

parties. (Where one member of the couple produces viable eggs, the clone might even have some genetic contribution from each "parent" - nuclear DNA from one and mitochondrial DNA, found only in the egg, from the other.) Moreover, gay or lesbian couples might choose to clone for the same reasons-in order to have children without relying upon third parties, who may ultimately request parental rights and responsibilities.

Opponents of human reproductive cloning could respond that couples who were infertile because of gametic inadequacy do have other options for having children. They can adopt children. They can use assisted reproduction methods using donated eggs or sperm. Such donations might be particularly appropriate coming from a first degree relative of the infertile person, who would share 50 percent of his or her genome, thus producing a child who was 50 percent related to one parent and 25 percent related to the other. These possibilities raise both the question of what is meant by a child "genetically their own" and whether such a desire should be supported.

On the other hand, whatever "children genetically their own" means, the United States currently allows infertile couples to take many steps to try to have such children. Proponents of human reproductive cloning argue that it is unfair to single out one particular group of the infertile and forbid them to use an advanced reproductive technology that would help.

b. Human Reproductive Cloning to Provide Transplants

The desire to clone is not confined to the infertile. A fertile couple may resort to cloning in order to save the life of an existing child, who desperately needs compatible cellular transplantation, e.g., bone-marrow, in order to survive. The parents may remove cells from the dying child to clone another child who will be a perfect match, resulting in two healthy children who happen to be identical twins of different ages. (Of course, if the dying child's illness had been caused by his genes, cloning would, in most cases, not be useful.)

Opponents of human reproductive cloning sometimes invoke the image of "organ farms" populated by "spare parts clones," who would be a source for hearts, lungs, and other essential organs. Killing or harming one human, whether or not a clone, for the purpose of providing organs for another, they argue, is wrong. More fundamentally, creating a child for that purpose is using that child as a means to an end, not as an end in itself, and that, they contend, is also wrong.

Proponents of human reproductive cloning present this scenario not for irreplaceable organs like the heart, but instead about transplants that involve little risk, notably bone marrow transplants. Furthermore, they note that children already have been conceived and born for the purpose of providing bone marrow or stem cell transplants to their older siblings, either through conventional conception or through in vitro fertilization. In at least one reported case, parents used in vitro fertilization with pre-implantation genetic diagnosis in order to ensure that the implanted embryos would be able to provide matching tissue to their ill sibling. Proponents of human reproductive cloning argue that if we allow the creation of tissue donor children in those ways, we should not ban their creation through cloning. Proponents can also point out that children are conceived from a wide variety of intentions or, in many cases, accidentally, with no intention to start a pregnancy. The desire to create a tissue donor child to save the life of its sibling is, they claim, certainly better than many of the other reasons children are conceived.

It is not clear how often this scenario would arise given the availability of other treatments and other sources for bone marrow and other tissues or organs. It might also be the case that, if successful, non-reproductive human cloning could provide simpler solutions to this problem by creating histocompatible cells or tissues for transplantation into the patient whose cells provided

the DNA used to make the cloned cells.

c. Human Reproductive Cloning to Replace a Loved-One

The first two examples are cases where human reproductive cloning would be used for some motive other than, or in addition to, creating a whole person who was genetically identical to another. The couple that is infertile because of gametic inadequacy just wants a child "of their own" and reproductive cloning might provide, they think, the best way to reach that goal. Parents seeking a tissue transplant want genetically identical tissue, but are not motivated by the goal of having a genetically identical child. For them human reproductive cloning is a means to a goal other than the production of a child genetically identical to an existing person. The third example, however, is motivated by a desire for such an identical child. One sympathetic version of the example might involve a couple with a beloved young child. The child dies and the parents, in their grief, wish to have another child quickly, seeking perhaps in some way to "replace" their dead child. Human reproductive cloning might allow them to have a new child that was genetically identical to the first child. They might believe that this genetic identity would help assuage their grief and so seek to clone the first child.

Opponents point out that inherited genes are not overwhelmingly powerful and that, therefore, the clone would not be the same as the dead loved one. Furthermore, they argue that this kind of "replacement" is not psychologically healthy for the parents or for the second child. They also note that, when the second child turns out not to be exactly the same as the first, the consequences for the parents and the child could be negative. On the other hand, proponents would counter that those who have not lived through the tragedy of a dead child may not feel in a position to judge the actions of parents who have.

B. ARGUMENTS AGAINST HUMAN REPRODUCTIVE CLONING

In contrast to the arguments in favor of human reproductive cloning, the arguments against it are both varied and numerous. They fall into six broad categories: (1) possible physical harms to the cloned embryos, fetuses, children, and gestational mothers; (2) possible psychological harms to cloned children and others; (3) possible harms to human society; (4) an inherent immorality or impermissible unnaturalness of human reproductive cloning; (5) pragmatic difficulties in allowing cloning for only some reasons; and (6) a majoritarian political argument. Each is discussed below.

1. Physical Harms

All new drugs and biologics and many new medical devices must be proven "safe and effective" to the satisfaction of the FDA before they can be marketed in the United States. "Procedures," unlike drugs, biologics, and medical devices, are not regulated by the FDA and need not be demonstrated, to anyone, to be safe or effective before their use.

There is, as yet, no direct evidence concerning the safety of human reproductive cloning. As far as is known publicly, such cloning has never been tried. And, although the Dolly technique for cloning has now been used regularly for cattle, sheep, goats, and mice, it has never been successfully used in any primates. Researchers at Oregon State University cloned two monkeys using somatic cell nuclear transfer with the cell nuclei taken from embryonic monkey cells; no monkeys or other primates have been cloned using nuclei from born primates. In spite of hundreds of efforts, those researchers have been unable to establish another pregnancy by somatic cell nuclear transfer using monkey nuclei from any source. As of June 2000, more than 400

efforts had failed after the first embryonic donor success.

There are serious theoretical reasons to be concerned about the safety of reproductive cloning. These include, among others, epigenetic changes in the donor cell's DNA, which might not be reversed in the cloning process; problems with maternal and paternal imprinting of DNA in a clone; accumulated damage in the DNA of the donor somatic cell; telomere length; and problems with reprogramming of the donor cell's DNA. None of these concerns apply to natural reproduction or to the various existing forms of assisted reproduction. Practical experience adds to these theoretical concerns. In cattle and sheep, animals produced by somatic cell nuclear transfer processes have shown a high level of deformity and early death, as well as a very high rate of miscarriage. More than 90 percent of the embryos implanted fail to reach term; over 15 percent of the animals born alive have serious birth defects. This compares with a rate of serious birth defects of about 3 percent in humans. And even apparently "normal" clones may have abnormal gene regulation, leading Rudolf Jaenisch to testify to a National Academy of Sciences panel that "most adult clones may have (at least subtle) abnormalities. Completely 'normal' clones may be the exception."

In addition, in other cloned mammalian species the cloned fetuses grow overly large in utero. This may pose a significant risk to the woman carrying the fetus during gestation and at birth. Why the fetuses grow so large is not known; some think it may be a result of faulty nuclear reprogramming during the process of nuclear transfer.

Present evidence thus indicates but does not prove that human reproductive cloning would be substantially less safe than either natural reproduction or existing forms of assisted reproduction. But it quite clearly does not prove that it is safe and it does raise very serious questions about the procedure's safety.

On the other hand, these standards of safety have not been applied to other forms of advanced reproductive technology. In vitro fertilization was not approved by the FDA before its use, nor was it extensively tested in animals before experiments began in humans. The same is true of many medical procedures that do not involve new drugs or devices. Proponents argue that it is unfair and inappropriate to subject this one procedure to a higher standard than similar procedures - although that begs the question whether such proof of safety should, in fact, be required broadly for reproductive technologies.

Human reproduction is not entirely safe, for the child or for the mother. Although modern medicine has greatly reduced infant and maternal mortality rates, about half of one percent of newborns die within a month of their birth. One or two percent live but have serious birth defects. Furthermore, in the United States parents are not forbidden to reproduce even when the children (or the mother) will be at very high risk. A couple where each member carries a gene for an autosomal recessive disorder - like cystic fibrosis, sickle cell anemia, or Tay-Sachs disease - runs a 25 percent risk of having an affected child. A couple where one member carries a gene for an autosomal dominant disorder, like Huntington's disease, faces a 50 percent risk that each of their children will inherit that gene. Similarly, parents with non-genetic health conditions that might be transmitted to a child (HIV infection provides one example) are allowed to put themselves and their future children in jeopardy by becoming pregnant. Human reproductive cloning may be less risky than at least some existing, and allowed, child-bearing; advocates argue that it should not be banned on this account as long as the parents understand and accept the risks. On the other hand, reproductive cloning involves a degree of premeditation that is often missing from sexual reproduction and a substantial medical intervention, which might distinguish it meaningfully from normally commenced "at risk" pregnancies.

2. Psychological Harms

a. Psychological Harms to the Cloned Child

Cloning by means of somatic cell nuclear transfer would make it possible to produce a child who is virtually genetically identical to an existing or previously existing person, i.e., a delayed genetic twin. Many fear that this would inflict deep and lasting psychological damage upon such a child. Some children may suffer from a loss of uniqueness and a diminished sense of individuality and self esteem grounded in the fact that he or she is the genetic copy of another person. Others may be unduly burdened by heightened expectations of parents and others. Thus cloning, it is argued, deprives the child of the right to a unique identity and denies the child the right to an open future.

Proponents of human reproductive cloning argue that common experience with identical (or "monozygous") twins, whether reared together or apart, provides a compelling counterexample to this argument, for identical twins do not necessarily suffer psychological injury as a result of their genetic similarity. A child who is created by reproductive cloning would be no less unique than an identical twin. To the contrary, clones are likely to differ much more than identical twins. Although a cloned child would possess almost the same genotype as the genetic donor, he or she would result from a different egg (with distinct mitochondrial DNA), gestate in a different womb, and grow up in a different environment. The process of cloning requires reprogramming of the genes of a specialized donor nucleus. This process is apparently incomplete and is thought to contribute to the high frequency of birth defects and miscarriages. The result is there may be real differences in the ultimate DNA of the clone.

Although identical twins share the same genome, opponents of human reproductive cloning point to differences between clones who are born and raised years apart and identical twins. Identical twins begin life with a blank slate, equally ignorant of each other's destiny. A cloned child, on the other hand, may start life with some knowledge of what his genetic predecessor has already become. He may feel much about himself or his fate is pre-determined, losing the sense of freely constructing his own identity and choosing his own future. Even if the clone does not believe in genetic determinism-that our fate lies only in our genes-some people nevertheless fear that the life of a cloned child would always be haunted by the shadow of the original and unduly shaped and constrained by the expectations of others. Hence, the child clone could be denied the "right to an open future" by having his future autonomy undermined by unfair and over-zealous parental expectations.

A related concern is that the cloned child would become the prisoner of these pre-set expectations that she will possess particular traits or resemble the genetic donor in important ways. Even if such expectations proved to be false, if they are widely shared by the child's parents and by society, they risk becoming a self-fulfilling prophecy.

In addition, because human reproductive cloning offers the prospect of total control over reproduction-over the child's specific genome-some fear that it would not only cause parents to harbor unrealistic expectations but also to view their children more as objects manufactured according to precise specifications than as independent persons. To the extent that reproductive cloning fosters such social attitudes, it may ultimately lead to the objectification of children who will be treated as mere means to parental fulfillment, rather than as ends to be loved and cherished for themselves.

Proponents of human reproductive cloning say it is difficult to argue that cloning should be

banned to protect against this speculative harm. Parents of clones might have unrealistic expectations of the clone, but this problem of "expectations" is not unique to cloned children. Furthermore, it can be argued that parents who go through the expensive and burdensome process of assisted reproduction, including nuclear transfer, have a strong desire to lavish parental love and care on any child that results. Many parents whose children are the unwanted product of sexual conception are objectified and treated as commodities the world over. The motivations and behavior of a few parents are not a reason to ban a neutral technology that is compatible with both good and bad outcomes. What would be the consequences for the children if they fail to live up to unrealistic expectations? Would they face the rejection of their parents and the disappointment of society? This concern, proponents would argue, is not different in quality or quantity from unreasonable expectations placed on some children who are normally conceived. These harms are abuses that can be combated by education and are not intrinsic to the technology.

Opponents, however, urge that the differences in expectations between cloned children and other children are differences of kind, not of degree. Regardless of one's belief in the role of genetics behavior, parents who want to clone a child usually would do so in order to have a child with a precise genetic make-up. Common sense, it is argued, suggests that a parent, particularly if the child is the parent's own clone, is unlikely to forget about that the child carries his or her genome. For the cloned child to have such a parent may threaten the cloned child's own self-image, as well as her sense of privacy. The argument that cloning deprives a child of the right to an open future is based not simply on genetic determinism, but in part on experience with genetic testing. Clinical geneticists and genetic counselors often counsel against testing children for late onset genetic disorders because a child who tests positive might grow up in a world of limited horizons or suffer psychological harm. Insurers and employers could hardly be expected to ignore information about the clone's "genetic parent-twin". A basic family history of the cloned child would take on much greater significance.

Some have expressed concern about the possible abusive nature of certain utilitarian purposes for reproductive cloning, once the procedure is considered safe for purposes of physical safety. Examples could include creating a cloned child to provide organ and tissue transplants, or to replicate an unusual or rare genotype primarily to benefit the biomedical research community. In response to this concern, others have pointed to the current laws against child abuse which provide a basis for deterring abusive cases of reproductive cloning. However, cases in which, for example, multiple clones of a distinctive genotype are created, may present harms which are not readily remediable after the fact by typical child abuse statutes. To take an extreme example, if the parents of a dying child-or researchers-wanted to clone a series of equally short-lived children as replacements of a loved one until a cure could be found, the state could consider asserting a legitimate preventive interest.

b. Psychological Harms to the DNA Donor

Some argue that the fact that there exists another individual who share the same genetic identity may inflict psychological harm not only upon the cloned child, but also upon the person who provides the genetic material. The person who is the source of the genetic material (if still alive) may experience a loss of self worth rooted in the knowledge that he or she is no longer unique, but now has a genetic copy. Some genetic donors might see themselves reflected and diminished in the body of the clone, thus producing a harm to him that is the mirror image of the harm suffered by the clone. On the other hand, some genetic donors may have opposite negative psychological effects; a high sense of self-worth that led the donor to want to clone himself might be reinforced in unhealthy ways.

One mechanism to avoid or minimize such potential injuries is to ensure that no one is cloned without first discussing the procedure with an objective professional and obtaining informed consent. Indeed, human reproductive cloning performed in the absence of prior consent could even violate a moral or legal right.

c. Psychological Harms to Other Participants

Opponents of human reproductive cloning could argue that it permits parenthood to be deconstructed into its component parts, making it possible to separate the genetic, gestational, and rearing functions. As a consequence, other participants in the cloning process, such as egg donors, gestational surrogates, and the individuals who intend to rear the child, could also suffer psychological harms associated with the splintering of parenthood. One might also worry about the possibilities of coercion or duress in the procurement of somatic cells, egg cells, or surrogate mothers. Indeed, it is even possible that people could be cloned without their consent, which could cause substantial psychological damage.

On the other hand, proponents could note that many modes of assisted reproduction pose the same risks, thus this objection is not unique to cloning. It cannot justify a law singling out cloning for special treatment while leaving artificial insemination, egg donation, and gestational surrogacy entirely unregulated. They would argue that, as with other forms of assisted reproduction, these risks should be regulated by counseling, screening, informed consent, and so forth, and not by prohibition.

3. Harms to Society

Opponents argue that human reproductive cloning would have a wide range of possible negative consequences for human society. These include confusion of family relationships; encouragement of genetic enhancement of children; distributive injustice; encouragement of commodification of children; the loss of human genetic diversity; overpopulation; and threats to democratic values of individuality, privacy, and autonomy.

a. Confusing Family and Generational Structures

The fact that human reproductive cloning would make it possible to separate the genetic, gestational, and rearing functions also means that there could be, on rare occasions, as many as five different individuals who claim some biological connection to the child; the genetic donor, the woman who provides the egg (which also includes mitochondrial DNA), the woman in whose womb the clone is gestated, and the biological progenitors of the persons who provide the genetic material. Which of these many potential candidates should be identified as the "parents" of the child? This is an issue that needs statutory resolution since it is already the subject of case law in surrogacy and embryo donation cases. If a cloned child is actually a delayed genetic twin, is the genetic donor the child's sibling or parent? This depends on how this society wants to define these terms. And are the parents of the genetic donor the child's parents or grandparents? If a woman, for her second child, clones her mother, is the first born child the clone's sibling or grandchild? Opponents of human reproductive cloning point out that these fundamental questions highlight the ways in which human reproductive cloning may confuse the structure of the family and blur generational boundaries.

On the other hand, proponents argue that human cultures accept many forms of familial relationship. In vitro fertilization and other assisted reproductive technologies have already raised many of the kinds of generational issues that cloning raises. The family has already been the

subject of much change. The census shows two-parent families in the minority. While proponents contend that human reproductive cloning introduces concerns similar to concerns already present and tolerated by the law and society, opponents respond that the potential for confusion of roles is greater when a child may be a genetic twin of a parent.

b. Encouraging Genetic Enhancement

Some are concerned that human reproductive cloning might open the door to eugenics and to the systematic selection of genetic traits in offspring. Reproductive cloning itself functions as a form of genetic selection by making it possible to create a child with a known genetic identity. With the mapping and sequencing of the human genome, it may ultimately become possible to isolate and select the genes responsible for a given trait. If functioning genes could be inserted into the sperm, ovum, embryo, somatic cell or clone, the genetic makeup could be altered. Rather than taking their risks with the genetic lottery that is sexual reproduction, prospective parents might choose to clone in order to control the genotype of their child and perhaps of subsequent generations.

Opponents of human reproductive cloning have also worried that parents would not choose wisely. Selection of certain physically attractive characteristics attaches a value to physical appearance that might devalue or disadvantage alternative phenotypes as persons or as societal models. Cloning not only offers the power to select a desired genetic phenotype, but also the power to produce multiple copies of such persons. If cloning is combined with such forms of genetic selection, some fear that science fiction images of the mass production of individuals with particularly desirable genetic traits could one day become a reality.

Proponents counter that speculative application of eugenics after human reproductive cloning does not in itself justify legal prohibition. All that would be necessary, they assert, is regulation of introduction of genes during or after the process. Genetic enhancement can be accomplished with or without human reproductive cloning and reproductive cloning can be done with or without enhancement.

c. Distributive Justice: Cloning only for the Rich

Because human reproductive cloning affords the ability to control a child's genotype, unequal access to such technology could exacerbate existing inequalities in our society. Reproductive cloning would probably be quite expensive and it is not likely to be covered by health insurance. But if human reproductive cloning is confined to those who can afford such a technology, only the wealthy will be able to pass on their "genetic endowment" to their progeny in perpetuity. If this genetic inheritance did, in fact, correlate strongly with success in society, opponents of reproductive cloning fear that it would pose the risk of a society with entrenched, virtually permanent caste hierarchies. Judge Richard Posner, for example, projects that reproductive cloning might tend to crowd out sexual reproduction and, in so doing, aggravate inequalities in genetic endowment and wealth, thus creating pressures for eugenic regulation.

In *Plyler v. Doe*, the Supreme Court expressed concern about the denial of public education to illegal alien children because this might "promote the creation and perpetuation of a subclass of illiterates within our boundaries." If educational inequalities are troubling because they could perpetuate a caste system, then what about genetic inequalities? Thus widespread use of reproductive cloning could result in a "DNA-divide," a society of genetic haves and have-nots.

This argument depends on genetic inheritance correlating strongly with success and on the

widespread use, by the wealthy, of human reproductive cloning. Societies already tolerate many inequities, perhaps most easily seen in the United States in large disparities in wealth or in access to health care. These also affect children. For example, most people believe that a "good education" correlates strongly with success and wealthy parents often try to buy such an education for their children. Is reproductive cloning different? In any event, proponents of human reproductive cloning could argue that the potential for maldistribution of a safe and effective technique is not a reason to ban the technique. There is nothing in the nature of cloning technology that dictates it must be available only to the rich; it could be allowed only if it were made widely available.

d. Commodifying Persons and Commercializing the

Family

Some opponents argue that by placing a price tag on the cloned child, human reproductive cloning threatens to commodify all children. The danger these opponents see is that children will be regarded as fungible goods that are manufactured according to precise specifications and traded on the market, rather than as unique beings who are priceless. Opponents urge that, in so doing, reproductive cloning also threatens to commercialize children and the family, a realm which many believe should be shielded from the economic values that govern the market. They contend that this kind of commodification is already present in other assisted reproductive technologies, particularly when third party gametes (eggs or sperm) are sold based in part on the seller's attributes. Offers to pay \$50,000 or more to desirable egg donors have been widely reported. Reproductive cloning could present a strong form of this commodification as it holds out the promise of delivering a "precise product," a baby with a known genotype and not just an unpredictable mixture of parental genes.

Proponents of reproductive cloning can respond that commerce in clones could be banned. We do not forbid organ transplants because of fears of commercialization; instead, we ban the sale and purchase of most organs and regulate their distribution. A similar regulatory scheme could be implemented with respect to DNA for use in reproductive cloning. Proponents contend that the family is not shielded from economic values and commercialization by current law. They argue that reproductive cloning, like other things in society, can contribute in both positive and negative ways to broad social problems, such as rampant commercialism, but it is not so intrinsically unjust or commercialized that we need to criminalize it on this account.

e. Reducing Genetic Diversity

Reproductive cloning replicates an existing genome, preventing the random recombination of genes that is a byproduct of sexual reproduction. As a corollary, a few fear widespread use of reproductive cloning to create children could ultimately reduce genetic diversity in our society. A real reduction of genetic diversity could have terrible consequences for humanity's ability to survive changing environments, such as new diseases.

Proponents find this argument implausible. There are over 6 billion different human genomes in the world today. It seems very unlikely that most people will choose to reproduce by cloning when the alternative is so much easier and cheaper. But even if a large fraction of the population did reproduce by cloning, there is no reason to believe that they would all choose to clone the same few people. On balance it seems unlikely that reproductive cloning will substantially reduce our genetic diversity.

f. Increasing the Population

At the Committee's public hearings, at least two members of the public argued that the world's population is already too big. Reproductive cloning would only increase it, causing substantial negative environmental effects. This argument seems weak. Reproductive cloning still requires women to carry pregnancies to term. Reproductive cloning would only increase the population if women decided to have more cloned babies than they would otherwise have had sexually-produced babies. The expense, difficulties, and risks of reproductive cloning compared with sexual procreation make this unlikely.

g. Threatening Socially Important Values

Some argue that reproductive cloning threatens socially important values such as individuality, privacy, and autonomy, values that are crucial to a democratic society. By making more predictable humans, opponents say, reproductive cloning undercuts our ideas of free will. Seeing human clones, people will have less ability to feel free and to act autonomously. This will in turn weaken political and social institutions that seek to protect the rights of autonomous individuals.

Proponents of reproductive cloning try to dismiss this argument as based on an extreme view of genetic determinism. Clones, they argue, would not be so much more predictable than other people as to shake society's faith in free will and the importance of the individual.

4. Human Reproductive Cloning Is Impermissibly Unnatural or

Inherently Immoral

During the March 28, 2001 congressional hearings on human cloning, Rep. Clifford Stears asserted that "[h]uman cloning is a form of playing God since it intervenes with the natural order of creation" and ". . . is an unethical use of technology." This brief quotation illustrates the two arguments that are perhaps most commonly expressed against cloning technology: that reproductive cloning is "unnatural" and that it is an affront to divine power. Certainly, cloning could be considered "unnatural" as it relies on human intervention in a "natural process." It clearly runs counter to a normally functioning natural environment, at least for mammals. It does not provide for the random combination of genetic material from eggs and sperm that is the essence of sexual reproduction. In addition, it could theoretically render males reproductively obsolete. All that is needed to clone a human being are human eggs, somatic cell nuclei, and uteri; and a woman can supply all of these. A system of reproduction that renders males obsolete also renders the "natural" method of human reproduction obsolete. Those opposed to human reproductive cloning on these grounds worry that the process will run counter to and even harm nature. On this view, the intent "to improve on nature" through reproductive cloning has been considered an overstepping of natural limits, human "hubris of enormous magnitude."

Others note that humanity has been attempting to control nature from the very beginning-agriculture, motorized transportation, medicine all "interfere with nature." Over time, human intervention into nature has been met with both rejoicing and resistance as it is fraught with ambiguity-offering both remarkable good and ruinous evil. American society has generally accepted that where science can intrude into "the natural order" for good - to improve human life and health, for example - it should do so. Many question the assumption that there is a strong connection between a thing being "natural" and it being "moral." Intrusion into the "natural order of things" is a necessary component of human life. Although humans ought to take responsibility for the impact of their decisions and activity on "the natural order of things," the fact that cloning

technologies intervene in nature in and of itself seems an insufficient reason for prohibition of human reproductive cloning.

A similar argument against human reproductive cloning rests on the premise that the process and its outcome are contrary to God's will. Reproduction, according to this argument, is solely God's domain. When we take it upon ourselves to create humans through reproductive cloning, we are infringing on the divine domain, "playing God," as it were. On this view, finite and fallible beings should not make decisions properly limited to the infinite and infallible. Many religious accounts give humans the responsibility for being caretakers of the rest of creation. The cloning of human beings oversteps the limits of this responsibility and runs counter to the responsibility itself. Furthermore, human beings produced through cloning lack the unique and essential quality of being conceived through love. "With cloning, human life does not arise from an act of love, but is manufactured in the laboratory to preset specifications determined by the desires of others." Finally, many religious critics fear that human reproductive cloning will result in the use of cloned humans for personal gain. Respect for human dignity-resident in being created in the image of God-requires that a person be treated as an end in him/herself, not as a means to fulfill the desires or goals of another.

Proponents of reproductive cloning argue that the warning not to "play God" is often invoked in the wake of a scientific development so powerful that it threatens comfortable boundaries of human action. As NBAC noted, this slogan is usually called upon as a "moral stop sign" on the basis that: (1) humans ought not be probing the mysteries of life; (2) decisions regarding life's beginning and ending belong to God; (3) humans are fallible and self-interested; (4) humans have inadequate knowledge of outcomes which God alone possesses; and (5) humans do not have the power to control processes governed by divine omnipotence. Theologian Ted Peters argues, "The phrase 'playing God' has very little cognitive value . . . from the perspective of a theologian." Peters suggests that in common parlance it has come to mean "stop." As such, it serves as a red light potentially thwarting not only science but also thoughtful deliberation about the direction and application of research. But it is precisely careful deliberation that is needed in considering potential uses and abuses of cloning technology. Peters and others would argue that "playing God," as it were, is precisely what God expects of humanity. Humans are partners-"co-creators"-with God. As co-creators humans have influence on and take responsibility for the direction in which creation moves and changes-for better or worse. Although there are a wide range of theological positions, it is not necessarily wrong "to play God" in a humble and accountable way. From this perspective, the admonition not to "play God" does well to remind human beings of their fallibility and the importance of considered constraint, but it alone is not sufficient argument for prohibition of human reproductive cloning.

Finally, opponents of human reproductive cloning argue that the consistent polling data reflecting a strong popular will against or repugnance at human reproductive cloning can be viewed as a collective refusal to give substitute or proxy informed consent in behalf of cloned children to be subjected to such experimentation. Similarly, opponents may argue that such public will can be expressive of a widespread desire for societal control of certain aspects of the genetic revolution that "cross the line." Opponents urge that people may not always express their rationale for their revulsion with the same arguments, but that the people "know it when they see it". Under this view, human reproductive cloning is obscene technological replication, not protectable procreative liberty.

5. Pragmatic Difficulties with Permitting Some Human

Reproductive Cloning Subject to Regulation

Selective regulation is another policy option regarding cloning for reproductive purposes. On its face, regulation may seem more attractive than the alternatives of unrestricted use of reproductive cloning or statutory prohibition. Regulation offers the promise of curbing abuses while allowing the technology to be used in certain circumstances. In addition, those who find prohibition an inappropriate use of governmental power may find regulation more acceptable. To assess the option of regulation, we need to specify what goals regulations are intended to accomplish, what kinds of regulation are envisaged, and what the effects of proposed regulations are likely to be.

The goals of regulation should be to eliminate or reduce problematic cases of reproductive cloning. As discussed previously in this report, some possible uses of reproductive cloning raise more serious and widespread moral concerns than other uses. Many citizens might oppose reproductive cloning in certain situations, but accept it under other circumstances. First, reproductive cloning would be ethically problematic if the clinicians carrying out the procedure did not have appropriate training and skills. Poor quality of care would compromise the safety of the woman who bears the cloned child, as well as the well-being of children who may be born. Second, reproductive cloning would be morally objectionable if the individual who is cloned did not consent to the procedure. Lack of consent would violate the autonomy and liberty of the person to be cloned, undermining his or her right to decide not to have offspring under those circumstances. Third, reproductive cloning would be problematic if extremely large amounts of money were paid for persons with specific phenotypic characteristics to provide nuclear DNA for reproductive cloning. Such payments would commercialize reproduction to the extent that the child is regarded as a commodity to be specified and purchased. These concerns about the quality of care, informed consent, and commercialization might be termed procedural in the sense that they would apply without regard to the circumstances where reproductive cloning was sought.

Another group of moral objections focuses on the reasons motivating reproductive cloning. Examples are reproductive cloning in which the parents have very specific expectations for the phenotype of the child, are planning to exert their utmost parental power to have the child follow their plans, and would be deeply disappointed if the child did not meet their expectations. For instance, a person may desire to achieve so called "immortality" by producing a child who is genetically identical and has the same personality and occupation. Such cases raise concerns about psychological harm to the particular child because of unrealistic and excessive parental pressures. Also such cases are troubling because they involve physicians in activities that are inconsistent with important societal values. Such values include allowing children to fulfill their individuality rather than cherishing them only to the extent that they conform to parental expectations. This latter set of objections might be termed substantive.

From a regulatory perspective, the challenge is to try to devise regulations that would discourage or reduce these situations that raise procedural or substantive concerns. What kinds of regulations might be proposed? To address the first set of procedural concerns, regulations might require licensing of facilities, certification of practitioners, reporting of outcomes, informed consent from all parties involved in reproductive cloning (including the donor(s) of nuclear DNA material, the egg donor, and the gestational mother), and limits on excessive payments for eggs and nuclear DNA materials. Such regulations would help to ensure the quality of services and appropriate informed consent. These kinds of regulations are in place and are widely accepted for other medical procedures.

To address the second class of substantive concerns, regulations might require clinicians engaged in reproductive cloning to take some steps to discourage cases in which parents will prize the child only to the extent that it fulfills their specific expectations. At a minimum, practitioners

might be required to educate and counsel patients seeking reproductive cloning about the concerns raised about this method of reproduction, particularly concerns about excessive parental expectations for the child. This requirement would help ensure that decisions for reproductive cloning are truly informed and would increase the likelihood that children born of this technology would have opportunities to shape their own futures. However, education and counseling leave it to the parents to decide whether to continue to seek cloning for these purposes. Such regulations for education and counseling would be similar to current mandates for physicians to counsel patients before obtaining genetic testing or prenatal testing for birth defects.

Other regulations might go even further, to require clinicians to discourage reproductive cloning if parents desire a child with predetermined phenotypic characteristics. Furthermore, regulations might explicitly allow clinicians to decline to participate in cases of reproductive cloning in which, in their judgment, parents will try strenuously to foreclose the child's options that are incompatible with their expectations. Under regulations to discourage instances of excessive parental expectations, practitioners would evaluate the intention and motive of those seeking reproductive cloning. There is some precedent for clinicians making recommendations regarding specific reproductive decisions in requirements for physicians to recommend or obtain prenatal testing for syphilis, rubella immunity, Rh incompatibility, and HIV infection. However, having third parties evaluate the motives for reproductive decisions raises its own set of ethical problems, as we next discuss.

Well-intentioned regulations may be problematic because they are inefficient or have unacceptable burdens and unintended consequences. Regulations to discourage cases of excessive parental control may be inefficient in several ways. They may be overly broad to achieve their goal, because in many cases the feared harms will not occur. Parents who at the onset seek to produce a child with certain specified characteristics may change their minds and love the child as a unique individual as the child develops its own characteristics. As with children born through sexual reproduction, parents are likely to learn through experience that children usually develop their own interests and characteristics, despite parents' expectations and upbringing. At the same time, regulations to discourage cases of excessive parental control may also be too narrow to achieve their goal. It is possible that parents who at the onset say that they will cherish their child no matter how he or she turns out may react differently when they see a child who cannot be distinguished physically from an existing individual. Faced with this close resemblance, parents may develop strong expectations that they could not predict and therefore did not discuss during prenatal counseling. Moreover, if the goal is to moderate excessive parental control and expectations, regulations dealing with reproductive cloning will miss the far greater number of cases in which parents have excessive expectations for children conceived through sexual reproduction or other forms of assisted reproduction.

It is possible by regulation to try to restrict access to reproductive cloning solely to couples who are infertile or at some genetic risk. These would be parents whose reasons for seeking to clone would not revolve around seeking a genetic duplicate for a pre-existing person. At least two of the witnesses before the Committee, Professor John Robertson and Dr. Glenn McGee, argued for such systems. However, there is no guarantee that access would be so carefully controlled. Potential broad based use of reproductive cloning raises concern among many that market forces, genetic determinism, and undue emphasis on genetic relatedness could be unintended consequences.

In addition, regulations designed to discourage or prevent most morally troubling cases of reproductive cloning may have detrimental consequences. First, such regulations may be burdensome and invade privacy, whether implemented by physicians or in a legal setting. When

physicians currently discuss with patients reproductive decisions, they are usually non-directive in the sense that the physician lays out options, points out issues for the patients to consider, but leaves the final decision to them. If clinicians seek to discourage certain types of reproductive cloning, discussions would be directive. However, it is troubling if physicians evaluate the motives and intentions of persons making reproductive decisions and seek to discourage certain decisions. Reproductive decisions are personal and private. Persons engaging in sexual reproduction are not asked to justify their intentions. Many would consider it disrespectful and intrusive - an invasion of privacy -- to ask people to justify their reasons for such personal decisions. Furthermore, there is the risk that because of the power imbalance in the doctor-patient relationship, physicians and counselors may impose their own personal values about parenting onto patients who do not share their view. Moreover, it is difficult to specify precisely every situation of unacceptable reproductive cloning. Such vagueness in classifying acceptable and unacceptable actions may give physicians so much discretion that their recommendations are arbitrary and unfair. Forced to determine the acceptability of unusual cases, with no precedents to turn to, physicians may fall back on their own personal values. These values may be controversial to others. For instance, some clinicians may want to restrict reproductive cloning to parents who are married or whose general values correspond to their own. Limiting access to medical services solely on the basis of personal beliefs, however, is difficult to justify as good public policy or an acceptable component of professional standards.

The decision whether to allow reproductive cloning could be placed in the hands of a governmental body, something akin to a licensing board or a family court. (Dr. McGee argued that the process could be made akin to judicial adoption procedures.) Taking the decisive role away from the physician mitigates some concerns, but not all. The grounds on which a governmental body would decide who could or could not have children through cloning would likely remain both vague and subject to "gaming" by eager parents. And citizens may be particularly reluctant to set a precedent of having reproductive decisions made by the government or made under governmentally-sanctioned standards for "appropriate" reproductive decisions.

Another problem is that substantive regulations may be ineffective and have unintended adverse consequences. Knowing that certain "reasons" for reproductive cloning are considered unacceptable, patients who are eager to use it for these purposes may misrepresent their reasons in order to gain access to the technology. Since such misrepresentation would be extremely difficult to detect, the regulations may not have their intended goal of discouraging reproductive cloning for more morally troubling reasons. In the long run, then, regulations may not achieve their desired goals but may lead to cynicism as well as intrusion into private matters.

In light of these difficulties, people will disagree over the desirability of regulation of reproductive cloning. These disagreements need to be considered in the context of specific types of regulations that might be envisaged. Procedural regulations regarding quality of care and informed consent raise few objections. Some citizens will believe that such procedural regulations provide adequate protection with acceptable burdens and side effects. Others who are concerned about abuses of reproductive cloning might consider additional substantive regulations. While some may judge substantive regulations desirable, others may reject them because they are ineffective or have unacceptable side effects. Persons who reject substantive regulations face a dilemma: is it preferable to prohibit reproductive cloning altogether or to permit it with only procedural regulations. The decision hinges on whether it is considered better to allow reproductive cloning, accepting that some persons will seek it for morally troubling reasons, or to prohibit reproductive cloning, accepting that persons will not be able to obtain it for reasons that many would find acceptable. Faced with this dilemma, some persons might reasonably conclude that the abuses of reproductive cloning would be so frequent and egregious

as to justify a ban on reproductive cloning. Others would argue that the harms of regulated reproductive cloning are acceptable and do not justify such a restriction on reproductive rights.

Given the depth and breadth of concerns expressed both locally and globally, it is important to exercise caution when considering regulation of reproductive uses of human cloning technology. Even if a compelling argument is made in a particular case, it does not necessarily follow that reproductive cloning is justified or desirable in general.

6. A Political Argument

One thing that is clear about human reproductive cloning is that most Americans, and most Californians, oppose it. The survey results vary according to how the question is asked, but they consistently show large majorities against human reproductive cloning. One could argue that the popular will, even if it did not have a compelling basis, may be sufficient for a law banning cloning. Some people might conclude, now or at some point after the physical safety of cloning had been demonstrated, that the arguments against cloning are not very strong. If no substantial rights are being infringed, a government might ban things solely because its citizens do not like them. This might be the case at the local level, for example, with some zoning regulations that dictate the aesthetic attributes of a neighborhood. California state law may provide another example. In 1998, California, by referendum, banned the sale of horse meat for human consumption. The arguments for banning horse meat seemed mainly to have been a popular prejudice in favor of horses, but the "right" of people to eat horsemeat seemed weak. One might view human reproductive cloning similarly and so believe that, in light of weak arguments in favor of human reproductive cloning, the public's preferences should be respected.

This position seems unlikely to be popular. Proponents of reproductive cloning will insist that reproduction, through cloning or otherwise, does involve important interests and should not be prohibited without good reason. Most opponents of reproductive cloning will be confident that there are good reasons for a ban. But for those without confidence in either side's arguments, a decision to ban human reproductive cloning based purely on public preference may be justifiable.

C. OUR CONCLUSIONS

The Committee believes that California should ban human reproductive cloning. Every Committee member finds the safety concerns about human reproductive cloning compelling and would forbid the technology unless or until it were shown safe. We all also accept some of the other arguments against human reproductive cloning, though different members of the Committee find different arguments persuasive. We recognize that both the science of human reproductive cloning and the ethical discussions concerning it are likely to change in coming years. These considerations led some members to consider another moratorium, banning reproductive cloning for another period of years. Ultimately, we concluded that the Legislature should pass, and the Governor should sign, a flat ban with no expiration date. A subsequent Legislature and Governor could, of course, allow human reproductive cloning based on new information or changed views. We concluded that, with this technology, the burden of going forward should fall to those who seek to convince the State to make such a change.

III. CALIFORNIA SHOULD NOT PROHIBIT BUT SHOULD REASONABLY

REGULATE HUMAN NON-REPRODUCTIVE CLONING

RECOMMENDATION

The Committee unanimously agrees that California should not prohibit but should reasonably regulate human non-reproductive cloning. We believe that use of this technology offers potential medical and scientific benefits while not raising many of the same concerns as human reproductive cloning. Such uses might include cloning technology as a source of human stem cells that would not be rejected by a patient's immune system. California should regulate all human non-reproductive cloning in the State, public or private. That regulation should do at least three things: a) prohibit the use of pre-embryos after development of the primitive streak, b) ensure that the persons providing cells for this purpose gave informed consent, and c) require that the research be permitted by an approved Institutional Review Board ("IRB").*

We define non-reproductive human cloning as the transfer of human cell nuclei into enucleated oocytes to produce human pre-embryos without implanting the pre-embryos to produce a human child. Such a process would likely be used to create early pre-embryos to be used as sources of embryonic stem cells. As set out below, we would limit the use of such pre-embryos to the period before the appearance in the pre-embryo of the so-called primitive streak, which occurs 14 to 18 days after the pre-embryo's creation. This developmental stage has also been termed the blastocyst or pre-embryo.

Human embryonic development is a complicated process. The current scientific description of this process defines its terms carefully. The term "pre-embryo" is used to refer to an entity in a stage of development that begins after fertilization and ends approximately 14 days later with the appearance of the primitive streak. The primitive streak is a band of cells at the caudal, or "tail," end of the embryonic disc from which the embryo develops. Its appearance is a crucial step in the development of an organism out of the sphere that is the pre-embryo. At the time the primitive streak appears, the pre-embryo is about one millimeter in size, roughly the size of the dot on the letter "i" in this text. If inserted in a uterus, it would rarely result in a live birth.

Various committees, in the United States and elsewhere, that have studied embryo research have concluded that the appearance of the primitive streak marks an important step in the moral status of the pre-embryo, and hence, the ethical arguments concerning pre-embryo research. Only about 40 percent of fertilized eggs ever reach the primitive streak stage. Before the appearance of the primitive streak, the pre-embryo is not necessarily one individual - it could lead to identical twins. The development of a nervous system and any possibility of feeling sensations comes much later than the appearance of the primitive streak. For these reasons, many such committees have suggested limiting embryonic research to about 14 days or the appearance of the primitive streak. For example, in 1994, the Human Embryo Research Panel of the NIH recommended that federal funding of embryo research be allowed under three conditions: (1) that the pre-embryos were less than 14 days old; (2) that the information which was sought would not be obtained by studies performed with animal embryos or other experimental designs; and, (3) that scientists could demonstrate a compelling reason for performing the studies. These conditions have to be demonstrated to a committee for the protection of human research subjects (Institutional Review Boards), meeting the requirements of federal regulations.

The remainder of this section of our report discusses arguments for human non-reproductive cloning, then arguments against it, before discussing the Committee's conclusions. The arguments are generally summarized with their counter-arguments.

A. ARGUMENTS IN FAVOR OF HUMAN NON-REPRODUCTIVE

CLONING

1. General Benefits to Human Health and Medicine

The arguments in favor of human non-reproductive cloning are scientifically complicated but, as matters of policy, quite simple. Research using this technique holds substantial promise of preventing and alleviating human disease, disability, and premature death. Non-reproductive cloning technology might be able to create populations of functional new cells to replace those damaged through wear and tear or disease. Undifferentiated human pluripotent stem cells obtained from donated pre-embryos have been coaxed into becoming neurons, liver cells and heart muscle cells, all of which appear to function normally in vitro. In light of these potential benefits, NBAC recommended that research on embryonic stem cells continue and be eligible for federal funding.

The possible uses of cloning technology to produce stem cells are numerous and varied. Such non-reproductive cloning could be used for basic research into human embryology and reproductive biology. The following are examples of this kind of research:

- o Increasing knowledge about embryogenesis, i.e., embryo formation, and the development of birth defects
- o Developing a better understanding of the biology of human implantation
- o Understanding better the causes of spontaneous abortion
- o Developing more effective or simpler forms of contraception
- o Improving methods of in vitro fertilization (IVF) treatment for both male and female infertility
- o Developing pre-embryo biopsy and sampling techniques for pre-implantation diagnosis of genetic or chromosomal abnormalities

Improved understanding of these processes might have benefits in preventing birth defects and in aiding, or preventing, pregnancy.

2. Avoiding Immune Responses to Transplanted Tissue

A second and more discussed area of use of non-reproductive human cloning involves cloning in conjunction with the use of human embryonic stem cells. The science behind human embryonic stem cells was discussed briefly in the background section, above. Its promise is immense, although still speculative. But if (1) embryonic stem cells can produce cells and tissues useful in medical therapy, but (2) those cells or tissues trigger an immune response in the patient, then (3) the use of human non-reproductive cloning to produce stem cells with the patient's own DNA might avoid that immune response. Any or all of those steps may not occur. Alternatively, other cells, such as adult stem cells, or other processes, such as transferring the patient's DNA into an embryonic stem cell rather than into an enucleated egg, might avoid any need for human non-reproductive cloning. Nonetheless, at this point such cloning looks like it may be very important to the usefulness of potential stem cell therapies.

As important as it is to consider questions of the extent of moral respect due to the human pre-embryo, proponents of non-reproductive cloning claim that the potential benefits of stem cell technologies make it equally important to consider the cost of not using embryonic cells. If someone suffers a life threatening illness and dies because nothing can be done, there is no moral culpability. If, however, the development of life sustaining therapy and treatment is restricted, then proponents of human non-reproductive cloning might argue that those members of the public who support such constraints bear some responsibility for those patients they have determined not to help.

Opponents of human non-reproductive cloning do not deny its potential scientific and medical benefits, although they do point out, quite accurately, that many of those benefits are speculative and, if they emerge at all, will not appear soon. Instead, they generally urge that the same or similar benefits could be obtained from using cells that do not require the destruction of pre-embryos, such as adult multi-potent stem cells. The value of those cells, however, is at least as uncertain as the value of cells created by human non-reproductive cloning.

B. ARGUMENTS AGAINST HUMAN NON-REPRODUCTIVE CLONING

At least four arguments can be made against human non-reproductive cloning. Most of them are the same as more general arguments against the creation or use of human pre-embryos and embryos in research. To the extent human non-reproductive cloning is used in such research, it is necessarily subject to those arguments. One argument, however, applies only to non-reproductive human cloning and not to other research with created pre-embryos. We discuss that argument first.

1. Human Non-Reproductive Cloning Will Lead to Human

Reproductive Cloning

Many people are concerned not so much with the beneficent use of pluripotent stem cells to treat and cure disease but of the potential abuses of this technology. Such an argument was expressed by Judy Norsignian, Executive Director of the Boston Women's Health Book Collective, in her testimony to the House Committee on energy and Commerce regarding the Human Cloning Prohibition Act of 2001 on June 20, 2001. "While we do not oppose the use of human embryos for valid medical research, including their use to generate embryonic stem cells, we do oppose the creation of clonal human embryos. To allow this procedure would make it all but impossible to enforce the ban on the creation of fully formed human clones. Further, it would open the door to other, more profound forms of human genetic manipulation."

This is a form of slippery slope argument that suggests that taking the initial step (in this case, allowing the creation of pre-embryos for research including the development of cells and tissues for transplant) necessarily results in an action determined to be wrong (in this case, the use of human cloning to produce a child). Because a possible outcome or application is wrong, the argument goes, the first step ought not to be taken. One could argue that human non-reproductive cloning could lead to reproductive cloning in two quite different ways; it is not clear that either path is plausible.

One argument is that the presence of cloned human pre-embryos in research laboratories will make it substantially easier for someone to attempt reproductive cloning - the cloned pre-embryos

will already have been created. If viable human pre-embryos can be created by nuclear transfer cloning - an as-yet unanswered question - that process seems unlikely to prove difficult. The ability to "harvest" eggs exists at hundreds of IVF clinics around the country; the nuclear transfer step, though not efficient, seems unlikely to be difficult to learn. In any event, those who seek to have a cloned baby are likely to want a clone of a particular person and not any cloned pre-embryo found in a laboratory.

In addition, reproductive cloning requires that cloned pre-embryos be implanted into willing gestational mothers. The difficult steps are likely to be finding those willing gestational mothers and performing the implantation successfully. Research on pre-embryos before the primitive streak forms would provide little guidance to would-be reproductive cloners on whether such cloned pre-embryos would develop to term and how best to implant. Regulation of reproductive cloning arguably could focus more easily on recruitment of gestational mothers and implantation rather than on creation of cloned pre-embryos.

The slippery slope argument has a second variation. One could argue that human non-reproductive cloning would make reproductive cloning more likely by making the public accustomed to, and accepting of, the idea of human cloning. For this argument to be true, people would need not to distinguish strongly between the creation of pre-embryos and the creation of babies. Although some people, notably those who believe the strong form of the moral status of pre-embryos, do equate the two, it seems unlikely that most people will. Public acceptance of non-reproductive cloning used to make liver or heart cells seems to us unlikely to breed public acceptance of cloned babies.

2. The Moral Status of the Pre-Embryo

The developments in nuclear transfer and stem cell technologies outlined above have sparked hope that new effective therapies will become available to treat human disease and relieve suffering. However, they have also raised deep ethical and religious concerns inherent in research with human pre-embryos and cadaveric fetal tissue. These concerns center on the moral status of the persons, or objects, created by human non-reproductive cloning. The arguments come in both a strong form, which considers the pre-embryo itself entitled to full human rights and hence cannot be created for the purposes of research, and a weaker form, which holds that it is entitled to some more limited respect.

Edmund Pellegrino, in testimony to NBAC regarding the derivation and use of human embryonic stem cells, nicely summarized the core claims of the strong argument from the pre-embryo's moral status. . . . [H]uman life is a continuum from the one-cell stage to death. At every stage, human life has dignity and merits protection. . . . [T]he embryo would be treated as a means to an end. Its inherent moral status is violated because it must be killed in order to obtain stem cells. There is no moral or legal basis for subjecting any member of the human species to harm or death in non-therapeutic research based on prediction that it will die anyway, no matter how certain that prediction might be.

This perspective is based on the acceptance of the status of the human pre-embryo as a fully human person. On this view, which grants the pre-embryo moral status equivalent to that of an infant or adult, the full moral rights and protections of personhood are bestowed at the moment of conception. Therefore, any procedure which results in direct harm to the pre-embryo may not be undertaken even in pursuit of a good end for someone else. This concern has two parts. First, using the pre-embryo as a means to benefit others is wrong in itself; second, the pre-embryo's informed consent is not, and cannot be, obtained. Both violate human dignity. Nonetheless, many

who hold this view seemingly recognize the promise of stem cell research as Pellegrino indicates:

The Commission should instead [of legitimizing embryonic stem cell research] strongly encourage the funding and development of alternative sources of stem cells—those that do not depend on the destruction of living human embryos or make use of cells from induced abortions. In light of the rapid developments in this field, the possibility and probability of the development of morally acceptable sources of stem cells is a reality.

The argument from the weaker moral status of the pre-embryo differs from the full personhood view just described. This developmental view of moral status posits that an individual acquires interests, rights, and roles incrementally as his or her development of sentience, consciousness and relationships justifies these safeguards. Based on the developmental continuum from pre-embryo to adult and the "symbolic" value of pre-embryos as human "beginnings," the human pre-embryo deserves "profound respect" but not the protections associated with full personhood. This position could also lead to arguments against human non-reproductive cloning, but has more often been used to support such research.

Arguing that human pre-embryos are alive and are valued, Meyer and Nelson have suggested that while the human pre-embryo commands "minimal but real" respect and cannot, for example, be considered property, its destruction need not display disrespect. Their account grants that human pre-embryos deserve respect in all circumstances, even when destroyed for good reasons. Examples of restrictions on the treatment of pre-embryos that would demonstrate such respect include the use of pre-embryos only if the research goals cannot otherwise be obtained and only if the pre-embryo is less than 14 days old.

Discerning the moral status of human pre-embryos is a matter of profound perplexity and debate. David H. Smith opines that, "The fact is we really don't know what they are, and our obligations are indeterminate. We are in a new territory, collectively feeling our way." In such an atmosphere of ambiguity and potential benefit, it appears appropriate to try to work out incrementally and with great care the kinds of pluripotent stem cell research that are morally justified.

3. Protection of Egg Donors

If donated human eggs are needed to create cloned pre-embryos, research and clinical success of human non-reproductive cloning will necessarily increase demand for such eggs - and increase the pressures on women to provide them. Egg donation is not an entirely benign process. It requires the use of ovulation producing drugs and entails specific rates of super-ovulation. The egg retrieval procedure bears a significant set of risks. In return, the donors would receive no personal health or monetary benefits from a potentially harmful procedure used to benefit others.

The donor's informed consent is also a concern. Some women are vulnerable to pressures to participate in research or to help the infertile. There is reason to believe that egg donation has already been subject to abuse by the assisted reproduction industry. Payments have been made that exceed compensation for the costs of participation and actually amount to payment for the egg itself. This commercialization does not respect the participants in the process. As Cynthia Cohen notes: "It takes little imagination to foresee the primary means for getting women to provide eggs for the purposes of [non-reproductive cloning] will have to involve coercion of those in the process of attempting to have children by means of the new reproductive technologies." To avoid economic and other forms of coercion, there should be safeguards for the well-being and freedom of choice of the women providing eggs.

4. Distributive Justice

The last argument revolves around access to the fruits of human non-reproductive cloning. It can be argued that justice requires society to ensure that the benefits of medical science be distributed fairly with particular attention paid to those consistently marginalized by the health care system. The benefits of the regenerative medicine that non-reproductive cloning makes possible should not further polarize health status and access to care. In her testimony to this Committee, Patricia Baird spoke of the "seventh generation rule" which is applicable here—decisions are to be made not solely based on immediate gratification but with concern for the costs and benefits accrued for children and seven generations to come.

C. OUR CONCLUSIONS

We believe that the enormous medical promise of stem cells to relieve human suffering makes a compelling ethical case for the pursuit of many lines of research. Human non-reproductive cloning, which might prove essential to effective stem cell therapy, is one such line of research. The moral scale weighing harms to a limited number of pre-embryos on one side against potentially hundreds of thousands of affected and clearly morally significant humans, on the other hand, can, it seems to us, justify the use of pre-embryos in this work. To ban such research would, to many of us, be itself unethical.

On the other hand, there are appropriate concerns about this kind of research. We believe, therefore, that California should regulate the use of human non-reproductive cloning. In particular, it should take steps to ensure that all such research done in California, whether publicly or privately funded, be approved by appropriate Institutional Review Boards or their equivalents. It should require that the egg donors, and the donors of the cells whose nuclei are transplanted, give real and appropriate informed consent. And, from a sense of caution about the moral status of the pre-embryo, we join other groups in recommending that such research be limited to pre-embryos in which the primitive streak, an essential early sign of development, is not yet present.

IV. IMPLEMENTATION ISSUES

RECOMMENDATIONS

In banning or regulating human cloning, California may be affected by actions of the federal government. Federal regulation needs to be watched carefully to ensure that California's actions are both necessary and appropriate. So do the actions of other states, which might provide experience useful to the California regulatory plan.

Regulating a scientific field undergoing rapid change is difficult for a legislature. The California Legislature should define the terms of its prohibition on human reproductive cloning carefully and its regulation of human non-reproductive cloning carefully but broadly. It should delegate the implementation, including further definition, of that regulation to a state agency.

The Committee strongly believes that California will increasingly face complex challenges arising from genetic and reproductive technologies. "Cloning" by embryo-splitting is one of many such technologies. We recommend that California establish an on-going mechanism to advise the Governor and the Legislature on this and related issues of human biotechnology.

The Committee's discussions raised several questions concerning how California should

implement a policy about human cloning. These questions have led to three recommendations.

A. ISSUES OF FEDERALISM

The federal government has not yet acted to prohibit human reproductive cloning, although the FDA has asserted jurisdiction over it. Federal actions might make legislation by California unnecessary or even, under the Supremacy Clause of the Constitution, invalid. California should watch federal legislation and regulation carefully and take it into account in its own actions.

If the federal government were to ban reproductive cloning, a similar action by California would probably be unnecessary. Such legislation could still have some benefits. It is possible that federal legislation prohibiting reproductive cloning might be held invalid as beyond the powers granted Congress by the Constitution's Commerce Clause. In that event California legislation could be effective when federal legislation was not. It is conceivable, though very unlikely, that federal legislation could be invalidated on the grounds that it violates a federal constitutional right to clone. In that case, similar legislation by California would almost certainly be similarly invalid.

If the FDA's jurisdiction over human reproductive cloning under its existing authorizing statutes were upheld, or if Congress expressly gave the FDA that authority, the need for California to act would be diminished. It might not, however, disappear. The FDA would regulate human reproductive cloning with respect to safety. If California believed that even safe reproductive cloning should be banned, it might want to enact restrictive legislation since the FDA in such a scenario, would legally have to allow reproductive cloning if proven safe.

If the Congress bans human non-reproductive cloning, California would not be able to permit that procedure. If Congress merely regulates such cloning, California might be able to add further regulatory requirements, depending on whether the federal statute preempted state law. It might be, of course, that such federal regulation would cover all the issues of concern to the State, in which case California legislation might be unnecessary.

B. ISSUES OF DEFINITION AND ADMINISTRATION

All regulation of human cloning requires a definition of the procedure to be regulated. Existing statutes and proposed legislation have used differing, and in ways inadequate, definitions of human cloning. Some have even argued that the definition in the existing California statute, the best of those in current use, is ambiguous. Advocates for assisted reproduction have argued that it prohibits the transplantation of the nucleus of a human oocyte that would later be fertilized by sperm, thus giving rise to an embryo with the conventional two parents. It can be argued that the definition does not include this procedure. In any event, as the sanctions in the existing statute are imposed almost exclusively by the State Department of Health Services, concerned researchers or assisted reproduction clinicians could have, but did not, seek an interpretation of the language from that Department. In spite of the weaknesses of their arguments, they illustrate the challenges of clear definition.

There are two main problems in defining human cloning. First, legislatures often lack the scientific expertise needed to write an accurate definition. A number of bills introduced in American states used definitions that were scientifically inaccurate or meaningless. Second, the technology may change more rapidly than the definition. For example, 1990 British legislation banned "human cloning" but defined it in a way that did not include the Dolly procedure. As another example, existing definitions, including California's, talk about the transplantation of a donor cell's nucleus into a human oocyte. It might be possible, however, to clone a human

through transplantation of a nucleus into a human embryonic cell or even a non-human oocyte. Neither would be covered by existing legislation.

Instead of seeking to write an exact definition into the statute, the Legislature should write a broad definition and invest a state agency with the duty of writing, and, when necessary, revising, specific definitions. For example, a legislative definition might read as follows:

Human reproductive cloning is defined as the creation of a human fetus that is substantially genetically identical to a previously-born human being. The use in humans of somatic cell nuclear transfer with a donor cell from an adult, as used in the creation of Dolly, is an example of such cloning. The Department of Health Services shall have the power to write and interpret regulations defining more precisely the procedures that consist human reproductive cloning for the purposes of this statute.

With this kind of a definition the administrative agency could have, or acquire, scientific advice on a proper definition. It could also change or interpret the definition to keep pace with changing technology much more rapidly and easily than the Legislature.

C. CONFRONTING NEW ISSUES ARISING FROM BIOTECHNOLOGY

The Committee was given a relatively narrow mandate - to make recommendations about state policy on human cloning. Even that mandate, however, led to some difficult new issues. The most troublesome for the Committee was "cloning" by embryo-splitting (also known as "blastomere-separation").

Embryos can split at an early stage to produce two (or, rarely, more) people who are genetically identical. This is the source of human identical twins, who make up about one birth in every 240. Although there has been very little research into artificial embryo-splitting in humans, there seems to be no substantial barrier to splitting embryos that are created through in vitro fertilization. In essence, this process would create additional identical twins. In the normal course of events, none of the twins would be identical to anyone who had been alive before; each would have a copy of a new genome. This mitigates substantially many of the arguments against human reproductive cloning.

Embryo splitting is not addressed by the existing California legislation on cloning, nor did the Committee believe that it was clearly within our mandate. Embryo splitting, however, can raise issues similar to those arising from human reproductive cloning by nuclear transfer and addressed above. The first important issues are those of physical safety. A review of the results of research on this process with other mammalian species would be important.

A second cluster of issues arises from the potential use of embryo-splitting to have a "delayed" twin. One or more embryos created by this splitting could be frozen for a period of time, later to be removed from cryopreservation and implanted into a woman. This might occur weeks or years after the first embryo is implanted and brought to term. The latter twin would have a genotype that has already come into existence. The parents (or others) could wait and see whether they wanted another copy of the first child, producing many of the concerns of nuclear transfer cloning.

On the other hand, this is only a concern if some of the split embryos are frozen for a significant period of time. Embryo splitting and implantations only a short time apart (e.g., months) would look more like the case of naturally-occurring identical twins. Whether, for example, 5 or 10 year

birth separations are sufficient to trigger the same kinds of psychological risks as reproductive cloning from a mature adult requires a more discriminating analysis. Similarly, the use of embryo-splitting to have a delayed twin as a source of replacement tissue or nonessential organs for the first child also implicates the commodification of children and abuse arguments addressed above.

The Committee was not charged with making recommendations on embryo-splitting, and thus did not solicit witnesses on the topic. Nevertheless, in light of the overlapping issues and arguments, the Committee believes further evaluation of these issues, by someone, is appropriate. This appears to the Committee to be a perfect example of the kinds of complicated issues that human biotechnology will raise for state governments. Currently, the Legislature and the Governor have few ways to get expert advice on such issues. This Committee is an exception, not the rule.

We strongly recommend that California establish some kind of mechanism to provide expert advice to the government on such issues. Such a group would require some modest funding and staff. It should, however, prove invaluable in helping the State come to grips with the new dilemmas posed by rapid advances in our understanding of human biology. Not only would this enable California to play its historic role as a leading state "laboratory of democracy," in the words of Justice Louis Brandeis, but, more importantly, it would increase its ability to protect its citizens from dangerous or unwise applications of our new scientific knowledge of human biology.

SEPARATE STATEMENT OF FRANCIS C. PIZZULLI

I believe Recommendations Nos. 2 and 4 should go significantly further. They should (1) suggest the scope of an enforcement agency, particularly for non-federally funded entities that are not deterred by IRB disapproval and consequent loss of federal funding; (2) recommend directing the agency having jurisdiction over public and private research to promulgate regulations for the approved IRBs: (a) to identify possible risk/benefit criteria supplemental to federal IRB regulations (which do not address human non-reproductive cloning), especially as there is more than minimal risk to women donating eggs, e.g., (i) the progress of work to derive stem cells from nuclear transfer in primates and other species; (ii) the status of alternative approaches to solving the immune response issue in cell replacement therapy (e.g., via adult stem cells or histocompatibility reprogramming techniques on embryonic stem cells); (iii) the criteria proposed by the 1994 NIH Human Embryo Research Panel (discussed above); (iv) security controls; and (b) to implement centralized oversight as appropriate, such as is found in NIH's Recombinant DNA Advisory Committee (RAC) and Human Pluripotent Stem Cell Review Group (both of which provide for some public access). Reasonable regulation under the above criteria neither mandates immediate approval nor precludes the possibility that technological developments will obviate the demand for this technique for cell replacement therapy.

The bipartisan approach to the public oversight of cloning - as exemplified by the overwhelming passage of S.B. 1344 led by genetics policy expert Patrick Johnston (D-Sacramento) and Jim Battin (R-La Quinta) -- teaches that what Kass and Callahan refer to as the opening act of a long debate over a genetics "revolution" need not be based on traditional divides. As Andrews points out, both new and old analytical concepts and values may be invoked in the debate - ranging from child abuse and incest laws, to genetic bondage and constitutional antipathy, to caste systems and titles of nobility.

Public trust in an effective oversight system, state or federal, will redound to the benefit of the regulated sector in addressing the citizenry's fears of a brave new world being fabricated without

its informed consent.

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