FDA Regulation of Human Reproductive Cloning: A Technology in Search of a Niche

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Since 1998, the Food and Drug Administration (FDA) has stated publicly that it has jurisdiction to regulate human reproductive cloning.[1] Consistent with this position, the agency sent letters to researchers informing them of the need to submit an investigational new drug (IND) application before clinical efforts to clone a human being.[2] Further, FDA has stated that, because human reproductive cloning raises currently unresolved safety concerns, the agency will not approve such an application until those concerns are addressed appropriately.[3] In this way, FDA, in effect, has banned human reproductive cloning.

The agency has not, however, ever formally articulated its legal basis for such a ban. Some have criticized FDA's failure to follow administrative procedure, and the lack of a clearly articulated jurisdictional basis could weaken any enforcement effort the agency might seek to undertake in the future.

In a recent article, we posit a legal basis for FDA regulation of human reproductive cloning.[4] We argue that FDA could plausibly argue that cloning is relevantly similar to gene therapy. FDA has regulated gene therapy for over a decade, using its authority under both the Federal Food, Drug, and Cosmetic Act (FDCA) and the Public Health Service Act.

Gene therapy involves transferring a segment of DNA containing a specific gene or genes into an individual's cells and the expression of that gene in the body to overcome effects of incorrectly functioning genes. The new gene corrects defects by either replacing a nonfunctioning gene with a functioning one, or by causing cells containing deleterious genes (e.g., ones that cause cancer) to self-destruct. Gene therapy directed to nonreproductive (somatic) cells alters only the DNA of the recipient and not his or her progeny. Gene therapy targeting reproductive (germline) cells, known as germline gene therapy, actually modifies the DNA in sperm or eggs, thereby modifying the genome of subsequent offspring.

Cloning, like gene therapy, entails the transfer of genetic material to affect the genetic constitution of a human being. Rather than partially modifying an existing genome, cloning replaces the genome entirely. During cloning, the original nucleus is removed from an egg cell and replaced with a nucleus from a somatic cell, such as a skin cell. The cell, with its new genetic blueprint, then divides under laboratory conditions to form an embryo. Earlier this year, Korean scientists claimed success in generating cloned human embryos.[5]

To date, there has been no documented evidence that a human embryo has been transferred to a woman's uterus. If a cloned embryo were transferred and successfully gestated, the resulting individual would be a genetic copy of the source of the somatic cell. Because the transferred nucleus contains the entire genetic makeup of the future individual, and this genetic information can be transmitted to subsequent offspring of that future person, cloning can be thought of as both somatic and germline gene therapy. Just as the FDA-regulated "article" in gene therapy is the DNA segment containing a gene, the "article" in cloning can be the nucleus and all of the genetic material contained therein.

Cloning raises safety concerns similar to those raised by gene therapy and, in particular, by germline gene therapy. Like gene therapy, cloning may harm the recipient of the DNA as well as future individuals when that DNA is transmitted to future generations.

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It might be argued that FDA should not regulate cloning because it is not therapeutic and does not cure or prevent illness. But a therapeutic or preventive effect is not a prerequisite to FDA regulation, because the definition of "drug" under the FDCA also extends to products that "affect the structure or function of the body."[6] Transferring a nucleus undeniably affects both the structure and function of the future individual.

But, cloning differs in one significant aspect from other forms of gene therapy. Whereas current gene therapy protocols deliver genetic material to an existing human being for that person's benefit, cloning delivers genetic material into an egg—from which the original genetic material is removed—that is intended to develop into a born human. FDA regulating reproductive cloning as a form of gene therapy requires that the agency have regulatory jurisdiction over the safety and effectiveness of products administered prior to birth and even prior to gestation.

There are several historical precedents to support FDA's jurisdiction over "future" persons. These precedents indicate that FDA's mandate is broad enough to encompass regulation intended to protect the child born as a result of human cloning. In particular, the Kefauver-Harris Amendments of 1962[7] were passed as a direct response to the tragedy of thalidomide—in which children were born with significant limb defects following *in utero* exposure to the antinausea drug. There was no suggestion that the drug was otherwise harmful to the women taking it. Congress' intent in enacting the amendments—which gave FDA the authority to regulate the safety and effectiveness of drugs intended "for use in man"—must necessarily have encompassed protection of both currently living and future persons who may be exposed to a regulated product, even when they are not the intended recipient of that product.

As another example, since 1979, FDA regulations have required teratogenicity information to be included in drug labeling.[8] Such labeling must address the drug's teratogenic effects on reproduction and pregnancy, as well as effects on later growth, development, and functional maturation of the child. Information on possible teratogenicity cannot be considered necessary for the safe and effective use of the drug, if safety and effectiveness applies only to the individual for whom the drug is intended. Thus, FDA must consider the safety of the drug for the unintended recipient—who may experience injury following birth—to be relevant to the overall safety and effectiveness of the drug. Similarly, FDA regulation of medical devices used as part of *in vitro* fertilization encompasses a review of their effect not only on the woman undergoing the procedure but also on the egg, sperm, and embryo. While these precedents do not prove that FDA has the legal authority to regulate on behalf of future persons, they demonstrate that the presumption that it can has become entrenched in the FDA landscape and has never been challenged.

While FDA has a plausible jurisdictional basis, it also must be acknowledged that human reproductive cloning raises not only complex scientific challenges but also serious ethical concerns. Some have questioned FDA's institutional competence at mediating the much-needed societal conversation about the ethical and moral implications of new technologies, of which cloning is but one example. This is because FDA and others have viewed the agency's mandate as comprising only protection of the public health, and not the resolution of ethical disputes concerning the appropriate use of the technologies the agency oversees. Whether FDA is the appropriate arbiter of the ethical dimensions of new medical technologies and whether other institutions that exist now—or that could be created in the future—would be more suited to that role remain open questions that warrant broad public discussion.

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1 *See, e.g.*, Rick Weiss, *Human Clone Research Will Be Regulated: FDA Asserts it Has Statutory Authority to Regulate Attempts at Human Cloning*, WASH. POST, Jan. 20, 1998, at A1 (asserting FDA's statutory authority to regulate human cloning).

2 *See, e.g.*, Letter from Stuart L. Nightingale, M.D., Assoc. Comm'r for Med. Affairs, FDA, to colleagues, *at* http://www.fda.gov/oc/ohrt/irbs/irbletr.html (Oct. 26, 1988).

3 *Id.*

4 Gail H. Javitt & Kathy Hudson, *Regulating (for the Benefit of) Future Persons: A Different Perspective on the FDA's Jurisdiction to Regulate Human Reproductive Cloning*, 2003 UTAH L. REV. 1201 (2003).

5 Woo Suk Hwang et al., *Evidence of a Pluripotent Human Embryonic Cell Line Derived from a Cloned Blastocyst*, 303 SCIENCE 1669 (2004).

6 21 U.S.C. § 321(g)(1)(C) (FDCA § 201(g)(1)(C)).

7 Drug Amendments of 1962, Pub. L. No. 87-781, 76 Stat. 780 (1962) (codified in scattered sections of 21 U.S.C.).

8 21 C.F.R. § 201.57(f)(6).