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Placing a Moratorium on Research Cloning to Ensure Effective Control over Reproductive Cloning

transcribed remarks of
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My thesis is that we need an international moratorium on human cloning, that is, on any production of human embryos through somatic cell nuclear transfer ("SCNT") at this time, because this is the only way to achieve a prohibition of reproductive cloning, for several reasons. Practically, if any laboratory is free to create human embryos through SCNT, the result will be cloned babies or, at the very least, serious attempts to create them. Politically, in order to enact a ban on reproductive cloning at the federal level, it appears very likely that a moratorium on research cloning will also be needed. By the end of the moratorium period, means can be developed—which do not now exist in state or federal law—both to rein in some of the wilder, entrepreneurial aspects of the "fertility business" in the United States and to exercise appropriate control over the manner and circumstances under which cloned human embryos would be produced for therapeutic purposes.

Not only is a moratorium on the laboratory production of cloned human embryos needed for prndential reasons, but it can be achieved without adverse effects on other important interests. Placing a moratorium for three to seven years on human embryo cloning will not thwart the development of potential therapies that are commonly cited as the reason for allowing research cloning. (Indeed, I think it amounts to a gross misrepresentation for those who favor research cloning to try to sell it to the public as "therapeutic cloning" and to suggest that a ban will prevent thousands—or millions—of patients with serious and even lethal diseases from obtaining rejection-proof

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HeinOnline -- 53 Hastings L.J. 1057 2001-2002

transplants.) Furthermore, adopting a moratorium on the creation of human embryos through somatic cell nuclear transfer will position the United States to take a leadership role in international cooperative efforts that are now underway to restrict the misuse of this new technology. Finally, allowing the uncontrolled creation of cloned human embryos risks undermining public support for human embryonic stem cell ("hESC") research—support, which, I believe, has been grounded on the argument that these cell lines have been and can be created from frozen embryos left over from infertility treatment and donated by couples who would otherwise discard them. The question is therefore not whether to destroy the embryos (that decision has already been made), but how they will be destroyed. Should they be washed away or used as a source of stem cells for important biomedical research? The notion of creating embryos solely for research, which will necessarily entail their destruction, is much more controversial and substantial risk therefore attaches to any program—such as embryo cloning—that involves the creation of research embryos.

I. A Few Introductory Remarks on Reproductive Cloning

I do not intend to thoroughly analyze the merits of reproductive cloning, that is, the creation of children through SCNT. Yet, I cannot totally ignore the topic, as it undergirds the whole notion of restricting cloning for research purposes, that is, the creation of human embryos through SCNT, as a source of stem cells or for other laboratory studies, restricted to the first two weeks of embryonic development and without implantation into a uterus.

It is widely agreed that reproductive cloning should be prohibited. That was the position recommended to President Clinton by the National Bioethics Advisory Commission in June 1997, in the first major report on the possibility that the SCNT transfer technique, demonstrated in mammals by the cloning of the sheep Dolly, might be applied to human beings.[1] This conclusion rests principally on the ethical unacceptability of using such a highly experimental technique with many known and hypothesized (but unresolved) physical risks with unconsenting human subjects. It also recognizes that many substantial psychological, social, legal, and ethical objections to using SCNT for reproduction have yet to be settled. The conclusion that reproductive cloning should not be permitted has been reached by virtually every group to examine the subject since 1997, most recently by a panel of the National Research Council ("NRC") in mid-January 2002.[2] The week before that, the California Advisory Commission on

1. NAT'L BIOETHICS ADVISORY COMM'N, CLONING HUMAN BEINGS (1997).
2. COMM. ON SCI., ENGINEERING, AND PUB. POL., SCIENTIFIC AND MEDICAL

HeinOnline -- 53 Hastings L.J. 1058 2001-2002

Human Cloning recommended legislating against reproductive cloning on even broader grounds, including the psychological and social harms.[3]

The reasons for banning reproductive cloning are many, beginning with the results of cloning research in animals. As of September 2001, Ian Wilmut (the cloning pioneer who created Dolly at the Roslin Institute in Scotland) reported that there have been 31,007 sheep, cow, goat, pig, and mouse eggs used in cloning research worldwide. These have produced 9,391 embryos for implantation, but out of that process have come only 267 live-born offspring, many of whom have had crippling and even lethal abnormalities. With results like these in mammals, I cannot imagine that any reasonable researcher—or any reasonable person of any sort—would even be talking about attempting to use any other novel technology on human beings. Yet, as you know, there are physicians and scientists who have very publicly proclaimed that they intend, or are now attempting, to use SCNT to create human babies.

What is particularly worrisome about the physical risks to the products of cloning—to say nothing of the additional risks to the women who would have to be manipulated to produce the eggs needed or who would act as "surrogate mothers," especially since a number of the animals carrying clones have themselves died in the process, apparently due to abnormal development of the fetus they were carrying—is that these risks apparently cannot be fully predicted or avoided. The epigenetic changes that have been found to occur as a result of SCNT seem to relate to the fashion in which the DNA in the nucleus has to be re-programmed back to the embryonic state,[4] which differs from what occurs in normal embryogenesis in ways that are not yet fully understood. For this reason, it would not even be possible to "screen" embryos for genetic abnormalities, as some of the malfunctioning genes would not express themselves in the embryo and there is, as yet, no way to know which defects in "genetic imprinting" physicians should be looking for. Moreover, the usual reason for engaging in a risky medical experiment—that it offers the only hope of saving a life that is otherwise beyond medical rescue—is absent here, for without the cloning procedure there would be no "patient" and no one placed in harm's way.

Despite these substantial reasons why reproductive cloning would be a reckless and indefensible act, simply on physical grounds,

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ASPECTS OF HUMAN REPRODUCTIVE CLONING (2002) [hereinafter SCIENTIFIC AND MEDICAL ASPECTS].

3. REP. OF THE CAL. ADVISORY COMMITTEE ON HUM. CLONING, CLONING CALIFORNIANS? 53 HASTINGS L.J. 1145 (2002).

4. David Humphreys et al., *Epigenetic Instability in ES Cells and Cloned Mice*, 293 SCIENCE 95 (2001).

HeinOnline -- 53 Hastings L.J. 1059 2001-2002

to say nothing of the other sorts of harms it might cause, there are those who have not only announced that they are attempting reproductive cloning, but who proclaim that prohibiting the use of SCNT for the creation of children would violate their "reproductive rights." The United States Supreme Court has never decided whether our protected liberty interests in making decisions about family life and in using medical means to prevent the birth of children encompasses unrestricted access to any and all forms of artificial reproductive technologies; moreover, even if the constitution protects "reproductive liberty," it is far from obvious that it would cover the use of techniques to allow asexual replication rather than sexual reproduction. It is my own judgment that even if SCNT techniques were proven (through animal research) to pose no greater risk of physical harm than artificial reproductive technologies and even if these techniques were the only means for some people (a very small number under any credible scenario) to produce genetically related children, a prohibition on reproductive cloning would still pass constitutional muster.[5] (Moreover, I do not see how any "last hope" right to use cloning, were it recognized, could be cabined; rather, it would establish a right of any person who wanted to use SCNT to do so and to use any other available means of controlling the genetic makeup of his or her children.) For the purposes of this article, suffice it to say that the constitutional objections to banning reproductive cloning are dubious and unproven, whereas support for such a prohibition has been demonstrated repeatedly in public opinion polls, in legislative debates in this country, and by enactments around the world; most remarkably, leaders in medicine and science—who rarely if ever favor outlawing any technology—have supported the enactment of legal prohibitions that carry severe criminal penalties.

II. Holding Back Research Cloning to Prevent Reprodnctive Use

The question is thus whether a ban on reproductive cloning ought—or must, at least for the time being—also extend to research

5. A central reason why we generally respect the rights of couples to make their own choices about reproduction and rearing their children is that the kinds of interventions that would be required if the state tried to decide who was or was not likely to produce good children or to be a good parent would be enormously intrusive. Indeed, *Griswold* invoked "privacy" as the right that protected individual choice about reproduction because the statute in question intruded not only on the physician's office where a contraceptive might be prescribed but also upon the marital bedroom where it might be used. Griswold v. Connecticut, 380 U.S. 947 (1965). In controlling a high tech procedure like cloning, the state need not invade the sanctity of the home or set off down a slippery slope of judging the appropriateness of all reproductive choices.

HeinOnline -- 53 Hastings L.J. 1060 2001-2002

cloning. I am not arguing here in favor of any particular piece of legislation. In particular, I think Sen. Brownback's bill, S. 1899 (the Senate version of H.R. 2505, passed by the House last July), which prohibits clouing for any purpose, has several flaws, not the least of which is that its ban on research cloning does not take the form of a time-limited nioratorium. Rather, I hope to demonstrate that a nioratoriuin on research cloning is needed both to niake the ban on reproductive cloniig effective and simply to achieve the passage of such a ban at all.

A. The Connections Between Cloning for Research and for Reprodnction

To begin, we need to be clear that cloning does not differ depending on its purpose. The NRC report labels research cloning "a very different procedure"[6] froin human reproductive cloning, but this is clearly a matter of political advocacy rather than science. For those who object to restricting research cloning, it would be handy if the procedure the NRC would have us call "nuclear transplantation to produce stem cells" was different, but as the NRC's own illustrations make clear (compare Figure 1 and Figure 2 in the report), the cloning procedure is identical up to the point where a blastocyst created through human SCNT is either implanted into a woman's uterus (reproductive cloning) or used as a source of stem cells (research cloning).

Since the procedure is the same, creating cloned embryos for research would greatly increase the risk of reproductive cloning, just the way the availability of guns greatly increases the risk of homicide. That homicide is itself the object of criminal prohibitions does not obviate the need for gun controls; likewise, a prohibition on reproductive cloning would not end the need to place a ban on research cloning until greater assurances can reasonably be made that eiibryos cloned "for research purposes" will not be stolen or misappropriated for reproductive uses. This concern is not inerely rhetorical, as the highly entrepreneurial and largely unregulated *in vitro* fertilization (IVF) business in the United States has already been marked by instances of misappropriation of embryos.

The connection between research and reproductive cloning is especially innportant if it turns out to be difficult to produce viable huiian blastocysts through SCNT. The scientific sophistication to create such blastocysts niay well be beyond the ability of the self-proclaimed cloners. In that case, not only might the results of studies carried out to create "research enibryos" ease the way for those who have announced their intention to engage in reproductive cloning, but they could actually provide reproductive cloners with a source of

6. SCIENTIFIC AND MEDICAL ASPECTS, *supra* note 2, at ES-5.

HeinOnline -- 53 Hastings L.J. 1061 2001-2002

embryos. Such "leaked" embryos could make it possible for such would-be cloners to overcome their own technical inabilities to generate the necessary embryos, leaving them with the less technically demanding task of achieving pregnancies, using standard measures developed by IVF clinics.

Finally, in addition to the risk of surreptitious misappropriation, the existence of cloned embryos in laboratories increases the risk that reproductive cloning will occur for another reason, namely the constitutional uncertainties surrounding this field that I mentioned before. While I am not persuaded by the "reproductive liberty" arguments against a ban on reproductive cloning, there is no question that the claim to override such a prohibition would be stronger on behalf of a woman who has had a clone of herself created than on behalf of a woman who wants to enjoin the enforcement of the statute so that a lab will be willing to attempt to create such a cloned embryo. In the former case, the woman could say, "I have a constitutional right to have my embryo implanted rather than destroyed. When the cloning procedure was started, I agreed to allow it to be created for research purposes, but the rule in all research is that the subject can change her mind at any time and I have changed mine now and want to attempt to allow this embryo to be born." Most judges, I would hope, would reject this argument, but there is nothing in the existing case law that says it might not persuade some courts. In disputes between a man and a woman over possession and use of frozen embryos created with their gametes (as, for example, when a divorced woman wants to attempt pregnancy with some or all of the IVF embryos created with her ex-husband, who objects to such use), courts have responded no differently because the embryos exist than they would if one person were insisting on using gametes from another (unwilling) person for reproductive purposes.[7] But these rulings clearly rest on the notion that no one should be forced into parenthood.

In the hypothetical cloning case, the position of the woman asserting a right to use her cloned embryo is not opposed by another person (since this is asexual reproduction, there is no other person!). Rather, her position is closer to that of a couple seeking to obtain their frozen IVF embryos from a fertility clinic that does not want to release them; in the only litigated case of this sort I'm aware of, the couple prevailed. Thus, the disposition of a challenge to a ban on reproductive cloning brought by a woman with an existing cloned embryo, legally created in the absence of a ban on research cloning (with or without the cooperation of the lab where the cloning

7. Nor have the courts regarded the embryos to possess a "right to be born," such that the party wishing to attempt pregnancy ought necessarily to prevail.

HeinOnline -- 53 Hastings L.J. 1062 2001-2002

occurred), would seem to be in doubt and not resolved by existing cases. The constitutional claim might be sufficient to persuade some judges to allow the woman to use her embryo to attempt a pregnancy. Moreover, once a cloned embryo has been implanted, no court would order an abortion as a means of implementing a statutory prohibition on reproductive cloning.

B. A Broad Moratorium is Needed to Get Any Restrictions Adopted

Besides the practical reasons for not allowing research cloning, the political reality is that the only way to get a ban on reproductive cloning out of the United States Congress is to put a moratorium on research. On one side stand the right-to-life forces who insist on a total ban on all cloning, lest the government say, in effect, "It's okay to make cloned embryos so long as you kill them rather than implant them." That, of course, is an anathema to them. On the other side are those who are not only inclined to favor unfettered research, but who do not want to vote for S. 1899 (or any bill with comparable sponsorship) because they do not want to hand their political opponents an apparent victory. This stalemate has prevented Congress from acting on reproductive cloning for the past five years. We really do need federal legislation in this field, as national uniformity is the only effective way to control human cloning efforts; furthermore, only federal legislation will permit U.S. representatives to play an effective leadership role in the international efforts to prevent reproductive cloning.[8]

Looking at the wide margin (265-162) by which the House passed H.R. 2505 (which, like S. 1899, was originally sponsored by anti-abortion Members), one might be tempted to think that, this time, deadlock will be avoided because the Senate will also pass a broad ban. There are several reasons for thinking otherwise. The most basic is that the Senate is under Democratic control, which means that a measure restricted to reproductive cloning and sponsored by right-to-choice Senators (such as S. 1758, introduced by Sen. Feinstein) is not only more likely to be favored by a majority for party-line reasons, but also enjoys the parliamentary advantages of being favored by the Senate leadership. Second, the research community, having been surprised by the extent of support for H.R.

8. Already more than thirty countries have prohibited cloning, though some only restrict reproductive cloning. The United Kingdom, which is the best example of such a policy, is in a very different situation than the U.S. because their Human Fertilisation and Embryology Authority exercises real control over the fertility business in their country. They know how many embryos have been created in their labs and the uses made of them, whereas we have no idea about that. Under a motion made by the delegates of France and Germany, the United Nations' Sixth Committee is beginning, in March 2002, a year-long process of developing treaty structures for international control of human cloning.

HeinOnline -- 53 Hastings L.J. 1063 2001-2002

2505, has mounted a vigorous lobbying campaigu in favor of "therapeutic cloning." Last summer, researchers were much more concerned with ensuring that federal support would be available for hESC research. HHS Secretary, Tommy Thompson, had suspended the rules adopted by the National Institutes of Health in 2000, under President Clinton, uuder which federal research support could be provided to scientists to use (albeit not to derive) stem cells from discarded IVF embryos. Scientist and disease-related advocacy groups that see hESC research as a promising avenue to cures for conditions such as Alzheimer's, Parkinson's, and diabetes were recruiting conservative politicians to lobby President Bush to allow funding of hESC research, even if it meant backing away from his pledge to right-to-life groups not to allow federal funds to be spent on destroying embryos.[9] For Representatives who wanted to show their support for stem cell research, while not unduly offending their right-to-life constituents, a vote in favor of H.R. 2505 was particularly attractive: it allowed them to say, "I oppose any creation of embryos for research, especially when it involves a technique as unnatural as cloning," while simultaneously joining researchers in urging the Presideut to not overturn the Clinton policy on hESC research support. The same political circumstances do not now exist in the Senate as on July 31, 2001, when House members cast their lopsided vote for H.R. 2505, because nine days later the President announced his compromise (funding for hESC, but only using stem cells from embryos destroyed before 9 p.m. EDT on August 9, 2001, when he announced his decision). Today, with the hESC decision behind them, disease-advocacy and research lobbyists can focus on protecting freedom to create cloned human embryos for scientific purposes aud Senators have little need to seek political cover on the hESC issue through taking a restrictive stance ou embryo cloning.

The net result is that one cannot predict that the Senate will favor S. 1899 simply because the margin of victory for H.R. 2505 was very great and included many pro-choice Members and moderate Democrats. Rather, inaction on banning reproductive cloning remains a real possibility, either because the Senate deadlocks and is unable to pass any bill or because it passes S. 1758 and the House-Senate conferees are unable to reconcile the differences between their measures. Therefore, a second advantage to a moratorium on research cloning is that it is a middle ground on which both sides ought to be able to agree: it gives pro-life advocates a ban on all human embryo cloning, albeit one that is time limited, while reassuring pro-research advocates that the ban is only temporary and

9. *See* Alexander Morgan Capron, *Stem Cells: Ethics, Law and Politics*, 20 BIOTECHNOLOGY L. RPT. 678 (2001).

HeinOnline -- 53 Hastings L.J. 1064 2001-2002

subject to review in a few years, at which time the need to create cloned embryos to provide therapeutic benefits to individuals will either have been substantiated or not. Furthermore, in the meantime, state and federal officials can take steps—which are needed anyway—to implement effective regulatory measures for the fertility business and the public can be engaged in a broadly based debate over the pros and cons of human cloning and genetic modification of children as part of this general examination of state regulation of reproductive technologies.

While research advocates might fear that a moratorium on all forms of cloning would become permanent, that does not seem a real risk, to me, for several reasons. First, a moratorium could include an automatic review every five or so years, perhaps even one with a "sunset provision," meaning that the ban would lapse unless re-enacted after a specified term. Second, our experience with governmental decisions about hESC research demonstrates that when the prospect of real therapeutic benefit is sufficiently great, politicians find ways to support research even while proclaiming their adherence to principles that would seem to lead in the opposite direction. Notwithstanding the label "therapeutic," human embryo cloning is not yet at this point. Hence, the willingness of legislators to ban the creation of human cloned embryos for research today is not a good basis for predicting how they would vote five years from now if research on animal cloning and with stem cells derived from non-cloned embryos demonstrated the need for, and potential value in, creating cloned embryos for non-reproductive purposes.

Furthermore, the intervening period would not only allow serious efforts to control the fertility business, but also the working out of appropriate structures for "therapeutic cloning." Should specially licensed, secure laboratories be established where cloning would be conducted without risking "leakage" of cloned embryos to reproductive facilities? How—and with what safeguards against exploitation and physical and psychological harm—will eggs (potentially millions, were each patient with a relevant disease to be treated with custom-made stem cells from his or her own cloned embryos) be obtained from women? What additional authority does the Food and Drug Administration need in order to play a useful regulatory role? Are Institutional Review Boards the appropriate mechanism for overseeing therapeutic cloning research and what standards ought they to apply?[10] These are only a few of the issues

10. Section 4(b) of Senate Bill 1758 amends the Public Health Service Act (42 U.S.C. 289 et seq.) by adding section 498C, entitled "Ethical Requirements for Nuclear Transplantation Research," under which human SCNT research "shall be conducted in accordance with the applicable provisions" of 46 Code of Federal Regulations section 45 (2001), the so-called "Common Rule" governing research with human subjects. This

HeinOnline -- 53 Hastings L.J. 1065 2001-2002

that could receive serious examination during a moratorium and which are not addressed in present bills.

C. A Moratorium Will Not Cripple Research

Thus far, I have argued that, for practical and political reasons, legislation to ban reproductive cloning should also include a time-limited moratorium on the creation of human embryos through SCNT. Opponents of such a limitation—most of whom, such as the members of the NRC panel, apparently favor criminal penalties on any attempt at producing babies through cloning—suggest that it would cripple essential research. Their principal argument, and the one relied upon by disease-advocacy groups, is that it will be essential to clone human embryos for therapeutic purposes because the stem cells derived from a cloned embryo would match the patient-somatic cell donor and hence would avoid the rejection phenomenon that now limits organ and tissue transplantation. If this claim was persuasive, it would certainly weigh against enacting a moratorium on the creation of cloned embryos for non-reproductive uses, but it simply isn't.

As I have already mentioned, it's very misleading to call this "therapeutic cloning." If the term "therapeutic" was applicable here, we might as well simply drop the term "research" generally and call all processes of developing new biomedical technologies "therapies" from the outset. There is nothing therapeutic about the possible creation of cloned human embryos as a source of stem cells, and there won't be for many years. Indeed, the underlying field of hESC research is itself in its infancy. The term "therapeutic cloning" represents an attempt to recruit patient advocates to the cause and, it seems to me, it has been a really unseemly exploitation of their desperation. Michael West, the head of Advanced Cell Technology, the principal company that is now pursuing this technology, told a Senate committee last year that a ban on therapeutic cloning would cost 3,000 lives a day, so that even if a ban only created a six-month delay, Congress would in effect be responsible for taking half a

provision raises a number of questions, not the least of which is whether this structure—developed for research that is federally funded, or at least is conducted at institutions that do a lot of federally funded research and that have agreed to apply the same procedures to their non-federally funded research—will work if applied to research, all of which is privately funded (because other existing appropriations provisions prevent any federal funding of research in which a human embryo would be created or destroyed). Furthermore, the Common Rule generally requires that research subjects consent to participate (clearly not possible for embryos) and not be exposed to undue risks of harm (cloned embryos would be destroyed in the process of creating stem cell lines); thus, the only possibility for such research to be approved at all is for cloned embryos not to be regarded as research subjects. But, in that case, the Institutional Review Boards charged under the Common Rule with reviewing research protocols would have little basis for deciding whether or not to approve one or another proposal for research cloning.

HeinOnline -- 53 Hastings L.J. 1066 2001-2002

million lives. In fact, both the need for and the eventual utility of so-called therapeutic cloning are unproven.

A moratorium on research cloning will not prevent progress towards therapy. First, much research must be carried out using hESCs (which can be derived from IVF embryos that are being discarded and are donated for research instead) before there is any reason to use cloned embryos as a source for stem cells. Scientists need to learn how to induce hESCs to differentiate reliably into particular cell types before it will be possible to safely produce cells and tissues for treatment. They will also have to demonstrate that these transplanted cells have the ability to produce therapeutic benefits. Will the cells function normally? Will they avoid the fate of the originals? Some recent studies suggest, for example, that where diabetes results from an autoimmune mechanism, the implantation of new pancreatic cells is not the solution. Instead, the solution may lie in overcoming the autoimmune response, which will otherwise produce the same fate for the implanted cells.

Furthermore, it is not clear that cloned embryos would represent a better source than banks of hESCs for most patients. First, the very premise that cloned embryos offer a rejection-proof alternative to hESC lines is itself in doubt. In most cases (except where a woman is the source of both the egg and the somatic cell used to create a cloned embryo), the cloned embryo and the patient would have different mitochondrial DNA (that is, the genes in the cytoplasm of the cell, outside the nucleus) and this difference has been reported to cause immune responses in laboratory animals. Second, research is underway to determine whether hESC lines can become "universal donors" or can at least be made less antigenic, so that transplanted cells would be less likely to provoke immune rejection by the patient. Third, hESC lines offer a much quicker and more cost-effective prospect for transplantation than would stem cells from cloned embryos. Not only would the latter task face logistical difficulties (Will the SCNT technique become reliable enough to produce embryos quickly and easily? Where will all the eggs necessary to treat patients come from?), but the expense of such "custom-made" therapy is likely to be prohibitive for most patients. Fourth, the use of adult stem cells (that is, regenerative cells present in various tissues of an organism after the embryonic stage) could offer a means of avoiding immune rejection without having to create cloned embryos and attempting to derive stem cells from them. Research on the properties of adult stem cells is a very active field today. If such cells can be manipulated in a fashion comparable to what is being sought with ESCs, it might be possible to create cells, tissues, or organs for transplantation by harvesting readily available stem cells from a patient's fat or bone marrow and then transforming them into the

HeinOnline -- 53 Hastings L.J. 1067 2001-2002

desired type (perhaps to replace damaged heart muscle or deteriorated neurological cells). Likewise, with further understanding of the underlying mechanisms, physicians might be able to coax the stem cells already available in the patient to perform needed repairs without removing the cells from a patient's body.

Alongside research on human embryonic and adult stem cells, much research is required with cloned cells from mammals before the need arises to clone human embryos for research. For example, are the epigenetic errors that occur in cloned animals such that it would be foolish to use cells from cloned human embryos for therapeutic purposes? If a gene that is disrupted because of the SCNT procedure were important to the healthy functioning of a particular type of cell, then using a cloned embryo as a source of such cells for transplantation could be very risky. Having a moratorium on human cloning would push researchers to carry their research as far as they could in mammals, including primates, before turning to human studies. The upshot of all this is that a moratorium encompassing all human cloning, rather than just implantation of cloned embryos, will not prevent any therapies from being used because none are in prospect any time soon, nor is it likely to delay the development of such therapies.[11]

III. Conclusion

Plainly, the practical and political problems that I foresee if Congress does not include a moratorium on research cloning in its efforts to prohibit reproductive cloning, as well as the lack of deleterious effects that I believe such a moratorium would have on research, are matters of prediction, not of proof. There is some risk—principally, a risk of delay—if the predictions are wrong, especially about the effects on research. That risk might not be worth taking if the production of children through cloning is not something to be concerned about, indeed, not something to be avoided if possible. So, in the end, we come back to reproductive cloning and to the merits of efforts to prevent it occurring.

11. The moratorium would prevent other research, such as the creation of cloned embryos from somatic cells in which genetic mutations are expressed, as a possible means of developing stem cells that express the mutation, to aid in studying "how inherited and acquired alterations of genetic components might contribute to disease processes." SCIENTIFIC AND MEDICAL ASPECTS, *supra* note 2, at ES-12. The NRC panel also opined that cloning embryos would be useful to ensure that stem cell research "covers a more genetically diverse human population than that represented in the blastocysts stored in IVF clinics" but did not explain why it would be necessary to create cloned embryos to achieve this diversity, and concluded, without explanation or support, that "studies of genetic reprogramming and genetic imprinting will be substantially enhanced" through SCNT-derived stem cells compared with other hESCs. *Id.*

HeinOnline -- 53 Hastings L.J. 1068 2001-2002

In the early post-Dolly debates about human cloning, some fairly specious (or, at least to me, unpersuasive) arguments were raised against it based on clones being genetically identical.[12] Were objections of this sort the only ones, I would be inclined to agree with my colleague, Michael Shapiro, who wrote last fall: "The main reason why human cloning is such a horror is that much of the world would watch them, poke them, tell them how repulsive their origins are, and generally treat them as an 'it'." If he is right, the problem—which would not be an objection to cloning, but rather to our reaction to it—is plainly avoidable. But I don't think that is all there is, even when (if ever) the physical risks involved are eliminated.

Nonetheless, the other concerns are neither self-evidently disqualifying of reproductive cloning, nor are they supported by directly relevant experiential or experimental data; rather, they are matters to be analyzed, investigated, and debated and about which, in the end, disagreements are so likely that the decisive question will be where the burden of proof rests—with those who would prevent use of SCNT for the creation of human children, or with those who would employ this radical new means of creating children. Usually the response in this country is to place the burden on those who would regulate, but I think in this case, given what a fundamental and radical shift asexual reproduction represents, one could—as the Europeans now do routinely in environmental matters—employ the precautionary principle. This holds that once a certain prima facie case of significant and irreversible risks has been made out, those who would go forward bear the burden of negating the risks and the absence of definitive evidence cuts against the innovation rather than against its regulation.

So, what are some of the concerns about reproductive cloning? One issue about asexual reproduction is whether children would be harmed by having only one parent, in a genetic sense of the term. Obviously there are many families in which a stepparent raises a child, or a father raises a child born within the marriage who is known not to be his own biological offspring, without such circumstances raising substantial problems. But the relevance of such experience is

12. One respected person at the University of Chicago suggested that clones would be used as living sources for replacement parts and organs because they would not be fully human since their lack of genetic uniqueness would keep them from being individuals or moral agents. Another notion in the early coverage of cloning in the popular media was that, somehow, it would immediately produce "xerox copies." For example, in the film *Multiplicity*, the character(s) played by Michael Keaton emerged from the duplication process as ever-more aberrant copies of a full-grown man (with most of his memory—if not his judgment—intact). As Professor McLean suggests in her article, this public misunderstanding was exacerbated by the fact that when we first met Dolly she was already a sheep and not a lamb, leaving the sense that cloning was capable of producing fully adult organisms, rather than baby replicants.

HeinOnline -- 53 Hastings L.J. 1069 2001-2002

not entirely clear, because even then there actually are two biological parents, whether or not they are both currently involved with the child.

A second issue is whether the relationship between a person who is the source of a somatic cell nucleus and the one or more persons who are that person's clones can even be described in ways that make sense legally, socially, morally, or what have you. Obviously, such relationships don't fit existing categories and raise questions about who is a "sibling" (as the phrase "later-born twin" suggests), or who is a "parent" (the donor of the somatic cell nucleus or his or her own parents, whose sexual act gave rise to the unique genome represented in the clones)? Consider the question of whether there ought to be restrictions on who a clone could wed. My wife and I have nothing but sons. If we wanted to have a daughter, probably our best method would be to clone my wife. Now, suppose we did that and then, tragically, my wife died. Would her clone, who has no biological relationship to me, be a suitable replacement for my now dead spouse (assuming the clone were by then old enough to marry)? She would be the embodiment of the woman I had married, which is exactly the kind of "replacement" that people who want to use cloning to replace a dead child are talking about. Should the rules against incest apply? What if the clone had been raised by someone other than me and my late wife?

Many of the most contentious issues about reproductive cloning concern the impetus it gives to the already existing phenomenon of "designer babies." The notion that children should be "wanted" is an attractive one, especially compared with the alternative. One of the arguments for reproductive liberty is to allow people to be better parents in all sorts of ways, especially by not having children they don't want. When there is freedom to choose, those who are born are that much more precious. Some evidence now seems to suggest that, while artificial reproductive technologies are associated with slightly elevated physical risks, the children tend to be wanted (and loved) at least as much as children born through traditional reproduction. Yet, the line between a wanted child and a made-for-order child is a small one. The available means for designing children are too new and too modest to have produced much evidence about what the harm of being wanted may be—not in a general sense "a wanted child," but being wanted for specific characteristics and capabilities, be it male or female, with a known genetic makeup or specifically, with my own genetic makeup (and, if Dr. Segal's extrapolation is correct, a cloned child might be more like me than two twins are like one another).

Raising these issues does not mean that one buys into genetic determinism—quite the contrary! There are good reasons, however, to think that people who are drawn to cloning are, in many instances,

HeinOnline -- 53 Hastings L.J. 1070 2001-2002

trying to get a predetermined result. Indeed, the whole reason for using cloning rather than a method of sexual reproduction ("assisted" or otherwise) is to control the child's genome. So, while it is plainly the case that a genome is of importance only as it functions in a cellular, organismic, and social environment, people can be excused for thinking otherwise, given the prominent attention that science and the media pay to mapping the genome and to discovering "the gene for" this and that. Given the uniqueness of each individual's environmental experience, from the earliest embryonic moment onwards, it's true that if Mozart were cloned, you wouldn't get another Mozart. But, so long as the impulse to act otherwise exists, the failure of the Mozart clones to measure up to expectations is likely to be a source of harm rather than benefit for them, as their makers' expectations—and elaborate plans or fantasies—are disappointed. Of course, it is not uncommon for parents to have hopes and expectations for their children. But when these fly in the face of the reality of the child, there are also social forces that rein in—indeed, that at some point ridicule—parents who try too hard to mold their children's lives. Were medicine to sanction cloning as a legitimate way of getting the child you want, it would exacerbate rather than reduce the drive to regard children as objects to fulfill parental wants rather than as individuals who are entitled to their own, self-directed lives. Nor is this a matter of determining the outer limits of some "right" of paternal manipulation. As Peggy Radin pointed out years ago, any process that commodifies children has effects on people who don't even use the technology and I think that is something which will prove true here as well. To the extent that procreation becomes manufacture, the choice to go on with unmediated "sexual roulette"—free of whatever benefits genetic tinkering or outright cloning might provide—is likely to seem increasingly irresponsible and perhaps even impermissible.

There are a wealth of other issues that deserve to be examined and remarkably little data to use in the process. It is frequently suggested—as it was by Professor Segal in this symposium—that we can rely on studies of twins, which are read to be largely reassuring about the results of cloning. This seems largely specious because we have no studies of twins who are separated in time, especially where one is an adult at the time the other is born. This difference is crucial regarding concerns over the domination of a clone by the other, the extent to which the younger one (when aware of the life of the older progenitor, even if not raised by that person) would lack the sense of an "open future" and would instead feel bound to a path laid out in the life of the other. To the extent the twin studies teach us anything, they sound a cautionary note. Professor Segal reported that twins who are more physically alike appear behaviorally to be more

HeinOnline -- 53 Hastings L.J. 1071 2001-2002

different because their parents place a bigger emphasis on treating them differently and because they try harder to differentiate themselves. With twins, we have two people who (in principle) begin on a footing of equality; one will have been born shortly before the other (which I gather is frequently an issue in the relationship), but they are basically equal. That is not true in cloning of temporally separated clones and the issue that arises is, obviously, why would someone be using cloning except to be getting a particular result, so that rather than wanting to differentiate from the identical twin, people in this circumstance would be using cloning precisely because they wanted to get a particular result and would exert pressure toward that result.

There are many other concerns about the potential effects of cloning that a moratorium would give us an opportunity to evaluate, at least to some extent, even if in the end we may have to base decisions on very incomplete data. Above all, I hope that society as a whole will be mindful of the enormous power of cloning and genetic modification of reproduction and of the dangers that inhere in our inevitable temptation by such power. Often, great hopes have attached to technological developments, but the experience of recent years should have taught us that we need caution too. Thinking of the great power represented by the prospect of human cloning, I am reminded of C.S. Lewis' remark three decades ago in *The Abolition of Man*, that "Each new power won by man is a power over man as well."[13] Cloning provides the ultimate example of his warning: the power of one generation to determine the makeup of the next.

13. C.S. Lewis, THE ABOLITION OF MAN (1965).

HeinOnline -- 53 Hastings L.J. 1072 2001-2002