is helping scientists to pinpoint the location and sequence of the approximately 100,000 human genes. Further advances in gene splicing will allow scientists to repair defective sequences and eventually remove these genetic diseases from our population.

Genetic disease is not part of God's plan for the world. It is the result of the Fall (Gen. 3). Christians can apply technology to fight these evils without being accused of fighting against God's will. Genetic engineering can and should be used to treat and cure genetic diseases.

A second type of research is the creation of new forms of life. While minor modifications of existing organisms may be permissible, Christians should be concerned about the large-scale production of novel life forms. Their potential impact on the environment and on mankind could be considerable. Science is replete with examples of what can happen when an existing organism is introduced into a new environment (e.g., the rabbit into Australia, the rat to Hawaii, or the gypsy moth in the United States). One can only imagine the potential devastation that could occur when a newly created organism is introduced into a new environment.

God created plants and animals as "kinds" (Gen. 1:24). While there is minor variability within these created kinds, there are built-in barriers between these created kinds. Redesigning creatures of any kind cannot be predicted the same way new elements on the periodic chart can be predicted for properties

even before they are discovered. Recombinant DNA technology offers great promise in treating genetic disease, but Christians should also be vigilant. While this technology should be used to repair genetic defects, it should not be used to confer the role of creator on scientists.

I believe Christians involved in the scientific disciplines of biology, genetics, medicine, and molecular biology need to stand up and point the way to the wise and proper use of genetic engineering. The benefits are great, but so are the perils. As with any form of technology, Christians should thoughtfully and carefully promote the beneficial aspects of this technology while resisting and constraining its detrimental aspects.

The Little Lamb That Made a Monkey of Us All

Like many others, I was caught totally flat-footed, astonished by the announcement of the successful cloning of an adult sheep, Dolly. Caught so unaware, in fact, that Probe is re-airing my three-year-old program on human cloning the week of March 17-21, 1997, because so little had changed. When the announcement of a successful sheep cloning was made, it was too late to pull the program from the schedule; tapes had already been sent to all the radio stations and there just wasn’t time to replace it in only three weeks. Consequently (and spurred by a number of phone calls and e-mails from around the country), I have compiled a few thoughts and

comments regarding scientific and moral considerations about this historic breakthrough to temporarily plug the gap.

Scientific Considerations

Normal mammary cells were intentionally starved of critical growth nutrients in order to allow the cells to reach a dormant stage of the normal cell cycle. This process of bringing the cells into dormancy apparently allows the cell's DNA to be reprogrammed by the proteins already in the egg cell for renewed cell division and new cell functions. The cells were fused with an enucleated egg cell (a cell that had its nucleus removed) and stimulated to begin cell division by an electric pulse.

The process was inefficient. Out of 277 cell fusions, 29 began growing *in vitro.* All 29 were implanted in receptive ewes, 13 became pregnant, and only one lamb was born as a result. This is a success rate of only 3.4%. In nature, somewhere between 33 and 50% of all fertilized eggs develop fully into newborns.

The procedure was very non-technical, and no one is really sure why it worked. It needs to be repeated. All attempts to clone mouse cells from adults have failed. Some suggest that sheep embryos do not employ the DNA in the nucleus until after 3-4 cell divisions. This may give the egg cell sufficient time to reprogram the DNA from mammary cell functions to egg cell functions. Human and mouse cells employ the nuclear DNA after the second cell division. Human and mouse cells may not be capable of being cloned because of this difference.

The purpose of these experiments was to find a more effective way to reproduce genetically engineered sheep for the production of pharmaceuticals. A sheep embryo can be engineered to produce a certain human protein or hormone in its milk. The human protein can then be harvested from the milk and sold on the market. Instead of trusting the somewhat unpredictable and time-consuming methods of normal animal

husbandry to reproduce this genetic hybrid, cloning it assures that the engineered gene product will not be lost.

Genetic material is the same in all cells of an organism (except the reproductive cells, sperm and egg, which have only half the full complement), but differentiated cells are biochemically programmed to perform limited functions, and all other functions are turned off. Based on attempts in frogs and mice, most scientists felt that the reprogramming was impossible.

A critical question is the lifespan of Dolly. All cells have a built-in senescence or death after so many cell divisions. Dolly began from a cell that was already six years old. A normal lifespan for a ewe is around 11 years. Will Dolly live to see her seventh birthday?

It is also uncertain as to whether Dolly will be reproductively fertile. Frog clones are usually sterile.

Reprogramming the nucleus could lead to procedures to stimulate degenerating nerve cells to be replaced by newly growing nerve cells. Adults do not generate nerve cells normally.

Moral Considerations

Will humans be cloned for spare parts? While this is certainly possible, I consider it very unlikely that this would be sanctioned by any government. That doesn’t mean, however, that someone won’t try.

Will humans be cloned to replace a dying infant or child? This is certainly a possibility, but we need to ask if this is an appropriate way to deal with loss. Might unrealistic expectations be placed on a clone that would not be placed on a normally-produced child?

Will humans be cloned to produce children for otherwise

childless couples? This is the most often-given reason for human cloning. This argument is unpersuasive when there are currently so many children that need adoption. Also, this further devalues children to the level of a commodity. If *in vitro* fertilization is expensive, cloning will be worse.

Will humans be cloned for vanity? Someone will certainly try.

Will human clones have a soul? In my mind, they will be no different from an identical twin or a baby that results from *in vitro* fertilization. How a single fertilized egg splits in two to become two individuals is a similar mystery.

Does cloning threaten genetic diversity? Excessive cloning may indeed deplete the genetic diversity of an animal population, leaving the population susceptible to disease and other disasters. But most biologists are aware of these problems, and I would not expect this to be a major concern unless cloning were the only means available to continue a species.

If the technique is perfected in animals first, will this save the tragic loss of fetal life that resulted from the early human experimentation with *in vitro* fertilization? *In vitro* fertilization was perfected in humans before it was known how effective a procedure it would be. This resulted in many wasted human beings in the embryonic stages. The success rate is still only 1 in 5 to 1 in 10; normal fertilization and implantation success rates are 2-3 times that. While animal models will help, there will be unique aspects to human development that can only be known and overcome by direct human experimentation which disrespects the sanctity of human life.

This provides a means for lesbians to have a child. One supplies the nucleus and the other provides the egg. The egg does contain some unique genetic material in the mitochondria that are not contributed by sperm or nucleus. One cell from each donor would be fused together to create a new individual,

though all the nuclear genetic material comes from one cell. Sue Bohlin has an upcoming program on homosexual myths including gay marriage. This is no longer marriage as it is currently understood, and the technological hoops that must be jumped through for any gay couple to have children should be a clear warning that something is wrong with the whole arrangement.

Are human clones unique individuals? Even identical twins manage to forge their own identity. The same would be true of clones. In fact, this may argue strongly against the usefulness of cloning since you can never reproduce all the life experiences that have molded a particular personality. The genes will be the same, but the environment and the spirit will not.

All together, I find the prospect of animal cloning potentially useful. But I wonder if the procedure is as perfectible as some hope, and may end up being an inefficient process to achieve the desired result. Human cloning is fraught with too many possible difficulties, from the waste of human fetal life during research and development to the commercializing of human babies (see my previous cloning article) with far too little potential advantage to individuals and society. What there is to learn about embryonic development through cloning experiments can be learned through animal experimentation. The cloning of adult human beings is an unnecessary and unethical practice that should be strongly discouraged if not banned altogether.

Can Humans Be Cloned Like Sheep?

Why Is Cloning So Difficult and How Did They Do It?

Like so many others I was caught totally flat-footed and astonished by the announcement of the successful cloning of an adult sheep, Dolly. A few years ago I aired a radio program on the prospects of human cloning and considerably downplayed the possibilities. Earlier this year, we here at Probe had decided to rebroadcast this program because little had changed. When the announcement about Dolly was made, it was too late to pull the program from the schedule as tapes had already been sent to all the radio stations, and there just wasn't time to replace or update it. Consequently, I compiled a few thoughts and comments on this historic breakthrough and quickly made it available on our web site to temporarily plug the gap.

Subsequently, the article was featured on Christian Leadership's web site, Leadership University (www.leaderu.com), and I started receiving numerous phone calls and e-mails as a result. This essay is now an updated and expanded version of that article to help us think through both the scientific and moral implications of this stunning achievement.

The genetic material is the same in all cells of an organism (except the reproductive cells, sperm and egg, which have only half the full complement of chromosomes). However, differentiated cells (liver cells, stomach cells, muscle cells, etc.) are biochemically programmed to perform limited functions and all other functions are turned off. Most scientists felt that the reprogramming was next to impossible based on cloning attempts in frogs and mice.

So what did the scientists in Scotland do that was successful? Well, they took normal mammary cells from an adult ewe and starved them (i.e., denied them certain critical growth nutrients) in order to allow the cells to reach a dormant stage. This process of bringing the cells into dormancy apparently allows the cells' DNA to be deprogrammed. Apparently most if not all of the programming for specific functions of the mammary cells were turned off and the DNA made available for reprogramming. The starved mammary cells were then fused with an egg cell that had its nucleus removed. The egg cell was then stimulated to begin cell division by an electric pulse. Proteins already in the egg cell somehow altered the DNA from the mammary cell to be renewed for cell division and embryological functions.

As might be expected, the process was inefficient. Out of 277 cell fusions, 29 began growing as embryos *in vitro* or in the petri dish. All 29 were implanted into 13 receptive ewes, yet only one became pregnant. As a result of these efforts, one lamb was born. This translates to a success rate of only 3.4%, and the success rate is even less (.36%), when you calculate using the 277 initial cell fusions attempted. In nature, on the other hand, somewhere between 33 and 50% of all fertilized eggs develop fully into newborns.

Altogether the procedure was rather non-technical, and no one is really sure why it worked. The experiments still need to be repeated. Previously, all attempts to clone mice from adult cells have failed. But clearly, an astounding breakthrough has been made. You can be sure that numerous labs around the world will be attempting to repeat these experiments and trying the technique on other mammalian species. Can this procedure be done with humans? Should we try it with humans? I'll be dealing with these questions later in this discussion.

Why Clone Anything?

Before proceeding to deal with the question of human cloning,

a more basic concern needs to be addressed. Some, for example, may be asking, “Why would anyone want to clone anything in the first place, but especially sheep?”

The purpose of these experiments was to find a more effective way to reproduce already genetically engineered sheep for production of pharmaceuticals. Sheep can be genetically engineered to produce a certain human protein or hormone in its milk. The human protein can then be harvested from the milk and sold on the market. This is accomplished by taking the human gene for the production of this protein or hormone and inserting it into an early sheep embryo. Hopefully the embryo will grow into a sheep that will produce the protein.

This is not a certainty, and while the process may improve, it will never be perfect. Mating the engineered sheep is also not foolproof because even mating with another genetically engineered sheep may result in lambs that have lost the inserted human gene and cannot produce the desired protein. Therefore, instead of trusting the somewhat unpredictable and time-consuming methods of normal animal husbandry to reproduce this genetic hybrid, cloning more directly assures that the engineered gene product will not be lost.

There may be other benefits to cloning technology. Reprogramming the nucleus of other cells, such as nerve cells, could lead to procedures to stimulate degenerating nerve cells to be replaced by newly growing nerve cells. Nerve cells in adults do not ordinarily regenerate or reproduce. This could have important implications for those suffering from Parkinson’s and Alzheimer’s.

If the process can actually be perfected to the extent that production costs are reduced and the quality of the eventual product is improved, then this would be a legitimate research goal. The simplicity of the technique, though still inefficient, makes this plausible. But there are still questions that need to be answered.

One critical question concerns the lifespan of Dolly. All cells have a built in senescence or death after so many cell divisions. Dolly began with a cell from a ewe that was already six years old. A normal lifespan for a ewe is around 11 years. Will Dolly live to see her seventh birthday? Actually most cell divisions are used up during embryological development. Dolly's cells may peter out even earlier. This is critical because a 10-year-old sheep is considered elderly, and lambing and wool production decline in sheep after their seventh year. My guess though is that since Dolly's genes were reprogrammed from mammary cell functions to embryological functions, that the senescence clock was also reset back to the beginning. I expect Dolly to live a normal lifespan.

It is also uncertain as to whether Dolly will be reproductively fertile. Frogs cloned from tadpole cells are usually sterile. It is possible that while Dolly is normal anatomically, the cloning process may somehow interfere with the proper development of the reproductive cells. If this were the case, there may be other problems not immediately detectable. This will be answered this summer when Dolly reaches sexual maturity.

Can We Clone Humans?

While we have established that animal cloning may be permissible and even scientifically useful, what about cloning humans? First of all, is it feasible? Secondly, just because we can do it, should we? Should we even try?

At this point it is reasonable to assume that because the procedure works with sheep and possibly with cattle (the experiments with cattle are already underway), it should be perfectible with humans. This does not mean, however, that there may not be unique barriers to cloning humans as opposed to cloning sheep.

Some suggest that by using the particular procedure developed

by the researchers in Scotland, sheep may be easier to clone. The reason is that sheep embryos do not employ the DNA in the nucleus until after 3 to 4 cell divisions. This may give the egg cell sufficient time to reprogram the DNA from mammary cell functions to egg cell functions. Human and mouse cells employ the nuclear DNA after only the second cell division. This may be why similar experiments have not worked in mice. Therefore, human cells and mouse cells may not be capable of being cloned because of this difference.

If this barrier does indeed exist, it is not necessarily insurmountable. The news of a cloned sheep was surprising enough that no one, including me, is now going to step out on the same sawed-off limb and predict that it **can't** eventually work with humans. I mentioned earlier that the procedure is so startlingly non-technical that there are numerous laboratories around the world that could immediately begin their own cloning research program with a minimum of investment and expertise. While I fully expect that many labs will begin studies on cloning other mammalian species besides sheep, I'm not so sure about humans.

In 1993, researchers here in the United States employed well known techniques to artificially twin human embryos. They immediately became embroiled in a firestorm of public scrutiny that they did not anticipate nor enjoy (see my earlier article, "Human Cloning: Have Human Beings Been Cloned?"). They were even criticized by other researchers in the field for jumping ahead without scrutinizing the ethical ramifications. The public reaction was no doubt very sobering to the rest of the scientific community. Many countries have already either completely banned experimentation in human cloning or at least imposed a temporary moratorium so that the ethical questions can be properly investigated before stepping ahead. Even the researchers in Scotland responsible for Dolly have plainly stated that they see no reason to pursue human cloning and are personally repulsed by the idea.

There are some in the scientific community, however, who feel that the ability to do something is reason enough to do it. But in this case, I believe that they are the minority. For example, molecular biologists imposed a moratorium of their own in the 70s when genetic technology was first being developed until critical questions could be answered. Also, while nuclear weapons have been produced for over 50 years, only two have been used and that was 52 years ago. Many are now being dismantled. These cases show us that human restraint, though rare, is possible.

So while it is reasonable to believe that humans can be cloned, and that someone, somewhere may try, the overall climate is so against it that I don't think we will see it announced anytime soon.

Why Clone Humans?

Overall, the public reaction has been negative toward cloning human beings, and this is rather curious in a culture that is admittedly post-Christian in orientation. Nevertheless, many people still want to draw a distinction between animals and humans.

As Christians we understand this desire because we assert that humans are made in the image of God and that animals are not. There is, therefore, a clear demarcation between animals and humans. But in an evolutionary view, humans are nothing special—just another animal species. The expected reaction was offered by an editorial in the *Dallas Morning News* (Monday, 3 March 1997, 9D) by Tom Siegfried which he titled: "It's hard to see a reason why a human Dolly is evil." He summarized his perspective when he said, "The ability to clone is part of gaining deeper knowledge of life itself. So Dolly should not be seen as scary, but as a signal that life still conceals many miracles for humans to discover." To the naturalist, any

knowledge is valuable, and the means to obtain it is justified essentially by its benefit to society.

With this in mind, let’s explore some of the reasons why people have suggested that human cloning is a worthwhile proposition and deal with some of the questions people are asking.

Concerns About Human Cloning

There is much that can be learned about human embryonic development by researching human cloning. While this is true, this is precisely the reasoning used by Nazi Germany to justify experimentation on Jews. Experiments were performed on exposure to cold, water, and other extreme conditions with human subjects, frequently to the point of death, because data on human subjects was deemed indispensable. Of course, we know now that animal models work just as well; consequently, there is no need to use human models to gain this type of data.

Will humans be cloned for spare parts? A few writers have suggested that some individuals may want to establish an embryonic clone to be frozen and put away. Then, in the event of a childhood disease requiring a transplant, the embryo can be thawed, implanted in a surrogate, and raised to a sufficient age for the spare organ to be harvested and transplanted. While this is certainly possible, I consider it very unlikely that these practices would be sanctioned by any government because it completely tosses aside the uniqueness of humanity and trashes the concept of human dignity. That doesn’t mean, however, that someone won’t try.

Will human cloning be used to replace a dying infant or child? This is certainly a possibility, but we need to ask if taking such a course of action is an appropriate way to deal with loss. Unrealistic expectations may be placed on a clone that would not be placed on a normally produced child. The cloned child may be the same genetically, but different in other

respects. This could create more frustration than comfort.

Will humans be cloned to provide children for otherwise childless couples? This is the reason most often given for human cloning, yet the argument is unpersuasive when there are so many children that need adoption. Also, this devalues children to the level of a commodity. Also, if *in vitro* fertilization seems expensive at $5,000-8,000 a try, cloning will be more so.

Will human clones have souls? In my mind, they will be no different than an identical twin or a baby that results from *in vitro* fertilization. How a single fertilized egg splits in two to become two individuals is a similar mystery, but it happens.

Does cloning threaten genetic diversity? Excessive cloning may indeed deplete the genetic diversity of an animal population, leaving the population susceptible to disease and other disasters. But most biologists are aware of these problems, and I would not expect this to be a major concern unless cloning were the only means available to continue a species.

If the technique is perfected in animals first, will this save the tragic loss of fetal life that resulted from the early human experimentation with in vitro *fertilization? In vitro* fertilization was perfected in humans before it was known how effective a procedure it would be. This resulted in many wasted human beings in the embryonic stages. The success rate is still only 10 to 20%. The success rate of normal fertilization and implantation is around 33 to 50%. While animal models will help, there will be unique aspects to human development that can only be known and overcome by direct human experimentation which does not respect the sanctity of human life.

Cloning provides a means for lesbians to have children as a couple. One supplies the nucleus and the other provides the

egg. The egg does contain some unique genetic material in the mitochondria that are not contributed by sperm or nucleus. One cell from each partner is fused together to create a new individual, though all the nuclear genetic material comes from only one cell. The real question is whether this is the proper environment for any child to grow up in. (For more information on this topic, see Sue Bohlin's essay, "Homosexual Myths.") Homosexual "marriages" are not really marriages in the normal understanding of the term, and the technological hoops that must be jumped through for any gay couple to have children should be a clear warning that something is wrong with the whole arrangement.

Are human clones unique individuals? Even identical twins manage to forge their own identity. The same would be true of clones. In fact, this may argue strongly against the usefulness of cloning since we can never reproduce all the life experiences that have molded a particular personality. The genes will be the same, but the environment and the spirit will not.

All together, I find the prospect of animal cloning potentially useful. But I wonder if the procedure is as perfectible as some hope. It may end up being an inefficient process to achieve the desired result. Human cloning is fraught with too many possible difficulties, from the waste of human fetal life during research and development to the commercializing of human babies (see my previous Human Cloning article) with far too little potential advantage to individuals and society. What there is to learn about embryonic development through cloning experiments can be learned through animal experimentation. The cloning of adult human beings is an unnecessary and unethical practice that should be strongly discouraged if not banned altogether.

Euthanasia: The Battle for Life from a Christian Viewpoint

Dr. Bohlin approaches this issue from a biblical worldview. As a Christian, he looks at current events and attitudes in this sad area and points out that popular sentiments may be far from biblical and godly.

Physician-Assisted Suicide in the United States

On March 6, 1996, the Ninth U. S. Circuit Court of Appeals struck down Washington state's ban on physician-assisted suicide. By a surprisingly commanding 8-3 vote, the court ruled that terminally- ill adults have a constitutional right to end their lives. Essentially, the court decided that an individual's right to determine the time and manner of his own death outweighed the state's duty to preserve life. This ruling will also likely uphold Oregon's voter approved doctor-assisted suicide law that has been bogged down in the courts.

The only recourse now is the Supreme Court, which is not expected to overrule the Appeals Court's decisions. On April 2, the Second U.S. Circuit Court of Appeals ruled that New York state's bans on assisted-suicide were "discriminatory." Then on May 15, 1996, Dr. Jack Kevorkian, the infamous "Dr. Death," was acquitted for a third time of doctor-assisted suicide in the state of Michigan.

The stage is set for a revolution in the law concerning euthanasia in this country. Kevorkian's escapes from the law

and these recent rulings from the Appeals Courts will further encourage the "right- to-die" lobby which seeks to make doctor-assisted suicide the law of the land. What will be overlooked is over 2,000 years of medical practice and ethical codes. The Hippocratic Oath, originating in 400 B.C., and the standard for medical practice ever since, states, "I will keep [the sick] from harm and injustice. I will neither give a deadly drug to anybody if asked for it, nor will I make a suggestion to that effect."

Allowing doctors to end life as well as preserve life would change the face of the entire medical community.The doctor/patient relationship will be forever compromised. Is your doctor's advice truly in your best interests or in his best interest to rid the hospital and himself of a pesky patient and situation?

Dr. Thomas Beam, chairman of the Medical Ethics Commission of the Christian Medical and Dental Society points out, "While the act of physician-assisted suicide seems compassionate on the surface, it is often the abandonment of the patient in their most needy time. Instead of support, the patient may only find confirmation of the hopelessness of their condition and physician-assisted suicide is legitimized as the only 'way.'"(1) It is not terribly difficult to see how this circumstance would undermine the delicate relationship between a doctor and his patient.

Surely, you say, most people don't agree with the policy of doctor- assisted suicide. However, the *New England Journal of Medicine* reported a poll from the state of Michigan which indicated that "66 percent of state residents and 56 percent of Michigan doctors would prefer that doctor-assisted suicide be legalized not outlawed."(2) And even though doctor-assisted laws were defeated in referendums in California and Washington, the defeats were narrow. And a similar law was finally passed in Oregon in 1994. In addition, 23 states are now considering such legislation. And as mentioned earlier,

two different Appeals Courts have ruled in favor of doctor-assisted laws. In this essay I will examine why so many favor legalization of assisted suicide. I will take a close look at Dr. Jack Kevorkian, the most visible proponent of assisted suicide. Also, I will examine what the Bible has to say about life, death, and God's sovereignty. Finally, I will discuss some test cases and inform you about what you can do to combat this growing evil in our land.

Who is Dr. Jack Kevorkian and Why Do People Seek His Help?

Why is such a large segment of our society, over 60% in some communities, enamored with the possibility of physician-assisted suicide? While there can be many roads that will lead to this conclusion, the primary one is fear. People today fear being at the mercy of technology, of being kept alive with no hope of recovery by machines. Few seem to realize that it is already legal for a terminally ill patient to refuse life-prolonging measures. We must realize that there is a difference between simply allowing nature to take its course when someone is clearly dying and taking direct measures to hasten someone's death. Former Surgeon General C. Everett Koop acknowledges,

> *If someone is dying and there is no doubt about that, and you believe as I do that there is a difference between giving a person all the life to which he is entitled as opposed to prolonging the act of dying, then you might come to a time when you say this person can take certain amounts of fluid by mouth and we're not going to continue this intravenous solution because he is on the way out.(3)*

Extraordinary measures are not required to keep a dying person alive at all costs. But some people fear exactly that. Removing this fear will take a lot of the wind out of the euthanasia sails.

Secondly, people fear the pain of the dying process. Intractable pain is a real fear, but few people today realize that most of the pain of terminally ill patients can be dealt with. Many doctors, particularly in the U.S., are not aware of all the measures at their disposal. There are new ways of administering morphine, for example, that can achieve effective pain management with lower doses and therefore a lower risk of respiratory complications.

Dr. Paul Cundiff, practicing oncologist and hospice care physician with 18 years of experience treating dying patients says,

> *It is a disgrace that the majority of our health care providers lack the knowledge and the skills to treat pain and other symptoms of terminal disease properly. The absence of palliative caretraining for medical professionals results in sub-optimal care for almost all terminally ill patients and elicits the wish to hasten their own deaths in a few.(4)*

But many would even be willing to live with the pain if they knew that they would not be left alone. The growth in the hospice movement will help alleviate this fear as well. The staff at a hospice is trained to deal not only with physical pain, but with psychological, social, and spiritual pain as well. If you have seen pictures of the many people Jack Kevorkian has assisted to commit suicide, you cannot help but notice that these are lonely, miserable people. Pain has had little to do with their desire to commit suicide. As a nation we have in large part abandoned our elderly population. When God commanded Israel to honor their fathers and their mothers, this was understood to mean primarily in their older years. Extended families no longer live together even when the medical needs of parents are not severe or terribly limiting. No one wants to be a burden or to be burdened.

Dr. Jack Kevorkian is a retired pathologist with essentially

no training in patient care. He is simply on a personal mission to bring about legalized physician-assisted suicide to help usher in a code of ethics based totally on relativism. “Ethics must change as the situation changes,” he says. “That’s the way to keep control. Not by an inflexible maxim that applies for two thousand years, but an ethical code that will change a decade later.”(5) Right now Kevorkian’s victims are the few lonely and desperate individuals who seek him out. The future victims of his crusade will not only be those who wish to die, but those whom doctors and relatives feel should die.

The Lessons of Holland

One of the primary reasons for concern about the legalization of physician-assisted suicide is the now runaway death culture of Holland. Doctor-assisted suicide was essentially legalized in Holland in 1973 by two court decisions. While not officially legalizing euthanasia in Holland, the courts simply said that if you follow certain guidelines you will not be prosecuted.

The problem is that any such regulations are not enforceable. As a result, the government of Netherlands reported in 1991 that only 41% of the doctors obey the rules and 27% admitted to performing involuntary euthanasia. That is, without the patient’s consent! In addition, over 2% of the deaths in Holland in 1990 were the result of direct voluntary euthanasia, but 6% of all deaths were the result of involuntary euthanasia.

Many people in Holland today carry around a card that states they are not to be euthanized without their consent! That is precisely where we are headed. Once a right to physician-assisted suicide is established as it was in Holland, it soon degenerates into others being willing and able to make the decision for you.(6)

In Holland, doctors performed involuntary killing because they thought the family had suffered too much; some were tired of taking care of patients, and one was mad at his patient![(7)] Even the conditions of allowed voluntary euthanasia are appalling. Robin Bernhoft, a U.S. surgeon of the liver and pancreas, relates an incident where a doctor in Holland told of a 26 year-old ballerina with arthritis in her toes requesting to be euthanized. Apparently since she could no longer pursue her career as a dancer, she was depressed and no longer wished to live. Amazingly, the doctor complied with her request. His only justification was to say that "One doesn't enjoy such things, but it was her choice!"[(8)]

With this in mind, when the discussion of guidelines comes up, remember that in Holland, guidelines were useless. Enforcement is near impossible, and families and doctors as well as patients will succumb to the pressures of pain, depression and inconvenience. Sadly, pain and depression are treatable. There have been tremendous advancements in pain management which the American medical community is only recently being brought up to speed on. Depression can also be addressed but some patients, families, and doctors are often too impatient and lacking in genuine compassion to do the hard work to bring someone out of a depression. It is easier to offer help in suicide.

The lessons of Holland need to reinforce in our minds the necessity of making as many people aware of the dangers as possible. Since our society is now dominated by a worldview that prizes individual autonomy and shuns any mention of Biblical ethics, it can be very easy, yet ultimately, deadly, to go along with the crowd.

Why Life Is Worth Living: What the Bible Teaches

As we discuss the issue of euthanasia and physician-assisted

suicide, it is critical that we not only understand what is going on in the world around us but that we also understand what the Bible clearly teaches about, life, death, pain, suffering, and the value of each human life.

First, The Bible teaches that we are made in the image of God and therefore, every human life is sacred (Genesis 1:26). In Psalm 139:13-16 we learn that each of us is fearfully and wonderfully made. God himself has knit us together in our mother's womb. We must be very important to Him if He has taken such care to bring us into existence.

Second, the Bible is very clear that God is sovereign over life, death and judgement.In Deuteronomy 32:39 The Lord says, "See now that I myself am He! There is no god besides me, **I** put to death and **I** bring to life, **I** have wounded and **I** will heal, and no one can deliver out of my hand." Psalm 139:16 says that it is God who has ordained all of our days before there is even one of them.Paul says essentially the same thing in Ephesians 1:11.

Third, to assist someone in committing suicide is to commit murder and this breaks God's unequivocal commandment in Exodus 20:13.

Fourth, God's purposes are beyond our understanding. We often appeal to God as to why some tragedy has happened to us or someone we know. Yet listen to Job's reply to the Lord in Job 42:1-3:

> *I know that you can do all things; no plan of yours can be thwarted. [You asked,] 'Who is this that obscures My counsel without knowledge?' Surely I spoke of things I did not understand,things too wonderful for me to know.*

We forget that our minds are finite and His is infinite. We cannot always expect to understand all of what God is about. To think that we can step in and declare that someone's life

is no longer worth living is simply not our decision to make. Only God knows when it is time. In Isaiah 55:8-9 the Lord declares, “For my thoughts are not your thoughts, neither are your ways my ways. As the heavens are higher than the earth, so are my ways higher your ways and my thoughts higher than your thoughts.”

Fifth, our bodies belong to God anyway. Paul reminds us in 1 Corinthians 6:15,19 that we are members of Christ’s body and that we have been bought with a price. Therefore we should glorify God with our bodies. The only one to receive glory when someone requests doctor-assisted suicide is not God, not the doctor, not even the family but the patient for being willing to “nobly” face the realities of life and “unselfishly” end everyone else’s misery. There is no glory for God in this decision.

Lastly, suffering draws us closer to God. In light of the euthanasia controversy, listen to Paul’s words from 2 Corinthians 1:8:

> *We were under great pressure, far beyond our ability to endure, so that we despaired even of life. Indeed, in our hearts we felt the sentence of death. But this happened that we might not rely on ourselves but on God, who raises the dead.*

Not only does He raise the dead but there is nothing that can separate us from His love (Romans 8:38). For an inspiring and thoroughly biblical discussion of the euthanasia issue, read Joni Earickson Tada’s book *When is it Right to Die?* (Zondervan, 1992). Her testimony and clear thinking is in stark contrast to the conventional wisdom of the world today. We must do the same.

What Will You Do? What Can You Do?

The Christian Medical and Dental Society has produced an excellent resource on physician-assisted suicide titled *The Battle for Life.*(9) As a part of the package they provide several cases to test your grasp of the principles involved and to help Christians be aware of the tough decisions that have to be made. I would like to share two of those with you and then discuss what you can do now to combat the "right to die" forces in this country.

Here is test case one:

> *Your 80 year-old grandmother has been fighting cancer for some time now and feels the emotional strain. She feels like she'll become a burden to the family. Her doctor notes that she seems to have lost her desire to live. Should she be able to have her doctor give her a prescription expressly designed to kill her?*

This is precisely what the courts have legalized in recent months and precisely what God's word says is wrong. It is wrong because it would be taking her life into our hands and violating God's sovereignty. Because physician-assisted suicide goes beyond letting someone die naturally to actually causing the death, it violates God's commandment, You shall not murder. There is a clear distinction between allowing death to take its natural course in someone who is clearly dying with no hope of a cure, and taking specific measures to end someone's life. There comes a time when the body is imminently dying. Bodily functions begin to shut down. At this point, people should be made as comfortable as possible, be supported and encouraged by their family and doctors, and allowed to die. This is death with dignity. Taking a lethal injection or breathing poisonous carbon monoxide takes life out of God's hands and into our own.

Test case number two:

> *Your spouse has an incurable fatal disease, has lost control of bodily functions and is unable to communicate. Special treatment and equipment can extend your spouse's life for a few weeks or even months but will involve much pain and exhaustion. Would it be morally right for you to not arrange for the treatment?*

Many would accept a decision not to arrange for treatment because that would not be killing but simply allowing death to take its natural course. Such decisions are not always clear-cut, however, and a physician and family members must take into account the pros and cons of intervention versus a faster natural death. Sometimes we rationalize that we need to keep the patient alive as long as possible because God may still work a miracle. But just how much time does God need to work a miracle? If God is going to intervene He will do so on His time and not ours.

Now that we have a better understanding of the issues, you may be wondering just what we can do about this threat among us. Three things:

Pray – Pray that God will turn the hearts of people back to Himself and back to protecting life. Pray for righteousness and justice in our legal system, that we enact laws that preserve life, punish the guilty and protect the innocent.

Speak Out – Present this information to other groups. Talk with your friends and family and discuss the reasons for protecting life.Contact your state and federal legislators and tell them to stand against physician-assisted suicide.

Reach Out – Visit the elderly, care for those who can't care for themselves, comfort the sick. Consider joining or starting a church ministry to the elderly, handicapped, or other individuals with special needs. As Christians we must lead the

way with our hearts and actions and not just our words. If we devote our energies to providing quality and loving care and effective pain control, the euthanasia issue will die from a lack of interest.

Notes

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8. Robin Bernhoft, M.D. 1995. Quoted in *Euthanasia: False Light*. Produced by IAETF, P.O. Box 760, Steubenville, OH

43952. Running time: 14:48.

9. *The Battle for Life* is an educational resource kit produced by the Christian Medical and Dental Society. The Kit includes an award winning video, *Euthanasia: False Light*, a leader's presentation guide with discussion questions, handouts for Christian and secular audiences, overhead transparencies, Biblical principles summary, research synopsis, cassette tape of public service announcements, and bulletin inserts. The Kit is available from the Christian Medical and Dental Society, P.O. Box 5, Bristol, TN 37621, Phone (615) 844-1000, FAX: (615) 844-1005. The retail price for the complete kit is $30.

The Sanctity of Human Life: Harvesting Human Fetal Parts

The grisly effects of over twenty years of an abortion industry in this country are becoming easier to document all the time. In Pennsylvania, the "anatomy specialist" for The International Institute for the Advancement of Medicine has a task that would cause many of us to become physically ill. He travels to local abortion clinics seeking abortion remains. He searches for fetal parts and tissues that may be of use to medical doctors and researchers. The Institute is one of a half-dozen fetal tissue providers in the country. They will charge handling fees of $50 to $150. These companies distribute over 15,000 specimens to doctors and researchers annually. Some large medical centers at universities regularly supply fetal parts to their own doctors and researchers (*The Human Body Shop*, by Andrew Kimbrell, HarperCollins, 1993, pp. 45-66).

The growth and future prospects of the fetal tissue market are actually quite good. Despite controversy over their effectiveness, the use of fetal organs for transplants is expected to grow. Prime targets for recipients are the 1 million Parkinson's disease victims, 3 million Alzheimer's patients, 6 million diabetics, and 25,000 with Huntington's disease.

The growth of this industry is assured for three reasons. First, fetal tissue comes from sources the Supreme Court in Roe vs. Wade does not consider persons. This gives developing babies virtually no legal status, and there is no recognized need for regulation of "non-descript tissue." Second, fetal tissue exhibits tremendous developmental potential. The use of fetal tissue in transplants is desirable since these tissues are expected to grow and hopefully replace adult tissue that has ceased to function or functions improperly. In the case of Parkinson's disease, fetal brain tissue is transplanted into the brains of Parkinson's victims in the hope that the fetal tissue will perform normally and lessen or eliminate the effects of the disease. Third, fetal tissue is available in an abundant and continuous supply. With over 1.5 million elective abortions performed in this country every year, the supply of fetal tissue is bountiful.

These prospects are complicated further by the fact that the best tissue for research and transplants is tissue obtained from fetuses that were still alive when the tissue was obtained. There is no way to offer protection under current law. France, the United Kingdom, Australia, Canada, and Sweden all have guidelines but no laws. The U.S. had the Reagan moratorium on fetal tissue research involving federal funds. But this moratorium has been misunderstood. All it did was ban the use of federal funds for this research, not ban the research altogether. This ambiguous situation provides new pressures on pregnant women seeking abortion. Some are asked to allow their abortion to be performed by certain procedures

to allow for the live acquisition of fetal parts. So not only is she asked to end the life that thrives within her, but she is sometimes asked to sign a permission waiver to allow for a particular procedure. The lack of legal status will lead to a commercial industry. President Clinton virtually assured this prospect when he lifted the ban on using government monies for research using fetal tissue from elective abortions.

This is no time to lose heart or grow faint in the pro-life movement. The fetal tissue industry will exert new monetary pressures to continue abortion on demand. This raises an additional rationalization that abortion is for the common good. “Just look what can be done for those suffering from these diseases” they will say. We must stiffen our resolve and understand what is happening in our culture.

The Sanctity of Human Life and the Bible

As the pro-life movement encounters increasing pressures from inside and outside, it becomes more important than ever to have our thinking grounded in Scripture. We must not only know what we believe, but also why. Some of these passages are ones you are familiar with to some degree, but some of them may be new. In either event, they are important to have for quick reference.

Psalm 139:13-16 says, “For Thou didst form my inward parts; Thou didst weave me in my mother’s womb. I will give thanks to Thee, for I am fearfully and wonderfully made; wonderful are Thy works, and my soul knows it very well…. Thine eyes have seen my unformed substance; and in Thy book they were all written, the days that were ordained for me, when as yet there was not one of them.” David clearly implies that God is intimately involved in the process of embryological development inside the womb. David also indicates that the days of every developing human have been numbered from before birth.

Psalm 51:5 says, “Behold I was brought forth in iniquity, and in sin my mother conceived me.” David is not suggesting that he was born as the result of a sinful relationship. What he is saying is that from the time he left his mother’s womb, even from the moment he was conceived, he was a sinner. David, therefore, was not some amorphous blob of tissue at conception, but a spiritual being with a sin nature. Some may object that I am using a modern day definition of conception and applying it to a 3,500-year-old text. However, conception was recognized as the beginning of life. They understood that the seed of the man needed to be combined with the seed of the woman and out of that union, a new life was brought forth. While our technical knowledge may be more precise, the idea is still the same.

Several individuals in Scripture tell us that they were called to their respective ministries before birth or while still in the womb. The Lord tells Jeremiah in Jeremiah 1:5, “Before I formed you in the womb I knew you, and before you were born I consecrated you; I have appointed you a prophet to the nations.” Isaiah says in Isaiah 49:1, “The LORD called me from the womb; From the body of my mother He named me.” Paul says in Galatians 1:15, “But when He who had set me apart, even from my mother’s womb, and called me through His grace, was pleased to reveal His son in me.” Our days were not only numbered, but our ministries already planned from the time before we entered our mother’s womb. Each and every life is indeed valuable in God’s eyes.

Even more instructive is the miracle of the Incarnation. In Matthew 1: 18-20, we are told that Mary was with child by the Holy Spirit. Jesus entered the world at the point of conception.

We celebrate the incarnation at Christmas, Jesus’ birth, but the actual event took place at conception. This reality is brought home to us when Mary visits her cousin Elizabeth a short time later. John the Baptist, at six months gestation in

Elizabeth’s womb leaps for joy inside her as he comes into the presence of the Messiah in Mary’s womb. At that point Jesus was not just a blob of cells or mere tissue. He was the Messiah, the Son of the Most Holy God. It is also important to note that John the Baptist was filled with the Holy Spirit and leaped for joy in the womb. Only beings made in God’s image can be filled with the Holy Spirit and that is what John was.

The Other Side of Life

Euthanasia has taken root in the culture and in our nation. Doctor-assisted suicide propositions failed in Washington State and California before passing in Oregon this last election. Dr. C. Everett Koop fears that for every Baby Doe that is allowed to die in a hospital due to physical or mental handicaps, there will be 10,000 Grandma Does. There is no question that we are faced with many difficult decisions concerning the end of life today because of the immense technological ability to sustain life indefinitely. While we hold that every life is sacred in the eyes of God, does there come a time when the merciful and right thing to do is to end a life?

The Bible actually has something to say to us in this matter. Apart from the commandment against murder there is additional information concerning the sanctity of life in 1 and 2 Samuel. For example, 1 Samuel 31 tells of the death of Saul’s sons, including Jonathan, in battle with the Philistines. When Saul witnesses these events and sees that defeat is unavoidable, he asks his armor bearer to kill him because he cannot stand the thought of capture by the Philistines. The armor bearer refuses out of fear, so Saul falls on his own sword to kill himself.

We learn, however, from an Amalekite who brings news about Saul to David in 2 Samuel 1, that like many other events during his reign, Saul did not get his own suicide quite right. We learn that this Amalekite had come upon Saul, whose

life still lingered in him, at which point Saul requested that the Amalekite finish the job, which he did. Upon news of the King's death, David and his followers tear their clothes and mourn the death of the King of Israel. David next asks the Amalekite why he did not fear to slay God's anointed leader (Saul). Without waiting for a reply, David has the man struck down. It could be argued that David's drastic response could be because it was the King. But just as clearly, this man took Saul's life, and capital punishment was administered. God is a God of life and not death.

The New Testament constantly presents death as the enemy. Jesus wept at the tomb of Lazarus not just because of the loss of a friend, but also because of the spoiling effects of death on His creation. Jesus continually healed the sick, even those who were close to death, not just to relieve suffering but because death was the enemy. Jesus' message was clear: we are to seek to preserve life not find ways to terminate it.

But many in our society face difficult decisions concerning life and death. When are extra-ordinary measures justified and when should nature be allowed to take its course? Some would even say that the merciful thing to do is to take active measures to end a life that is wracked with incurable suffering. Christian Medical ethicist, John F. Kilner, presents a threefold imperative for making decisions in this area. Our decisions should be **God- centered**, **Reality-bounded**, and **Love-impelled**. *God-centered* in that we have studied what Scripture has to say about life and death. We have gained an understanding of God's perspective. *Reality- bounded* in that we have educated ourselves concerning the relevant medical technologies and capabilities as well as the status of the patient. *Love-impelled* in that we consider others as more important than ourselves and that we are seeking the comfort and treatment of the one who is ill and not what will be easier for us to handle. All too often today, society offers a caricature of godly love and offers it up as the only

criterion to be considered.

Decisions of Life and Death in the Real World

When asked about issues of death and dying, a book I always recommend is by Joni Eareckson Tada, *When Is It Right to Die?* Joni brings a unique blend of biblical interpretation, personal experience, and knowledge of modern medicine to the issues of suffering, mercy, suicide, and euthanasia. One of the more important points in the book is that there is a real difference between allowing nature to take its course in a person who is clearly dying and taking specific measures to end someone's life. Joni quotes former U.S. Surgeon General and co-author of the book, *Whatever Happened to the Human Race?*, C. Everett Koop:

> *If someone is dying and there is no doubt about that, and you believe as I do that there is a difference between giving a person all the life to which he is entitled as opposed to prolonging the act of dying, then you might come to a time when you say this person can take certain amounts of fluid by mouth and we're not going to continue this intravenous solution because he is on the way out.*

This is what death with dignity is supposed to be all about. There does come a time when a patient is dying and there is nothing to be done to heal or cure him. The next question then is how long and with what measures do you prolong the act of dying. As a person dies, various bodily functions begin to shut down. Some will completely lose the ability to eliminate fluids from the body. In these cases, if intravenous fluids are continued, the body will bloat and become extremely uncomfortable. Medical care becomes torture. Better to remove the intravenous solution, provide limited fluid by mouth, and allow the dying process to continue while making the patient as comfortable as possible.

Withholding fluids in this case is totally different than withholding fluids from a newborn Down's Syndrome child because the parents don't want the child. The latter is murder. What is important here is to realize that every case is different. There is no set of rules that will be able to govern every possible situation. That is why any law attempting to legalize doctor- assisted suicide is dangerous. It is simply impossible to cover all the bases. The law will be abused.

We have the clear testimony of the Netherlands to back that up. A 1991 article in the *Journal of the American Medical Association*, stated that rules were established governing euthanasia in the Netherlands by the courts in 1973. However, the article stated that only 41% of the doctors obey the rules, 27% admit to having performed involuntary euthanasia (without consent of the patient), and 59% are willing to do so under various circumstances. In 1990, 5,941 deaths were the result of involuntary euthanasia.

But why is euthanasia gaining so much popular support? The reason is fear. People fear the power of modern medicine. They are worried that modern technology is out of control and that they may be left on life-support indefinitely and unnecessarily. People also fear the loneliness and pain of death. Today there is no reason to fear the pain. Surprisingly, the U.S. is a bit behind the rest of Western medicine in the treatment of pain in that there are many options available to treat pain and nearly eliminate it entirely for a dying patient. The loneliness is best dealt with in a hospice. A hospice is designed to take care of the emotional, mental, spiritual needs as well as the physical aspects of the terminally ill. In a hospital, a dying patient is often seen as a failure. A hospice can effectively provide care that is God- centered, reality-bounded, and love-impelled.

A Call to Action and A Warning

In this discussion I have tried to lay out some of the clear biblical and medical issues that face us today in the pro-life movement. Often we can become confused as to what we can do that is effective in turning the culture around. Certainly using the ballot box effectively is important. Making use of our representative form of government by writing letters and calling the appropriate legislators to let them know our position on a particular issue is another. But I would like to conclude with a specific encouragement and a warning.

My encouragement is to become involved in whatever way possible with a crisis pregnancy center in your area. If there isn't one, get a group together to find out how to start one. The Christian Action Council out of Washington, D.C., has set up hundreds of them around the country. Assisting women in a crisis pregnancy has a clear biblical parallel with how God treated Hagar when she left Abraham's household.

You will remember that when Sarah became frustrated with her inability to provide Abraham with a son to fulfill God's promise, she brought her servant, Hagar, to Abraham as a substitute. Abraham consented, of course, and soon found himself in trouble. When Hagar conceived there was immediate tension. Hagar was jealous because although she performed the duties of a wife for Abraham, she had gained none of the privileges. Sarah on the other hand was resentful because Hagar was successful where she had failed. Sarah complained to Abraham about Hagar's outward hostility and half- rightly blamed him for Hagar's mistreatment of her. Abraham gave Sarah permission to mistreat Hagar, and Hagar ultimately fled into the desert. This was indeed a crisis pregnancy. Hagar's child in her womb was the result of an adulterous relationship: she had been abused and mistreated, and she was now homeless and destitute.

But God met her in her time of need. He provided for her

materially by telling her to return to Abraham and Sarah. He comforted her emotionally by assuring her that her child was important to Him by indicating that it was a son and He already had a name picked out for Him: Ishmael, meaning "God hears." God also promised that her son would be the father of many nations. Hagar chose life for herself and for her son. Today, women will choose the same path if provided with the truth surrounded by love and compassion.

My warning is to say simply that violence is never justified in our fight to save lives. First, we are commanded to submit and obey governmental authorities (Titus 3:1 and Rom. 13:1). Remember that Moses was banished for 40 years for taking matters into his own hands in Egypt when he killed an Egyptian soldier who was mistreating an Israelite worker (Exod. 2:11). Moses had one solution in mind, but God had another. Israel had every right by today's standards to rise up in armed rebellion. God, however, had another plan. Civil disobedience is certainly allowed when God's laws are violated, but violent protest is nowhere recorded in Scripture (Exod. 1,12; Daniel 3; 1 Kings 18; Acts 4-5; Rev. 13). Daniel disobeyed the law of the land but submitted to the lion's den as did the martyrs of the early church when faced with terribly brutal and unjust persecution. Jesus rebuked Peter's use of the sword at His arrest (Matt. 26:52). Jesus submitted to Pilate's authority. He said, "You would have no power over me if it were not given to you from above" (John 19:10-11).

Whether dealing with abortion, helping women victimized by the allure and power of a legal abortion industry, or comforting people afraid of pain, suffering, and death, our response should be God- centered, rooted in the sanctity of human life; reality-bounded, knowledgeable about the situation, and love-impelled, guided by the desire to extend the love of Christ to all.

Human Cloning

Note: Please read The Little Lamb That Made a Monkey of Us All for the author's comments on the news of a successful lamb cloning (March 7, 1997). Also, please read the author's subsequent article Can Humans Be Cloned like Sheep? for an updated, expanded discussion.

Human cloning: Is *Brave New World* just around the corner? Well, no, not even close. Reports of human cloning in early October 1993, by researchers Robert Stillman and Jerry Hall from George Washington University sparked a firestorm of controversy. While a real-life version of Aldous Huxley's science-fiction prediction is nowhere near being fulfilled, there are serious questions about the ethical legitimacy and potential abuses that could result from the recently announced research.

In one respect, I sympathize with the scientists involved who naively felt their work was nothing unusual and who suddenly found themselves the subjects of *New York Times* and *Time* magazine cover stories as well as the special guests on "Good Morning America," "Nightline," and "Larry King Live." The spotlight did not suit them very well. Some aspects of the media hoopla were drastically overplayed, but other concerns are very real. What did the research actually accomplish?

Stillman and Hall, rather than cloning humans, actually just performed the first artificial twinning using human embryos. A similar procedure has been performed in mice successfully for twenty years and in cattle for ten years. Identical twins are produced when a fertilized egg divides for the first time and instead of remaining as one organism, actually splits into two independent cells. Stillman and Hall were able to achieve this

same effect by removing the protective layer around the developing embryo (zona pellucida), splitting the cells apart, and replacing the outer coating with an artificial shell.

Essentially, this raises the possibility of creating as many as eight identical embryos where there was once only a single embryo consisting of eight cells. The procedure was pursued in order to assist couples seeking in vitro fertilization. Many women are unable to produce multiple eggs. Once fertilized, the resulting embryos only implant 10-20% of the time. Therefore, if you have 2 to 8 identical embryos, all formed from one original embryo, you can implant one and freeze the rest. If the first implant is unsuccessful, you can thaw one of the frozen twins and try again.

To call this cloning, as the media have done, is a bit misleading. The more usual meaning of cloning an individual would be to take a cell from an adult individual, remove the nucleus, implant it in a fertilized egg that has had its nucleus removed. Strictly speaking, this is not possible today. The feat was accomplished in frogs back in 1952 by taking the nuclei of cells from the intestinal lining of tadpoles and implanting them into fertilized eggs that had the nuclei destroyed by irradiation. However, only about one in a thousand implants are successful. Many of the frogs die early but others grow into rather grotesque monsters. No, true cloning is a long way away indeed.

So if true cloning has not actually been achieved, then is there any real cause for concern? Indeed, there is!

The Ethical Dilemmas of Artificial Twinning

The initial outcry concerning the work of researchers Stillman and Hall at George Washington University has come from the public and the media. But many of their own colleagues are upset.

Many within the field have recognized for quite some time that artificial twinning would be possible with human embryos. But they knew that such experiments would raise a host of ethical concerns that they were unwilling to deal with. It is unfortunate that Stillman and Hall were so unprepared for the controversy because it just reinforces the idea many of us have that all scientists are blind to the ethical ramifications of their work. It is clear from interviews that Stillman and Hall care deeply, but just didn't think ahead.

Jerry Hall was asked in the *Time* magazine article (8 November 1993, p. 67) if he feared that his work would create a public backlash towards this kind of research. He said: "I respect people's concerns and feelings. But we have not created human life or destroyed human life in this experiment." What this statement implies is that Hall and Stillman do not consider the embryos they were working with as human life. The embryos used in this research project were doomed from the start because they were fertilized with more than one sperm. The extra genetic material precludes the possibility of normal embryonic development. But does this mean that these embryos are not human?

Many individuals carry a death sentence because of congenital conditions or genetic disease, but they are certainly human. We will all die eventually. The timetable is not important. I believe that these embryos were human beings and further experimentation was performed on them which added an additional risk to their already imperiled condition. If I had been a member of the ethical review board of George Washington University, I would have denied permission to pursue these experiments. Human experimentation was performed without informed consent.

Hall and Stillman have defended their work by saying they consider it only a logical extension of in vitro fertilization. These efforts are driven by a desire to relieve human suffering—in this case the suffering of infertile

couples. I know of many couples who have battled infertility, and I know that their pain is real and deeply rooted. But I also believe that this is a case where our desire to live in a painless world is clouding our ability to make moral decisions. One woman who had undergone eight unsuccessful in vitro attempts was asked if she would be willing to try artificial twinning. She said: “It’s pretty scary, but I would probably consider it as a desperate last attempt.” She is clearly frightened by the moral and ethical implications, yet if nothing else worked, she’d do it! Our decisions are based more on the tug of our hearts and pocketbooks than with our minds. We are losing our moral will! The whole subject is rife with potential abuses by people on all sides of the issue.

What Are the Potential Abuses of Artificial Twinning?

While artificial twinning itself raises some serious ethical questions, other possible scenarios that this research can lead to are just as troubling.

The two researchers involved have remarked that they felt their research was just the next logical step after in vitro fertilization. One of the warnings of Kerby Anderson, a familiar voice on the Probe radio program, in his book *Genetic Engineering* over ten years ago, was the argument of the slippery slope. Once a new technology is perfected, it opens up other technologies which are more troublesome than the original. Once started down the slope, it is hard to reverse directions. Hall and Stillman, by their own admission, have taken the next step down the slippery slope after in vitro fertilization. It is now important to assess the next step.

There are several scenarios which have received attention. One concerns couples who are known to be at risk for a hereditary disease such as cystic fibrosis. If from a single fertilized egg, two to four identical embryos could be created by the

artificial twinning process, then one could be tested for the genetic marker, and the others held in frozen storage. The genetic testing may require the destruction of the initial embryo. If the test is negative, then one of the reserve embryos could be thawed, implant- ed, and brought to term. This process is hardly respectful of human life. If the test confirms the presence of the genetic disease, all embryos could be destroyed.

Another suggestion is that the artificial twins could be kept frozen as an insurance policy even after the original child is born. If the original child dies at an early age, a frozen twin could be thawed, and the parent would have the identical child to raise again. Another suggestion has been to keep the frozen twins available in case the original twin needs a bone marrow transplant or some other organ. The tissues would match perfectly. A couple in California has already set a precedent by electing to have another child to provide bone marrow for their older daughter that had contracted leukemia. Fortunately for them, the tissues matched and both children are doing fine.

A final scenario suggests that frozen twins can be kept in reserve as the saleable stock for children catalogs. A catalog could be set up offering pictures and descriptions of the original twin and offering prospective parents the opportunity to have the very same child. This may sound foolish to you, but there are many in our society who would be willing to pay for just such a service. If you truly respect human life, then none of these possibilities should make sense. In light of what we have discussed, the subject of placing limits on scientific research also needs to be addressed.

What Can Constrain Scientific Research?

One of the questions that inevitably comes up is whether such research should be allowed to be done at all. Some of the scenarios I mentioned earlier are chilling. We wonder if such

things can be stopped by restricting the kinds of research that is done.

I have to admit that as a scientist myself, I am wary of giving the public a free voice to approve or disapprove what kinds of research are pursued by qualified scientists. Scientists themselves are usually the best judges of whether a particular project is worth doing on its scientific merits. Only other scientists can judge the worthiness of a research proposal based solely on its ability to contribute significantly to our body of scientific knowledge. In a society deeply rooted in the Judeo-Christian heritage, scientists could generally be trusted to make the correct moral decisions about their research as well. But this is not the case in our society today. We are a culture which is without a moral rudder. There is indeed a culture war going on. One of the consequences of this lack of direction is that many scientists and ethicists believe that scientists should be free to pursue their research goals regardless of what the long-term consequences might be.

John Robertson is a professor of law at the University of Texas. In a recent editorial, he said:

> *As long as the research is for a valid scientific purpose, embryos that would otherwise be discarded can, with the informed consent of the couple whose eggs and sperm produced the embryos, be ethically used in research. Neither the lack of guidelines, the moral objections of some people to any embryo research, nor the fears about where cloning research might lead justify denying researchers the ability to take the next step. (Chronicle of Higher Education, 24 November 1993, p. A40)*

Essentially Professor Robertson has insulated himself from any criticism from outside the scientific community. As long as informed consent can be obtained from the parents, the sole

criteria is a valid scientific purpose. Questions concerning the sanctity of human life are not allowed. Questions concerning the potential abuses are not allowed. In other words, scientists exist in some kind of a moral vacuum.

I am afraid that this kind of research is going to continue simply because there is not a large enough moral consensus present in society to prevent it. We have become too powerfully driven by the personal end in mind to repudiate the means to get there. Do we raise our voices in protest? Certainly. Do we continue to point out the moral and logical fallacies in the prevailing arguments? Certainly. But until the culture at large turns its attention from the immediate gain and considers what is right, the ethical slide will continue.

Moreover, there is the even more questionable and fear-provoking question of whether true human cloning is feasible.

Is Human Cloning Really Possible?

True cloning, as opposed to artificial twinning, is much more involved. Cloning is a technique that is partly successful in frogs. Frogs can be cloned by collecting eggs from a female frog. The nucleus in the eggs is destroyed by irradiation. Next, cells are isolated from the intestinal lining of a tadpole. The nucleus is removed from the intestinal cell and placed within a previously enucleated egg. The egg now has the opportunity to begin cell division and development.

Most of these embryos do not survive. Of those that do survive, the majority grow into rather grotesque monsters. Only about one in a thousand develop into a normal looking adult frog. One small catch is that all of these normal looking frogs turn out to be sterile. Even so, this is a remarkable achievement. But is this possible in humans, and if so, what are the barriers.

The first item to note is that the frog experiments utilized nuclei from a developing tadpole. Embryonic tissue is still actively dividing. Using a nucleus from a dividing cell is crucial to the success of these experiments. Non-dividing cells such as adult bone and neural cells have had the cell division portions of their genes turned off by a variety of molecular mechanisms. That is why the use of most adult cells would be impossible in these experiments. They wouldn't work. It also explains why DNA from long dead cells such as from a mummy, or even a dinosaur as in Jurassic Park is totally impractical.

Some cells in the adult body are actively dividing, such as skin fibroblasts. These cells continually supply new skin cells to replace those which sluff off. In fact it was skin fibroblasts that were purportedly used for cloning a man in David Rorvik's fictional book, *In His Image: The Cloning of a Man*, back in the late seventies. But there are difficulties here too. Skin cells have had many genes switched off. These are skin cells, not liver cells, or eye cells, or bone cells. All of the genes needed to produce the unique proteins required by all these specialized cells have been switched off by a variety of molecular mechanisms. Many of these mechanisms are unknown; consequently, we do not know how to unlock them. Nor do we know how to get them expressed in the correct sequence necessary for embryological development.

There are so many roadblocks to the successful cloning of an adult human that I don't expect it any time soon. However, I am afraid our current culture will pursue this possibility as long as there is potential profit and a perceived scientific benefit.