

Ethical Choices in the Genetic Age

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Part 1: Reproductive Cloning

The Genetic Age

Futurists are calling it “The Age of Genetic Biology.” Its birth was announced by advances that astonished even the scientifically sophisticated—DNA fingerprinting; genetic testing; transgenic animals; genetically modified foods; “Dolly” the sheep; the Human Genome Project; somatic gene therapy; adult and embryonic stem cells. The machine-gun pace and raw power of these discoveries foreshadow dramatic changes in genetic medicine and biotechnology. The medical and commercial applications that emerge during the new epoch will likely eclipse the achievements of physics and chemistry during the past century. Reinforcing that prediction is the fact that President George W. Bush’s first major address to the American people was not about recession, war, or terrorists, but about stem cells.

How much will the Genetic Age affect our lives? Consider the impact of electricity, automobiles, air travel, television, integrated circuits, wireless communication, computers, and the Internet on commerce, health care, and daily life. Now imagine the effects of biological innovations with the potential to control cancer, heart disease, and stroke; jumpstart another “Green Revolution”; check infectious diseases; correct genetic defects; regenerate diseased tissues; delay aging; generate targeted pharmaceuticals; boost the nutritional content of crops; and create foods that protect themselves and us from infection.

Reactions to such predictions range from keen enthusiasm to dire warnings of doom. Individual responses seem to depend on three factors. Medical need is a powerful determinant, outweighing philosophical or political philosophy. You might expect entertainment personalities Mary Tyler Moore (a diabetic), Christopher Reeve (a quadriplegic), and

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Michael J. Fox (a Parkinson’s sufferer) to be proponents of stem-cell research. It may be more surprising to learn that former First Lady Nancy Reagan, Health and Human Services Secretary Tommy Thompson, White House Chief of Staff Andrew Card, and Utah Senator Orrin Hatch—all staunch conservatives—have also lobbied for federal support of stem-cell work. Each has a family member afflicted with a condition that may be helped by stem-cell therapy.

Reproductive cloning raises a host of ethical issues.

A second important factor influencing acceptance is the person’s grasp of the science. Understanding a technological development generally predisposes one to a positive opinion. However, the rapid pace of biomedical research seriously challenges our ability to stay informed and to make reasoned choices about how to proceed. Adventist students need to understand the scientific, ethical, and religious implications of progress in these fields. Consequently, this series of articles will provide basic information about reproductive cloning, stem cells, and gene therapy.

A third factor is one’s personal convictions about human-

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ity's role in the natural world—a subject with deep religious and philosophical roots. Simply stated, now that we can do so, just how much should we alter the circumstances in which we find ourselves? How far should we go in remodeling the world or ourselves? At what point do we overstep our boundaries and trespass on the prerogatives of God? A thorough discussion of these questions could fill a library. We will review a few concepts to help Adventist teachers guide their students in developing reasoned opinions.

Reproductive Cloning

Let's begin our discussion by examining reproductive cloning. At its root, a clone is a replica. However, since the word *cloning* has been applied to several different biological manipulations, it's helpful to distinguish among them. **Gene cloning** is the isolation and replication of DNA segments. Embryo cloning (or blastomere separation) is the artificial division of an early embryo to produce multiple, fully formed offspring. **Reproductive cloning** is a type of asexual reproduction. We have been doing this for millennia with plants, taking cuttings from prized rose bushes and rooting them to create new plants.

Public attention has focused on reproductive cloning, or more precisely, “somatic cell nuclear transplantation.” This process creates a genetic replica of a living animal by reprogramming the nucleus from a body cell so it behaves like a fertilized egg. In practice, this involves injecting the nucleus from an adult donor cell into an egg from which the original egg's DNA has been removed. Under ideal conditions, the egg—with its new genetic material—develops into an embryo. When surgically implanted into the uterus of a hormonally prepared female animal, the embryo may develop into a normal offspring. Our world is now home to scores of sheep, mice, pigs, goats, cattle, a kitten, a guar (Asian ox), and a mouflon (wild sheep, produced by transplanting

nuclei from adult cells.

Public response to cloned sheep Dolly's birth was intense, almost panicked. The possibility of duplicating living humans clearly challenged personal sensibilities. Countless pages were written about the significance and consequences of cloning humans. In spite of early warnings, the prospect of human clones seemed remote before 1997—a subject for science fiction novels and abstract debates. Dolly made it imminent.

Why Are We Here?

How should Christians respond? Some consider Genesis a completed story, a chapter of Earth history that God closed on the sixth day of Creation. They regard God's original ordering of nature the perfect fulfillment of a sacred design. Human intervention, in this view, would be irreverent, disruptive, an expression of hubris.

A careful reading of the Creation story leads Seventh-day Adventists to a more nuanced stance. The Genesis account clearly indicates our dependent status, but it also teaches our kinship to the Creator, our God-likeness. Most agree that God's image in humanity encompasses intellect, moral agency, individuality, creativity, the capacity for altruistic love, and the ability to find fulfillment in relationships with other people and with God. We might add still another trait to the list. Notice that the Genesis text answers one existential question, but raises another. We were made by God—but why? Did He have a specific purpose? Does humanity have a role distinct from God's other created beings? Why were we made at that particular moment?

The setting of Creation suggests that God was saying something significant about Himself when He shared the creative function of reproduction: “Be fruitful and increase in number; fill the earth and subdue it. Rule over the fish of the sea and the birds of the air and over every living creature that moves on the ground” (Genesis 1:28, NIV). It was God's plan for humans to be co-creators with Him—to exercise their creative and reproductive power to expand the Garden, husband the Earth, and improve it. This is part of our operating instructions. God intended that procreation be consciously controlled, as deliberate as composing a symphony or painting a landscape. The reproduction-as-creation concept, added to the injunction to multiply, invests human reproduction with moral value and supports the use of techniques to assist reproduction.

In light of these concepts, let's explore some concerns raised by human cloning.

Safety

First, “do no harm”—a prime directive of the physician's oath. Dolly was the only animal to survive from 277 treated oocytes transferred to surrogate mothers—a success rate of about 0.4 percent.¹ A modified technique called pronuclear microinjection raised the suc-

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cess rate to 1.3 percent and produced Cumulina, the first cloned mouse.² In cattle, cloning nuclei from adult cells has produced long-lived offspring at rates exceeding 4 percent.³ All the reports, however, indicate that nuclear transfer cloning is associated with heavy losses at every stage of embryonic and fetal development, with stillbirths, newborn deaths, and serious congenital malformations in the few survivors. Most troubling are the late gestational losses that, in humans, would constitute a grave threat to the health of the mother.⁴ Experts surmise that all cloned animals have defects, obvious or subtle.⁵ Even Dolly, the “poster child” for cloning, suffers from mid-life arthritis and morbid obesity. Furthermore, repeated attempts to clone non-human primates have been uniformly unsuccessful.⁶ These observations underlie the hostile receptions given researchers who have at various times announced their intent to clone humans.⁷

Reproductive cloning using somatic cell nuclear transplantation fails to meet minimum safety standards for an elective medical procedure. The National Research Council⁸ and the now-defunct National Bioethics Advisory Commission⁹ rejected human cloning specifically because it would expose the fetus, the developing child, and the mother to unacceptable risks. From the Christian perspective, Scripture is clear in its call to protect human life, especially the lives of the most vulnerable.¹⁰ Cloning is morally precarious because it is medically hazardous.

We must recognize, however, that the National Bioethics Advisory Commission identified no other compelling ethical arguments against cloning. Furthermore, nuclear transplantation cloning is under intensive development. Since Dolly, the success rate appears to have improved more than tenfold. Another fivefold improvement might yield newborn clones at the rate of the best fertility clinics. Should the moratorium be lifted at that point, or are there other persuasive reasons to avoid cloning?

Unique Belings

A Sunday newspaper supplement featured the responses of teenagers to the prospect of human cloning. “So people will be cloned,” said one 18-year-old, “but you won’t know who the clones are, walking down the street. And how do you know if they’re going to even have a soul? How do you know, like, *what’s* walking down the street?”

Cloning challenges pervasive beliefs about personal identity. It evokes the specter of twinning and identity-switching, ideas so intertwined that they merge in our language. (Notice how the word *duplication* combines the ideas of both “two-ness” and “trickery.”) We

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Manual removal of the genetic material from a mammalian oocyte (immature egg).

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Injection of a nucleus from a body cell into an enucleated mammalian oocyte.

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A normal human embryo at the eight-cell stage of development.

intuitively expect individuals to look different and feel that physical distinctness is required for personhood. This is related to the idea that every individual must have unique genetic material and that genes determine the total physical and psychic nature of a human being. The European Parliament reflected this belief in its resolution on cloning, claiming, in part, that “each individual has a right to his or her own genetic identity . . .”¹¹

As powerful as these convictions may seem, they have no basis in fact. Monozygous twins are clearly individuals. Natural twins develop distinct personalities as a consequence of their independent experiences, environments, and choices. In spite of their identical genes and similar appearance, twins become fully individual “souls.” *Genetic uniqueness is not an essential component of personhood.*

Unlike a twin, a clone would have a different birth mother, would grow up in a different family, and would live at a different time than its nuclear donor. Even physical resemblance would be obscured by the different ages of the clone and the donor.

At the genetic level, their mitochondrial DNA would likely be different. For those reasons, a cloned person would mature into an individual who was entirely distinct from its nuclear donor. Clones of Albert Einstein or Michael Jordan are just as likely to become accountants and shoe salesmen as theoreticians and basketball stars.

To some extent, popular conceptions about genetic uniqueness reflect the

progress of molecular genetics. We are bombarded with reports of new genes that, according to the popular press, control everything from reading disability, schizophrenia, obsessive-compulsive disorder, and homosexuality to addictive behavior and criminality. The constant barrage has fostered a “Genes-R-Us” mentality—the belief that our faults lie, not in our stars, but in our DNA. The evidence, however, indicates that genotype accounts for no more than half of the variability between individuals. The rest of human distinctness comes from other sources—nurture, chance, or choice. Nearly everyone agrees that the genetic make-up of a sexually reproduced person does not limit that person’s autonomy. Why, then, would we expect a particular set of genes to constrain the freedom of a clone? Erik Parens of the Hasting Center summarized the matter eloquently: “As everyone in this room knows,” he said, “you can’t clone a self, because a self is a function of infinitely more than one’s genetic material.”¹²

Autonomy

Some people express concern that there may be attempts to limit the freedom and choices of cloned persons. There might be a

temptation to use clones expediently, assigning them value primarily on the basis of their usefulness in some predetermined role. For example, some have suggested that clones might be used as sources of transplantable tissues.

These are reasonable fears that deserve examination. The spare-body-parts scenario, however, can be dismissed, since no one has seriously proposed that essential organs be torn from a newborn to patch up its nuclear donor. That is a horror already prohibited by law. As far as using renewable or dispensable tissues obtained from clones—bone marrow or cord blood—there are ethical cautions that should be observed. A reality check, however, makes it clear that this happens even without cloning. Andrew Kimbrell claims that 50 to 100 couples had produced babies by conventional means to supply tissues for an older child within a few years preceding the publication of his book.¹³ It is difficult to categorically condemn such decisions. Much would depend upon the situation into which the child was born—it should be nurtured, cherished, and loved for itself.

There is a further concern: that clones might be created to gratify the vanity of their “originals.”

Egotists might want to duplicate themselves in more than just physical resemblance. The effect could be oppressive. “To aspire to genius is laudable,” observed one commentator. “To be a child of genius can be difficult,” he continues. “But to be expected to develop into a genius because you are its identical twin, could be crushing.” This problem, however, predates cloning. We already know that people sometimes have children by natural means for the wrong reasons, or for no reasons at all. How many youngsters have been driven into particular pursuits by controlling parents? Clearly, one doesn’t have to be a clone to be an extension of someone else’s ego. The take-home lesson is that this human foible is not intrinsic to cloning.

Family Structure

Reproductive cloning might be a last resort for couples if the husband cannot produce functional sperm. Another common hypothetical is of an infertile couple about to lose their only child. They want, literally, to replace their beloved baby. In such situations, nuclear transplantation may serve as an advanced form of assisted reproduction.

Former U.S. President Bill Clinton voiced the concern that cloning “has the potential to threaten the sacred family bonds.” The Brave New World image of infants mechanically replicated outside the family circle strikes us as ghastly—as Aldous Huxley intended. God’s plan is for children to be nurtured within the con-

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text of a loving family—with the presence, participation, and support of both parents. If nuclear transplantation is used to achieve human reproduction when other methods fail, such attempts must be within the setting of a faithful marriage with the support of a stable family. Furthermore, we must avoid the moral complications that arise when a third party acts either as the gestational surrogate or the source of the genetic material.

Eugenics

In the same public address, President Clinton observed that the “widespread practice [of cloning] would undermine important social values by opening the door to a form of eugenics.” Presumably, he was referring to the likelihood that individuals free of disabling genetic defects and possessing valuable skills would be selected for cloning.

Walter Anderson relates the story of a genetic testing program in a Jewish community.¹⁴ The goal was simple: to reduce the occurrence of two devastating diseases, Tay-Sachs and cystic fibrosis. Tay-Sachs is fatal: It blinds, paralyzes, and kills in the first few years of life. Cystic fibrosis causes chronic lung infections, breathing prob-

lems, digestive insufficiency, and lung failure. Among Ashkenazi Jews, the carrier frequency for both diseases is one in 25. When two carriers marry, there is a one-in-four chance that a pregnancy will produce an affected child.

The program offered blood tests to students in Orthodox Jewish high schools, with the results filed by identification number. When a boy and a girl seemed likely to marry, the matchmaker called the program hotline with their identification numbers. The office responded either that the pair was compatible or that they both carried the same recessive defect. Clearly, bioinformatics had overtaken the venerable tradition of matchmaking. Like a life-guard at the gene pool, the program produced remarkable results. New cases of Tay-Sachs were virtually eliminated, and the program was expanded to include other diseases. But ethicists were worried because this was obviously eugenics.

Eugenics is a four-letter word in ethics. Whenever a personal choice or a medical treatment has the effect of altering the traits passed on to future generations, that ominous word is used. The strong implication is that eugenics must never be permitted to happen. This is well-intentioned but misleading. It gives the impression that we don’t do eugenics (but we do) or that it can be avoided in the future (but it can’t).

Eugenics was proposed by Darwin’s cousin, Francis Galton, and became wildly popular in Britain on both sides of the political

spectrum by 1900. During its heyday in the United States, it bred compulsory sterilization programs, restrictions on immigration, and laws to prevent interracial marriages. Later, it was taken up by the Nazis. The result is a textbook example of classical conditioning. The association between the word *eugenics* and the way it was used to justify genocide is so powerful in modern minds that it inhibits rational thought about vital reproductive issues. Perhaps we should invent a new word that is not burdened with the weight of the Holocaust. Let's try *progenics*.

With the increasing availability of genetic information, more people will make progenic decisions. Whenever prospective parents use genetic tests to make reproductive choices, whenever a family decides to end a pregnancy because of fetal abnormality, whenever a fertility clinic selects an embryo that does not carry a catastrophic familial disease, whenever a couple that has borne a disabled child seeks genetic counseling, they are practicing progenics. The decision to use cloning under appropriate circumstances would be another example of personal reproductive choice.

Progenics is short-term and small-scale. It is an individual decision based on full disclosure of the best available information with the intent to avoid real suffering—conception of children with severe diseases in their own families. These are not the collective breeding programs envisioned by Galton or implemented by the Third Reich.

Common sense tells us that selective human breeding of one sort or another has been happening for a very long time, though it often had a satisfying innocence of chance about it. If progenics is about attempting to protect the genetic heritage of the unborn, we may be doing more of it today than when eugenics was public policy. The best safeguards against the failures of the past are to avoid coercive genetic policies, reject attempts to eliminate vaguely defined conditions, and forbid national programs to breed supermen, geniuses, or warriors. When genetic screening is done, it should be for clearly recognized diseases. Genetic test results must be reported through non-directive counseling, conforming to the concept

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STEP 1: The nucleus of an egg cell is removed.
STEP 2: The donor cell is starved. The absence of nutrients causes the cell to enter a suspended state, matching the state of the enucleated egg cell.
STEP 3: The donor cell is placed near the egg cell, and an electric current is used to fuse the cells together and stimulate development of the egg cell.
STEP 4: The developing egg is placed in a sheep oviduct for around six days. The oviduct acts as an incubator as the egg grows into an embryo and continues to develop.
STEP 5: After developing in an oviduct for around six days, the embryo is transplanted into the uterus of a surrogate mother ewe. This ewe will carry the developing sheep until it is born.

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that medical personnel are not authorized to control reproductive decisions.

Gut Reactions

The public response to Dolly's birth announcement was overwhelmingly negative. Polls performed in 1997 reported that three out of four Americans believed that human cloning should not be done. Describing their reasons, some said that it was "playing God" or "unnatural," but many described their reaction as loathing, a visceral revulsion. Ethicists have documented other negative reactions to various innovations—even given it a name—the "yuck factor." Just how reliable a guide is the "yuck factor" in making moral decisions? Is everything that makes people feel squeamish wrong or unethical? Ethicist Leon Kass argues that "repugnance is the emotional expression of deep wisdom" representing our intuitive ethical sensitivity and that it should be trusted.¹⁵ This position is based on intuition and emotion, making it impervious to reason. However, it is important to remember that society has reacted negatively to many major medical advances—immunizations, blood transfusions, x-rays, antibiotics, organ transplants, even fluoridating water—innovations that contributed to increasing human life expectancy from 50 to 80 years. How many find them objectionable today?

Creaturellness

Let's consider one more issue regarding human cloning. Dr. Stanley Hauerwas at Duke University questioned the motives for doing this procedure, while rec-

ognizing that it will be promoted for its usefulness in assisted reproduction and as a means for avoiding genetic disease. Hauer was expressed the concern that there was a “drive behind this to force us to be our own creators.”¹⁶ Others see reproductive cloning as “playing God,” thereby violating our standing as creatures.

These charges take us back to the theme of humanity’s purpose. Is Creation a finished product that will bear no further modification? Do advances in knowledge and power demean the sanctity of human life? Is the value of life eroded by an increased understanding of the processes of life? Are we better off not knowing and not using answers to fundamental biological questions?

“Even within religious communities,” wrote the National Bioethics Advisory Commission, “the warning against ‘playing God’ is too indiscriminate to provide ethical guidance.” Furthermore, “it overlooks moral invitations to play God.”¹⁷ As we have seen, God created humans with attributes resembling His own. **Certainly, that God-likeness has been tarnished and deformed by disuse and misuse, but we still exhibit a measure of the curiosity and creativity that is part of God’s nature. As no other creatures on Earth, we persist in probing and questioning creation, at-**

tempting to understand it and make it accountable. It is our divinely intended heritage.

Cloning Reviewed

Reproductive cloning raises a host of ethical issues. It forces us to balance competing interests—the child’s right to safety, individuality, and dignity against the donor’s rights to procreate and to have children free of genetic disease. With respect to the potential loss of uniqueness and the possibility that cloned individuals might be treated as commodities rather than respected as persons, there is ample justification for caution, but the risks are comparable to those in situations we already accept. Cloning’s possible effects on family structure would require that the procedure be limited to the bounds of traditional families. Eugenics as a public policy was a grave error. Progenics, with reproductive decisions in the hands of individuals—private and unconstrained—despite its risks, is a better course. It should be reinforced by legal limits on the intrusion of public interests into reproductive matters. At present, the inability of nuclear transplantation technology to meet reasonable standards of safety makes the judgment a simple, “Not yet.” ☞

(A future article by Dr. Zuccarelli will deal with the science and ethics of using stem cells, gene therapy, and genetic enhancement.)

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