Congress must clarify limits of gene-editing technologies

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Genome editing of human embryos represents one of the most contentious potential scientific applications today. But what if geneticists could sidestep the controversy by editing sperm and eggs instead?

According to a new paper co-written by a University of Illinois at

Urbana-Champaign legal expert who studies the ethical and policy implications of advanced biotechnologies, how the next Congress decides to handle the issue will affect the science, ethics and financing of genome editing for decades to come.

Although there are a number of statutes and federal appropriation riders that take as their bioethical center the human embryo, none exist that govern the editing of 'gametes'—that is, sperm and eggs, said Jacob S. Sherkow, a professor of law at Illinois.

"The current federal funding ban is predicated on a concept of bioethics that focuses on the embryo, and that's because there's widespread recognition in U.S. society that embryos have a certain moral salience that other biological components don't," he said. "But with advances in biotechnology, you can get around that. You can sidestep editing embryos by editing sperm and eggs, instead.

"Regardless of how one thinks about whether embryos should get special bioethical status in this context, you have to understand that the same technology can now be used on sperm and eggs. So federal funding bans on genetically editing embryos with technologies such as CRISPR may not extend to future generations of the technology—and those future generations are coming quickly."

In the paper, Sherkow and co-authors Eli Y. Adashi of Brown University and I. Glenn Cohen of Harvard Law School discuss how the editing of sperm and eggs differs from embryos from a bioethical and U.S. legal perspective.

"This is particularly timely for two reasons," he said. "One, genome-editing technology is getting more effective, cheaper and safer to use every day; and two, this is an election year. We're going to seat a new Congress in January, and whether to continue down this path is

something that the new Congress is going to have to decide."

The main statute that prohibits the clinical use of heritable genomic editing is an annually renewed Congressional appropriations rider first put into law in 2015.

According to Sherkow and his colleagues, the rider was initially dropped into an appropriations bill with little discussion. The language was briefly removed last year, prompting a debate about whether it applied to certain mitochondrial-replacement therapies and ought to be reinserted.

"The debate was firmly centered on the editing of embryos, but no legislator considered whether the language also applied to the editing of sperm and eggs," Sherkow said. "And there are strong arguments to be made that the plain text of the rider does not apply to sperm and eggs."

If the appropriations rider doesn't apply to editing sperm and eggs, then those who believe that such editing is just as problematic as editing embryos "should seek to alter the rider to make it apply to sperm and egg editing, as well," Sherkow said.

"Some of the ethical concerns raised about editing embryos are applicable to editing sperm and eggs while others are not," he said. "Objections to embryonic gene editing due to the need to destroy human embryos in research and clinical applications are quite different for sperm and eggs."

Those who have opposed the destruction of embryos, including members of some religious communities, haven't raised similar objections to sperm and egg editing, Sherkow said.

"Proponents of embryonic personhood claims emphasize that the genetic code of the early embryo is set at the time when sperm and egg form a

zygote. But sperm and egg editing occurs before that moment, toppling the claim that editing gametes alters 'a person,' and is really more analogous to selecting a sperm or egg donor."

At the same time, policymakers should be heartened by the notion that "we don't necessarily have to stop research on these technologies because now we have the ability to do it in gametes as opposed to embryos," said Sherkow, who also is an affiliate of the Carl R. Woese Institute for Genomic Biology.

"The new Congress that's seated in January should pay attention to the development of genome-editing technologies like these, and should be more attuned to the extent of what limits it wants to put on research, given that such research can proceed without some of the moral trappings that have jammed prior Congresses," he said. "For those who think that there are important differences between embryos and gametes, this may offer an opportunity to develop a different regulated pathway for sperm and egg editing."

More information: I. Glenn Cohen et al, Gene Editing Sperm and Eggs (not Embryos): Does it Make a Legal or Ethical Difference?, *The Journal of Law, Medicine & Ethics* (2020). DOI: 10.1177/1073110520958891

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