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# Regulating Human Cloning

*A report on the workshop held March 11, 2003, by the American Association for the Advancement of Science.*

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## PREFACE

In an effort to promote informed discussion encompassing both legal and scientific perspectives, AAAS convened a one-day invitational workshop on the regulatory issues associated with human cloning. Participants represented a wide range of backgrounds and constituencies, all of which should be included in a careful, science-driven examination of this topic.

Participants were asked to set aside, for the purpose of this discussion, the question of whether human research cloning should be prohibited and focus instead on whether a regulatory scheme could be developed that would prevent reproductive cloning, but allow research cloning to be conducted in a safe and ethical manner. While there have been many discussions of the scientific and ethical issues associated with human cloning, relatively little attention has been paid to the practical questions of how to design a workable regulatory regime.

Most of the work of the meeting took place in small groups. To lay the groundwork for these discussions, AAAS circulated a background paper in advance of the meeting. In addition, several plenary presentations helped to frame the issues for discussion. The presentations are summarized briefly in Appendix 1 and the background paper is included as Appendix 2.

By design, the meeting did not seek to build a consensus among the participants on the nature or shape of a scheme for regulating human research cloning. Instead, it was an attempt to identify the issues that need to be considered in developing such a scheme. This report summarizes the discussions and highlights the key issues that emerged, but does not draw conclusions or make recommendations. The report was prepared by AAAS staff. Participants were given the opportunity to review it in draft and some provided comments and suggested changes, which have been incorporated into this version. *Participants' views were diverse, however, and the report should not be construed as representing the opinions of any individual participant or the organization with which he or she is affiliated*. Further, detailed discussion of these issues will be needed should the federal government decide to implement regulations that prohibit reproductive cloning while permitting the use of cloning techniques for the purpose of creating stem cell lines for research.

Issues discussed at the workshop include definitional language, concerns regarding egg donation, cloning and research procedures, regulatory structures, tracking of research materials and products, use of the products of research cloning, and prevention of reproductive cloning.

## DEFINITIONS

As is often the case in discussions that bring together science and law, many definitions turned out to be controversial. The inability of participants to agree on the meaning of terms such as *blastocyst*, *embryo*, *viability*, and *potentiality* served as a reminder of the highly charged nature of the discussion at hand, and the vast range of issues present in the debate.

Definitional questions raised in discussion included:

- Some held that the term *embryo* has a specific meaning that has been used in other contexts, including areas of scientific research. Others argued that the term *embryo* has no precise meaning without substantial descriptors, such as "X-day-old embryo grown under Y conditions." Should *embryo* be the default term for regulators? Should regulatory efforts use the definition of *embryo* embodied in existing law for fetal tissue research?

- Should regulators use a single term for all cloned entities or would it be more useful to employ separate qualifying terms for individual stages? For example, "embryo at conception," "embryo at blastocyst stage," and "implanted embryo."

Much of the discussion focused on the use of more precise language and language consistent with scientific practice. For example, the more appropriate term to use when discussing reproductive cloning is the *transfer* of an embryo to the womb, not the oft-used *implantation*. Scientists have limited control over the ability of an embryo to implant successfully, so a more accurate description of their action is the *transfer* of an embryo to the womb.

While use of the term *embryo* can be polarizing, it can also promote clarity, even where some feel it has too great a political, emotional, or social "charge." Thus, for the purposes of this report, we have chosen to use the term *cloned embryo* to describe the product of nuclear transplantation.

## CONCERNS REGARDING EGG DONATION

Scientists cannot predict how many eggs will be needed for research on nuclear transplantation in humans. The number has varied widely in other species, with mice being very difficult to clone and cows relatively easy. It is impossible to say where on this spectrum humans will fall. It is clear, though, from the results with animal models, that producing a cloned embryo through nuclear transplantation that is suitable for research cloning will require fewer eggs than reproductive cloning, although there will still probably be a need for a substantial number of eggs. Some participants noted that as research proceeds, the efficiency of the required techniques should improve, which may then result in the use of fewer eggs.

Two current sources for human eggs were identified: women donating eggs primarily for fertility treatments and women donating eggs solely for research. The first source consists of women who donate eggs for the purposes of using an assisted reproductive technology (ART). The ART group would probably not be an acceptable source for egg donation for at least four reasons:

1. Scientists have not found an efficient way to freeze and thaw eggs. Only about five percent of eggs frozen using current techniques typically survive. (However, better freezing and thawing techniques may be on the horizon.)

2. Women in this group are donating in order to facilitate a fertility treatment, and they will not be inclined to set aside eggs for research that could potentially be used for the treatment. If better freezing and thawing techniques are developed, however, it might be possible to set some eggs aside for a future use—whether as part of the treatment or for research.

3. The highest-quality eggs would likely be used in the fertility treatment, potentially leaving researchers with only low-quality eggs. Some participants expressed concerns that any eggs from this group of donors would be low-quality, given the possible pathophysiologies associated with the reason for seeking ART assistance. Others noted, however, that eggs considered to be of low-quality for the purposes of assisted reproduction might still be adequate for the purposes of research.

4. In order to prevent conflicts of interest among physicians and researchers, research sites should be kept separate from fertility clinics.

The second source consists of women who donate eggs specifically for research. These women, the non-ART group, are divided into two subgroups: compensated donors who receive a monetary payment for their eggs and altruistic donors who receive no payment other than

reimbursement for expenses. These two subgroups will likely be the sources of eggs for nuclear transplantation research. Some participants expressed concerns that reimbursement for egg donors may place undue pressure on women of low socio-economic status to donate, and thus to subject themselves to medical risk.

Regarding the issue of directed donation, the argument was made that the case of cloning-derived therapies should be treated more like organ donation in which current practice allows family members or friends to donate to a specific person when there is a "match," rather than like fetal tissue donation, where directed donation is not allowed. The objection to the directed donation of fetal tissue is that it might encourage people to get pregnant and have an abortion in order to help a loved one. In the case of research cloning, the embryo will not be transferred to a uterus, and so some participants argued that directed donation should be permitted. There was no evident consensus on the issue, however.

It was the consensus of one working group that institutional review board (IRB) approval should be required for all egg donation for research purposes, from both ART and non-ART donors. One participant suggested that individuals who have served as gamete donors be consulted as regulations are developed. In addition, the issue of how many times researchers should be required to obtain donor consent is an important one. Once a tissue line is established, should it be necessary to go back to the donor for further consent when use of the cells changes? Some participants believed it should only be necessary to obtain informed consent once, provided that the initial consent is clear and comprehensive. Others suggested considering a process of on-going consent, since all possible developments may not be reasonably foreseeable. Participants disagreed on the current effectiveness of IRBs, and private IRBs in particular. Some argued that IRBs are plagued by major problems; others held that while they may be imperfect and there may be some bad ones, on the whole they are competent and effective.

## RESEARCH PROCEDURES

One group of participants proposed the following rough guidelines for responsible conduct of research cloning:

1. Human cloning research should be approved only when animal research studies have been completed.

2. All donors must provide informed consent.

3. The cloned embryo must not be allowed to develop beyond 14 days in vitro.

4. There must be regulations to preserve confidentiality of data, and handle other related privacy issues.

5. There must be a system established that tracks and monitors the products of research cloning, and that must be more than simply a paper (or electronic) recordkeeping system. The chain of custody is a critical issue, both for security reasons and because some individuals may not want to use products that are derived from research cloning due to their own ethical concerns.

A potential scientific solution to the tracking issue would be to utilize DNA typing to trace embryos and stem cell lines, and one participant suggested that this might be possible using the blastomere. Participants pointed out that IRBs already maintain paper records on research, so product tracking may just be a question of adding another "layer" to the IRB process.

## THE PRODUCTS OF RESEARCH CLONING

Members of one working group focused their thinking about the products of research cloning using the following framework:

1. What are the risks and benefits of research cloning products, and how are they to be assessed? Does the nature of research cloning itself call for a new regulatory structure? For example, if research cloning is a blend of new surgical techniques (generally unregulated) and new biologics (FDA-regulated), what is the appropriate regulatory framework?

2. How will people access these products? How will the costs of the research be recaptured? What will be the delivery structure for these products? Will it be through the private sector, like in vitro fertilization (IVF) has tended to be, or more often through academic centers, as in organ transplantation?

Each element of the framework raised secondary set of questions and concerns, as outlined below.

### Risk assessment

As there are not yet any products of research cloning, the risks and benefits of a particular product cannot be assessed, but significant concerns about errors, the potential for misuse, possibilities for illicit reproductive cloning, and unknown risks were raised. Also discussed was the expectation that research cloning would yield substantial information for basic science, including knowledge about embryonic development, gene expression, and cell differentiation.

Much discussion focused on whether current regulatory bodies and agencies could undertake the process of assessing risk and benefit for research cloning. Some participants felt that current regulatory agencies could adequately assess the risks, and protect the public, if it was made clear that those agencies had the authority to do so. In particular, the FDA, NIH, OSHA, and local IRBs were all cited as groups likely to have jurisdiction over various aspects of the research cloning process (for example, clinical trials, research issues, safe handling of biologics, xenoviral transfer risks, and contamination containment). The competing concern expressed by participants was that this approach would result in patchwork regulation of research cloning, with constant confusion over who has authority and jurisdiction at any given stage of the process.

### Access and delivery of products

If the question here is essentially "how will the poor get access?" then the crux of the issue is whether therapeutic treatments will be individualized or more generalized, like current drug therapies. Many felt that individual treatments were unlikely to result, and that more generalizable therapies would be the norm. The issue of access was seen as so complex as to warrant a separate discussion, and so was set aside by the group considering it, though the following regulatory questions were posed regarding therapy development:

1. *Research Cloning for Individual or Unique Therapies*. One participant questioned whether the FDA would be required to approve each derived stem cell line. Another reported that the FDA is analyzing the potential for considering

each donor as a "unique manufacturing campaign" that would receive a single license rather than separate licenses for each derived cell line.

2. *Disease-specific Stem Cell Lines*. Some participants expected that these would fall under investigational new drug (IND) provisions. A strong concern was voiced that researchers and FDA would need to ensure for quality control, and would need the clear regulatory authority to do so.

3. *Diversity of Stem Cell Lines*. A third critical area of research is to gather enough stem cells to reflect the genetic diversity of the human population and create generalized therapies that can be used for all individuals.

## REGULATORY STRUCTURE

Regulatory bodies of many types and shapes were proposed to address the various aspects of research cloning, although some felt that it may not be possible to produce an effective regulatory structure for this research. Some proposed that there should be one central IRB with expertise in cloning. Others felt a "RAC-like" body convened by the federal government would be more appropriate. (The RAC is NIH's Recombinant DNA Advisory Committee, which was established in the 1970s to oversee research involving r-DNA. Its original mandate has changed over the years as the science has developed.) One participant expressed strong doubt that such a body could ever be constituted, given the current political realities and the history of the Ethics Advisory Board in the early 1980s (See Appendix 2). In addition, critics of the RAC approach argued that research cloning is differently positioned than r-DNA research was when the RAC was formed. The bulk of the funding for r-DNA work was from the federal government, whereas the private sector is expected to play a much larger role in research cloning.

Defenders of a RAC-like body argued it was better to focus on the best possible regulatory structure and consider political realities as a separate question. From the point of view of the research community, the RAC ultimately proved unnecessary (the r-DNA research it governed did not turn out to be dangerous), but it was crucial in reassuring a nervous public, lending credibility to the research community and forestalling moves in Congress to ban r-DNA research. On the other hand, local IRBs have advantages as well, as they tend to be familiar with the researchers they regulate. Some suggested that there might be a need for protocol approval from both a RAC-like body and the local IRB.

Other participants suggested a wholly new regulatory agency, much like the United Kingdom's Human Fertilisation and Embryology Authority (HFEA). While it was generally conceded that being able to "track every ovum" had some appeal, it was pointed out that such a system works better where there is a nationalized health service than it might in the largely decentralized U.S. system. Other proposed structures included: facility licensure bodies, specially designated institutional oversight bodies, a public-private licensing and inspection entity, and voluntary accreditation bodies.

A major sticking point would be the source of authority for a regulatory body in the case of privately funded research. Some participants noted that implementing a regulatory structure would be much easier if NIH were funding the research. The FDA was mentioned as a possible source of authority, however it deals primarily with issues of safety and efficacy. Moreover, nuclear transplantation would not fit under the regulation of biologics until there is clinical testing of a potential therapeutic application. FDA does, however, have jurisdiction over tissues used for transplant.

Additional wrinkles included whether the authority should be state or federal, what kind of enforcement authority or "teeth" the regulators would have, how to make the regulatory body "reputable," and how to make participation mandatory, particularly in the absence of federal action. Additionally, suggestions for appropriate penalties to be assessed on violators included civil fines, revocation of licenses, criminal penalties for transfer to a uterus, and harsher penalties for fraud than for negligence. Further concerns included the political difficulties inherent in attempting to create and implement a federal oversight body, given the highly charged nature of the issue.

## PREVENTION OF REPRODUCTIVE CLONING

Mirroring the larger national debate, some participants supported the passage of a ban on reproductive cloning with language enabling research cloning, while others were strongly opposed to such a regulatory scheme. One frequent objection (raised by the Department of Justice in written testimony to the U.S. Congress, among others; see Appendix 3) is that such a ban would be unenforceable, as once the embryo is transferred to the womb it would be indistinguishable from a non-clonal pregnancy. Many participants articulated a position that a reproductive cloning ban should be enacted as a guide to what society thinks people should do and as a statement about what society believes on the issue of reproductive cloning. Lawmakers, they said, must recognize that those who would break the law would likely do so regardless of how it is structured. No law is fully enforceable in an open society, and even laws that are difficult to enforce can still serve as effective deterrents.

One possible structure to reduce the likelihood of reproductive cloning was suggested, codifiable in four elements:

1. Transfer of a cloned embryo into a uterus would be made illegal.

2. Facilities conducting nuclear transplantation would not be allowed to also house IVF labs.

3. Every embryo created by nuclear transplantation would have to be recorded, along with a record of its disposition; and

4. Disaggregation of the embryo must occur where created—no shipping or other transport of a cloned embryo would be allowed (transport of products, like stem cells, which could not be implanted and brought to term, would be allowed).

There were substantial questions as to how such a scheme might work—for example, what would constitute a "facility" or what proof would be needed to show disposition—but most participants agreed that this was at least a starting point for discussions of how to outlaw reproductive cloning while (if it is deemed desirable) permitting cloning for research purposes to proceed.

## CONCLUSION

In providing a neutral forum that allowed for an informal discussion to proceed, this AAAS meeting helped to build relationships among diverse constituencies, and to lay the groundwork for further dialogue. The meeting highlighted the continuing need for a more thorough examination of the difficult and often divisive topic of regulating human research cloning. Many participants characterized the proceeding as both "useful" and "necessary," with several expressing interest in engaging in a sustained dialogue on the topic.

## Appendix 1: Morning Proceedings

Following are brief summaries of the invited talks presented at the workshop.

**Dr. Rudolf Jaenisch** reviewed the fundamental processes involved in the science of cloning, then focused on the implications of animal cloning experiments for human reproductive cloning. The main challenge in reproductive cloning, Jaenisch said, is to determine how to "reprogram" genes, so that the "adult genes" expressed by the DNA of the somatic cell are "turned off," while the "embryonic" genes needed for the early stages of development are "turned on." Jaenisch reported that scientists have not overcome this challenge and that most—if not all—cloned animals have abnormalities that, even if not fatal, are likely to have detrimental effects on the animal. Jaenisch suggests that there are not only substantial technical obstacles to human reproductive cloning, but also biological barriers that will be difficult or even impossible to overcome. He noted that the epigenetic problems confronting reproductive cloning would not necessarily affect research cloning, as many processes would only require a small set of genes to be correctly expressed.

Jaenisch was followed by **Dr. Gregory J. Glover**, who outlined U.S. regulatory schemes and how they would affect human cloning. Currently, human cloning research would appear to be subject to a host of regulations from various agencies, including FDA, NIH, DHHS, as well as being subject to applicable state regulations, such as versions of the Uniform Anatomical Gift Act.

FDA has authority over cell and tissue-based therapies, and its jurisdiction applies to clinical research, regardless of funding source. FDA has presently asserted jurisdiction over all clinical research involving human cloning technology, which would apply to any attempt at reproductive cloning but not to research cloning that has not reached the clinical phase. DHHS has regulatory authority over all federally funded human subject research, and over other human subject research where institutions have filed an institution-wide assurance under the federal *Common Rule* (45 CFR 46). NIH has guidelines covering fetal tissue research and embryonic stem cell research which apply to federally funded research only.

**Dr. Paul McHugh** then gave a brief summary of the deliberations and conclusions of the President's Council on Bioethics, noting that President Bush had instructed the Council that its primary mandate regarding cloning was to examine the issues carefully and help spur public discussion, not necessarily to reach consensus. The Council released a report on the ethical issues associated with human cloning in July 2002, and plans to undertake an examination of regulatory issues as well. McHugh cited three issues of concern that should be addressed in proposed regulations: market pressures for human ova, concerns regarding a "slippery slope" of uses for the cloned embryo, and concerns that reproductive cloning might contaminate the gene pool.

The final speaker, **Ms. Lori P. Knowles**, discussed the approaches toward human cloning regulation in the U.K., China, Singapore, Israel, Canada, Australia, France, and Germany. Currently, only the U.K., China, and Singapore allow research cloning, while the rest prohibit both reproductive and research cloning and provide criminal penalties for those who attempt it. Knowles noted that the U.K. has a public regulatory body called the Human Fertilisation and Embryology Authority (HFEA) that is charged with oversight of public and private clinics and laboratories, and that administers a licensing scheme for treatment services, the storage of gametes and embryos, and embryo research. The U.K. requires cloned embryos to be destroyed after 14 days of in vitro development. Knowles stated that most Western industrialized nations permit stem cell research using surplus IVF embryos only. She has not, however, encountered in any other country the U.S. Department of Justice's argument concerning the difficulty of enforcing a reproductive cloning ban that permits research cloning. She also noted that none of

the countries mentioned above has considered implementing a ban on the importation of the product of a cloned embryo, as provided for in the bill recently passed by the U.S. House of Representatives (H.R. 534), although some have considered bans on the importation of a cloned embryo itself.

# Appendix 2: Background Paper

## PURPOSE OF THE WORKSHOP

The issue of human cloning has been the subject of much public debate since the birth of the cloned sheep Dolly was announced in 1997. The profound ethical questions surrounding the prospect of the birth of a human clone have received considerable scrutiny, and a broad consensus has emerged favoring a ban on such "reproductive cloning." However, the scope of such a ban and the question of how it should be enforced remain the subject of much debate.

Several major reports have been released on human cloning. The National Academies released two reports on the scientific issues associated with cloning: *Scientific and Medical Aspects of Human Reproductive Cloning* (January 2002) and *Stem Cells and the Future of Regenerative Medicine* (September 2001). The President's Council on Bioethics released a July 2002 report entitled *Human Cloning and Human Dignity* focusing primarily on the ethics of cloning. And President Clinton's National Bioethics Advisory Commission released two reports that also focused on ethical issues: *Cloning Human Beings* (June 1997) and *Ethical Issues in Human Stem Cell Research* (September 1999). By contrast, noticeably less attention has been given to the regulatory issues raised by human cloning and the cloning legislation currently being considered in the U.S. Congress. The purpose of this workshop is to explore these regulatory issues, and begin a focused, science-driven discussion that will help inform the debate among scientists, policymakers, and the public.

## BACKGROUND AND TERMINOLOGY

The term "cloning" is used broadly by scientists to refer to the copying of a molecule, cell, plant, or animal. The procedure used to create Dolly, and that could potentially be used to create a cloned human baby, is known as "nuclear transplantation." (It is also referred to as "somatic cell nuclear transfer.") The process involves the following four steps:

1. An egg (ovum) is removed from a woman who has agreed to act as a donor.

2. The egg's nucleus, which contains its DNA (half the number of chromosomes a somatic cell contains[1]), is removed.

3. The nucleus of a somatic cell (containing a complete set of chromosomes) is transplanted into the "enucleated" egg.

4. Under certain conditions, the resulting entity can be coaxed to develop as though it were a fertilized egg, thus creating a "cloned embryo."

If a cloned human embryo is successfully implanted into a woman's uterus, it has the potential to develop into a human baby which would have the same DNA as the donor of the somatic cell nucleus. In other words, the baby would be a "clone."

Nuclear transplantation can also be undertaken for the purpose of conducting human embryonic stem cell research. After a human embryo develops for several days (at which point it is referred to as a "blastocyst"), it is possible to derive from it embryonic stem cells, which are versatile cells that can theoretically develop into virtually any type of cell in the body. Stem cells derived from

[1] A somatic cell is any cell other than a sperm or an egg. Egg and sperm cells contain 23 chromosomes, while somatic cells contain 46.

cloned embryos would have the same nucleus DNA as the donor of the somatic cell nucleus. Many scientists believe that stem cells could one day be used for tissue transplants that could treat or cure numerous diseases or other physically debilitating conditions. One of the potential obstacles for such a tissue transplant is rejection of transplanted cells by the patient's immune system. Through nuclear transplantation, stem cells could be created with the same genetic makeup as the patient, thereby reducing the risk of immune rejection. To date, it should be noted, there have been no reports published in any scientific journals of a cloned human embryo reaching the blastocyst stage.

For the purposes of this workshop, the term "reproductive cloning" will refer to human cloning (i.e., nuclear transplantation) for the purpose of initiating a pregnancy and producing a baby. The term "research cloning" will refer to human cloning for the purpose of conducting biomedical research on stem cells derived from cloned embryos.

## REGULATORY HISTORY

While the federal government has never enacted legislation or put forth regulations that address the issue of human cloning specifically, genetics research and human embryo research have both been subject to federal restrictions. Since the 1970s, the Recombinant DNA Advisory Committee (RAC) has advised the National Institutes of Health (NIH) on ethical issues surrounding research that involves genetic manipulation. Established in response to fears that the creation of new types of organisms through genetic manipulation could carry potential dangers, the RAC has developed guidelines for researchers and conducts reviews of proposed gene therapy projects to ensure their safety. The RAC guidelines are mandatory for scientists at institutions receiving NIH funds for research involving recombinant DNA, and they have generally been followed by other scientists as well.

Federal funding for research on human embryos has also been the subject of federal regulations. Rules developed in the 1970s governing research on human subjects required that federally funded research on in vitro fertilization (IVF) be approved by the ethics advisory board (EAB). However, no members were ever appointed to the EAB, effectively blocking any IVF research funding until Congress removed the restriction in 1993. Subsequently, human embryo research funding was banned by the Dickey amendment, an appropriations rider that has remained in effect since 1996. Although Congress has never provided federal funding for embryo research, it has not restricted privately funded embryo research. Thus, much work on IVF and other assisted reproductive technologies has been conducted in the private sector over the past few decades. More recently, privately-funded research has moved forward on the derivation of stem cells from embryos created in IVF clinics. At the end of the Clinton Administration, NIH announced plans to fund research on embryonic stem cells that had been derived by privately funded researchers. In 2001, President Bush decided to amend this policy to allow funding for research only on stem cell lines that had already been derived at the time of his decision.

In March 2001, the Food and Drug Administration (FDA) asserted regulatory authority over "clinical research using cloning technology to clone a human being." The FDA stated in a letter to the research community that anyone undertaking such research would be subject to regulation under the Public Health Service Act and Food, Drug and Cosmetic Act, and would be required to submit an investigational new drug application (IND). "Since the FDA believes that there are major unresolved safety questions pertaining to the use of cloning technology to clone a human being," the letter stated, "until those questions are appropriately addressed in an IND, FDA would not permit any such investigation to proceed." Some legal scholars, however, have questioned

the legal basis of FDA's assertion,[2] and the Bush Administration has pushed Congress to enact a cloning ban that would erase any ambiguity.

The FDA also has authority, as part of its comprehensive regulation of biologics and cell-based therapies, over any research cloning with a goal of transplantation. This authority would not extend, however, to basic research with no transplantation endpoint.

## PROPOSED LEGISLATION

In 2001, the House of Representatives passed the Weldon-Stupak bill (H.R. 2505) imposing criminal penalties on anyone attempting to undertake reproductive or research cloning in the U.S. An alternative bill, the Greenwood-Deutsch bill (H.R. 2608), would have banned reproductive cloning for ten years but allowed research cloning to go forward. It was offered as a substitute amendment (H.Amdt. 285) to the Weldon-Stupak bill and was defeated. A companion to Weldon-Stupak was introduced in the Senate as the Brownback-Landrieu bill (S. 1899). An alternative bill that differed somewhat from the Greenwood-Deutsch bill was also introduced in the Senate. Known as the Specter-Feinstein bill (S. 2439), it would have imposed a permanent ban on reproductive cloning while permitting research cloning. It included criminal penalties for anyone attempting to transfer a cloned human embryo into a woman's uterus. The 107th Congress ended in 2002 with the Senate deadlocked on the issue.

In the new Congress, a similar set of bills has been introduced. The House has again passed the Weldon-Stupak legislation (H.R. 534), after rejecting the Greenwood-Deutsch substitute (H.R. 801). In the Senate, the Brownback-Landrieu (S. 245) and Specter-Feinstein (S. 303, now known has Hatch-Feinstein) bills have both been reintroduced. President Bush has come out in support of the Weldon-Stupak and Brownback-Landrieu legislation.

Those favoring a total ban on cloning, such as the Brownback-Landrieu bill, tend to base their arguments around preserving the genetic uniqueness of humans, the moral status of the embryo, and concerns about possible unintended consequences of cloning. In addition, some of those opposing cloning in any form have expressed concerns that research cloning might lead to the commercial exploitation of women by creating a market for human eggs harvested by hormone treatment and surgery that pose potential health risks to the donor.

The arguments of those favoring a narrower ban, such as the Specter-Feinstein bill, tend to be based in the potentialities of the research—possible cures, treatments and therapies that may result from research cloning. In addition, opponents of a total ban express concern about a law that would make certain types of research punishable as a crime.[3]

The criminalization of research is, in fact, an unusual step. Some scientific research can violate existing criminal laws (negligent homicide, for example), but restrictions that lawmakers place on *specific areas* of research do not typically involve federal criminalization. Creation of a federal crime is itself a noteworthy event, as the vast majority of criminal statutes are typically left to the states to define and enforce.

The range of positions on cloning in Congress is reflected in the cloning bans already enacted into law by a number of states. Several states, such as Iowa and Michigan, have enacted total bans,

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[2] Weiss, Rick. "Legal Barriers to Human Cloning May Not Hold Up." *Washington Post*, May 23, 2001, p. A1.

[3] AAAS, organizer of the workshop and publisher of this discussion paper, has issued a statement that supports research cloning. The full text of this statement is available online at www.aaas.org/news/releases/Cloning.shtml.

while others, such as California, have enacted bans on reproductive cloning that would permit, and even encourage, research cloning. While several states have set civil penalties for violation of their cloning bans, only Michigan has established criminal penalties.

## REGULATORY OPTIONS

Included in the narrower bans are requirements that research cloning be conducted under a set of regulations. Greenwood-Deutsch would require scientists to register with the Department of Health and Human Services before conducting research cloning and would apply FDA regulations governing the protection of human research subjects (parts 50 and 56 of title 21, Code of Federal Regulations) to all nuclear transplantation research. Specter-Feinstein would apply either the above-mentioned FDA regulations or the human subject protections set out in subpart (A) of part 46 of title 45, Code of Federal Regulations, which govern NIH research and do not require FDA review. Both bills stipulate that individuals donating egg cells for use in research cloning be required to give informed consent. In addition, Specter-Feinstein prohibits any cloned human embryos from being grown for more than 14 days, and does not allow nuclear transplantation to take place at IVF clinics. Both bills impose criminal penalties on any individual that attempts reproductive cloning, although Greenwood-Deutsch's reproductive cloning prohibition would sunset after 10 years.

Written testimony delivered by the Department of Justice to the House Government Reform Committee on May 15, 2002, called into question the efficacy of these narrower bans, arguing that enforcement of such laws would be nearly impossible. Enforcement of a total ban, according to this argument, would be relatively straightforward because nuclear transplantation requires "visible steps and sophisticated equipment, and can be distinguished from the usual process of in vitro fertilization (IVF). The cloning procedure uses complete nuclei extracted from body cells, not sperm, and requires additional steps (e.g., extraction of the egg's existing nucleus, chemical or electrical stimulation of the egg after transfer of the nuclear material) to produce an embryo."

Enforcement of a narrow ban, however, would be problematic, the Justice Department argued, because the prohibited activity—the transfer of a cloned embryo to a uterus—would appear similar to the transfer of a fertilized embryo to a uterus, which is commonly performed at IVF clinics. "[T]he transfer of an embryo to initiate a clinical pregnancy is presumably the same regardless of whether the embryo involved was originally produced by cloning or fertilization," the testimony stated. "Hence, there is no visible difference between the prohibited activity and the permitted activity, both of which would presumably be conducted within the privacy of a hospital or medical office. Entrusted with enforcing such a limited ban, law enforcement would be in the unenviable position of having to impose new and unprecedented scrutiny over doctors in fertility clinics and/or research facilities to ensure that only fertilized embryos were being transferred to would-be mothers."

In the report of the President's Council on Bioethics, a majority of 10 out of 17 Council members found research cloning to be ethically permissible. However, several of these members felt that a moratorium should be imposed to allow further discussion of the issues and the formation of sufficient regulatory mechanisms. Thus, echoing in part the concerns of the Justice Department, 10 members of the Council supported a 4-year moratorium on research cloning.

A 7-member minority of the Council recommended that research cloning should move forward as soon as a set of regulations can be put in place. Such regulations, the minority held, should include prior review of all research cloning experiments, protections for egg donors, a limit on the time a cloned human embryo is permitted to be grown, and registration and tracking of each individual cloned embryo created. They argued further that these regulations would be sufficient to deter reproductive cloning, even if slightly less effective than a total ban. Possible regulatory

models mentioned were the United Kingdom's Human Fertilization and Embryology Authority and Canada's Assisted Human Reproduction Agency.

These important questions raised about the feasibility and optimal structure of a system of regulations for human cloning are questions that remain largely unanswered. It is clear, however, that if such a system is to come about, it will take a determined effort involving scientists, ethicists, and policymakers working together. **Thus, at this workshop, participants will be asked to put aside the question of whether research cloning should be banned permanently, temporarily, or not at all, and consider instead the question of whether research cloning can be regulated, and if so how best to regulate it, in the case that Congress explicitly permits it or fails to take action at all.**

Questions to be considered by workshop participants will include the following:

- What are the existing gaps in current regulation or oversight?
- Do we need a new agency or regulatory body, or can we utilize the existing federal structures? Can self-regulation suffice?
- Who are the stakeholders and how should they be involved?
- What kind of legal enforceability mechanisms should there be? Should there be civil or criminal penalties?

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# Appendix 3: Department of Justice Testimony

**WRITTEN STATEMENT OF**
**DANIEL J. BRYANT**
**ASSISTANT ATTORNEY GENERAL**
**OFFICE OF LEGISLATIVE AFFAIRS**

**BEFORE THE SUBCOMMITTEE ON CRIMINAL JUSTICE, DRUG POLICY AND HUMAN RESOURCES OF THE HOUSE COMMITTEE ON GOVERNMENT REFORM**

**MAY 15, 2002**

Mr. Chairman and Members of the Committee, thank you for this opportunity to submit this written statement about the feasibility of the criminal law provisions of the various human cloning legislative alternatives that have been proposed. The following observations are necessarily tentative, and may have to be reassessed with further study and further development of the relevant science.

The task of enforcing a general ban on human cloning for any purpose does not seem to pose insuperable challenges to law enforcement. Such a ban would clearly define the exact activity to be banned, which is the use of the procedure known as somatic cell nuclear transfer to produce human embryos. The activity involves certain visible steps and sophisticated equipment, and can be distinguished from the usual process of in vitro fertilization (IVF). The cloning procedure uses complete nuclei extracted from body cells, not sperm, and requires additional steps (e.g., extraction of the egg's existing nucleus, chemical or electrical stimulation of the egg after transfer of the nuclear material) to produce an embryo. The eggs used in the procedure would have to be donated by women for reasons other than lawful reproductive goals. We understand that any pursuit of clinical research based on cloning would require harvesting a great many eggs from these women. These visible human activities and interactions are not different in kind from those which law enforcement is ordinarily called upon to detect and address. Those participating in the activities could be questioned and, with sufficient evidence gleaned from such interviews and from the physical evidence involved, prosecuted as the legislation provides.

Enforcing a modified cloning ban would be problematic and pose certain law enforcement challenges that would be lessened with an outright ban on human cloning. For example, the Human Cloning Prohibition Act of 2002 (S. 2439) is designed to "protect" certain cloning activities when they are conducted for the purpose of research. The Act seeks only to forbid "implanting or attempting to implant the product of nuclear transplantation into a uterus or the functional equivalent of a uterus."

As an initial matter, the prohibited activity "transfer of an embryo to a uterus" is an activity that is otherwise permitted now in all states and is performed thousands of times a year in fertility clinics. This legislation obviously is not intended to establish a broad prohibition on such lawful activity. However, the transfer of an embryo to initiate a clinical pregnancy is presumably the same regardless of whether the embryo involved was originally produced by cloning or fertilization. Hence, there is no visible difference between the prohibited activity and the permitted activity, both of which would presumably be conducted within the privacy of a hospital or medical office. Entrusted with enforcing such a limited ban, law enforcement would be in the unenviable position of having to impose new and unprecedented scrutiny over doctors in fertility clinics and/or research facilities to ensure that only fertilized embryos were being transferred to would-be mothers. Assuming that law enforcement authorities had the inclination or the resources

to undertake such an effort, this would be a formidable task in light of the number of embryo transfers performed in fertility clinics across the country every year.

Additionally, at the point when embryo transfer occurs, which is at the blastocyst stage (about 5-6 days after the embryo is produced), there does not seem to be any reliable means for determining the difference between a fertilized embryo and a cloned embryo. For all we know, these embryos are biologically indistinguishable. Moreover, if a researcher mixed cloned and fertilized embryos in culture and then implanted only some of these embryos, there would simply be no way for a prosecutor to prove that the implanted embryos were the ones which arose from cloning. Even after the fact, it is not clear how one could determine that the fetus in utero was originally produced by cloning, unless one could demand a prenatal genetic profile and show that this profile is genetically virtually identical to a particular pre-existing individual. Therefore it is not clear how, upon hearing that someone may be engaging in the activity prohibited under the Act, law enforcement personnel could determine that it was taking place, even if they were present and observing the activity firsthand.

Anything short of an outright ban would present other difficulties to law enforcement. In one of the proposals currently before you (S. 2076), clonal implantation would only be prohibited if it were done "for the purpose of creating a cloned human being." This language is ambiguous and implies that a clonal implantation would not be unlawful if done for some other purpose. Presumably, the requisite intent to violate the law would have to exist at the time of the clonal implantation. In the absence of a confession, it would be exceedingly difficult for law enforcement authorities to establish that those performing a clonal implantation did so with the requisite mens rea at the time the procedure was performed, even if the ultimate result is the birth of a cloned human being. Additionally, we note that S. 2076 does not appear to prohibit the exportation of cloned embryos, thereby raising the possibility that cloned embryos could be exported and used to produce cloned human beings abroad, without violating the law. Such an obvious "loophole" would undermine the apparent goals of the legislation and would cause difficulties and confusion in enforcing such a statute.

We also note that S. 2439 contains a criminal forfeiture clause that would apply to "[a]ny property, real or personal, derived from or used to commit a violation or attempted violation" of the ban on implantation. If read literally under this clause, a cloned embryo, which is referred to in the Act as the "product of nuclear transplantation," that has been implanted and is developing as a cloned fetus could theoretically or conceivably be forfeitable to the United States again raising extremely serious legal, moral, and practical issues.

Further, except in those exceedingly rare instances when the parties involved announced their intention to engage in unlawful activity in advance, it is difficult to envision how law enforcement officials could effectuate the stated goals of S. 2439 of preventing the birth of cloned infants. For example, once a pregnancy were established, any government-directed attempt to terminate a cloned embryo in utero would create problems enormous and complex.

## Conclusion

Mr. Chairman, the Department of Justice thanks you again for this opportunity to submit a statement about the issues surrounding the enforcement of the pending bills pertaining to human cloning. As stated at the outset, these thoughts are preliminary based upon our current understanding of the various ongoing legislative proposals and current understanding of the applicable science. The practical issues surrounding the enforcement of any legislation in this important area is a matter that should be given careful thought.

[Archived at: www.house.gov/weldon/issues/doj.htm]

## Appendix 4: List of Participants

*Workshop on Regulating Human Cloning*
*March 11, 2003 • Washington, DC*

**Jill Adleberg**
Federation of American Societies for Experimental Biology
**Kevin Alleman**
AAAS
**David Bowen**
U.S. Senate Health, Education, Labor and Pensions Committee
**Joanne Padrón Carney**
AAAS
**Audrey Chapman**
AAAS
**R. Alta Charo**
University of Wisconsin School of Law
**David G. Cooper**
AAAS
**Kevin FitzGerald**
Georgetown University
**Mark S. Frankel**
AAAS
**Michele Garfinkel**
The Center for the Advancement of Genomics
**Brent Garland**
AAAS
**John D. Gearhart**
Johns Hopkins University School of Medicine
**Alexandra K. Glazier**
Ropes & Gray, Boston
**Greg Glover**
Ropes & Gray, Washington, D.C.
**Larry Goldstein**
University of California, San Diego School of Medicine
**Douglas B. Hunt**
International Center for Technology Assessment
**Rudolf Jaenisch**
Massachusetts Institute of Technology
Whitehead Institute
**Alissa L. Johnson**
National Conference of State Legislatures
**Lori Knowles**
The Hastings Center
**David Korn**
Association of American Medical Colleges
**Matt Lamberti**
U.S. Senate Judiciary Committee
**Michael Manganiello**
The Christopher Reeve Paralysis Foundation
**Elizabeth Marincola**
The American Society for Cell Biology
**Paul McHugh**
Johns Hopkins University School of Medicine
**Malcolm Moos**
Food and Drug Administration,
Center for Biological Evaluation and Research
**Daniel Perry**
Alliance for Aging Research
**David A. Prentice**
Indiana State University
**Miguel Prietto**
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**Muhammad A. Sayed**
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**Joan Scott**
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**O. Carter Snead**
President's Council on Bioethics
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Juvenile Diabetes Research Foundation
**Al Teich**
AAAS
**Sean B. Tipton**
American Society for Reproductive Medicine
**Michael Werner**
Biotechnology Industry Organization

Please note that the participant information is being provided for identification purposes only, and the workshop report should not be construed as representing the opinion of any particular participant, nor the opinion of the organization with which they are affiliated.

## Appendix 5: Agenda

*Workshop on Regulating Human Cloning*
*March 11, 2003 • Washington, DC*

**8:45 a.m.** **Welcome and Introductions**

Albert H. Teich, Director, Directorate for Science and Policy Programs, AAAS.

**9:00 a.m.** **State of the Science (talk w/Q&A)**

Rudolf Jaenisch, Whitehead Institute, MIT.

*Moderated by Albert H. Teich.*

**10:00 a.m.** **Panel on Regulating Cloning (including Q&A and break)**

(1) Gregory Glover, Ropes & Gray, on current regulatory schemes.

(2) Paul McHugh, President's Council on Bioethics, on the consideration of cloning regulatory issues, and recommendations from the President's Council on Bioethics.

(3) Lori Knowles, The Hastings Center, on regulatory approaches of other countries.

*Panel chaired by Joanne Padrón Carney, Director, Center for Science, Technology, and Congress, AAAS.*

**12:00 noon** **Lunch**

**1:15 p.m.** **Breakout Sessions**

*Introduction by David G. Cooper, Project Coordinator, Center for Science, Technology, and Congress, AAAS.*

**3:00 p.m.** **Break**

**3:30 p.m.** **Plenary Session**

Presentation of breakout group results, discussion.

*Moderated by Brent Garland, Senior Program Associate, Scientific Freedom, Responsibility and Law Program, AAAS.*

**4:30 p.m.** **Adjourn**

For questions or further information about this report, please contact:

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For an electronic version of this report, and for further resources on human cloning, please visit the AAAS website at www.aaas.org/spp/cstc/issues/cloning.htm.