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Guest Editorial

The Moral Choices on CRISPR Babies

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In late November 2018, Chinese scientist Dr. He Jiankui announced at the Second International Summit on Human Genome Editing in Hong Kong that he had used CRISPR/Cas 9 gene editing on two female embryos that were brought to term through an in vitro fertilization (IVF) pregnancy. The world scientific community was ill-prepared for the announcement since the moral issues surrounding the editing of human embryos were under discussion but hardly resolved. The recommendation of the 12-member organizing committee of the 2015 International Summit on Human Gene Editing in Washington, DC, stated that it would be irresponsible to undertake any clinical use of germline editing unless and until the safety and efficacy issues were resolved and there was a broad consensus on the specific application, and that such use could proceed only under appropriate regulatory oversight (International Summit on Human Genome Editing 2015). Similar recommendations were made by the National Academies of Sciences, Engineering, and Medicine. This editorial gives two reasons for genetically modifying embryos and three reasons against it.

In favor: healthy children. In cases where a woman's eggs have a heritable genetic abnormality, as in mitochondrial mutations, a dominant allele associated with a disease, or both she and her husband have recessive genes linked to a disease, which could give rise to a genetically abnormal child, gene editing could in theory result in a healthy offspring. In such circumstances, where all of a woman's eggs are defective, preimplantation genetic screening (PGS) is unlikely to resolve the problem. For parents who wish to have a healthy child with their nuclear DNA, gene editing may be the only choice. Considering the interests of the parents and the limited use of gene editing purely for therapeutic purposes, an argument can be made that it is the ethical thing to do once the procedure can be proven safe and effective. This argument is implicit in the plan by Russian scientists to use CRISPR on the embryos of deaf couples who do not want deaf children (Le Page 2019).

In favor: reproductive autonomy. According to this argument, parents should be able to employ whatever methods are available to them at whatever expense they are able and willing to incur to have a baby of their desire with whatever physical, intellectual, or psychological traits they believe can be offered to their offspring. In this view, governments should not dictate or set limits on their rights as parents for reproductive autonomy over the choices available to them for a healthy and/or enhanced offspring. This is a strong libertarian position on human reproduction and it includes personal eugenic choices.

Against: Do no harm. Creating a child by genetic editing an embryo is too risky and is more likely than not on occasion to produce damaged children. The genome of living things is not a Lego system, where you can add or subtract a part that does not affect the other parts. In contrast, the genome is likened to an ecosystem. By targeting one gene, you will more than likely affect other genes in the system. The use of CRSPR for gene editing can introduce collateral damage through off-target effects (Carroll 2019). The damage may not be expressed right away, but years later or even in another generation in the offspring of the targeted embryo.

If one genetically alters a plant or animal and gets a bad outcome, one simply discards the product. But if one genetically modifies a human embryo and gets a bad outcome, once the embryo is brought to term, someone will have to care for the child for life—either the parents or the government. In such cases the risks and costs to society outweigh the benefits to the parents for a so-called enhanced child. Where there are genetically abnormal embryos, PGS can frequently screen out unhealthy for healthy embryos. If that is not possible then egg donation and adoption are alternatives for some individuals. Even if medical interventions are perfectly safe and effective, there are other reasons against applying gene editing to embryos for therapy or enhancement.

AGAINST: SOCIETAL ISSUES

Try to imagine that gene editing an embryo can improve the memory of a child. Few would argue that an exceptional memory is not desirable and would not offer someone an advantage in school and a career. Assume

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also that memory enhancement could be done relatively safely, with perhaps a small risk. It is highly unlikely that any current society, even societies with strong social welfare policies, would make this procedure available to everyone. Only a select number of wealthy families would be able to take advantage of this enhancement. Those children born with this trait will be in an elite group and would be rewarded for it. As a result, this gene editing would contribute to greater disparities in society. Of course, wealth provides all sorts of selective benefits to children, including gaining access to expensive elite colleges. But do we want to invest public funds in research to use genetics to create a genetic aristocracy of human traits? A counterargument is that the price of gene editing may be high at first, but then it will drop and be financially available to all economic groups. If IVF is any example, the average cost for one cycle is about $15,000, 40 years after it was first used in 1978. This defies the idea of universal accessibility.

If gene editing were restricted to medical therapies exclusively, namely, to prevent diseases, the disparity issue would not be relevant since it might be covered by health insurance. If therapeutic gene editing were permitted then two conditions would have to be met. First, there would have to be a clear demarcation between therapy and enhancement. Second, an appropriate regulatory body would have to oversee the protection of the boundary dividing therapy and enhancement, as well as overseeing the safety and efficacy of the process.

If there is no clear distinction between therapy and enhancement then the argument about economic disparities would be relevant.

Consider the gene-editing experiment done by Dr. He, who genetically modified two female embryos. He believed he was engaged in ethical medical therapy—preventing HIV infection (He et al. 2018). But under all accounts, the embryos were not genetically abnormal. Rather, he planned to afford them protection against HIV infection, which many would view as enhancement (So et al. 2017). Once the boundary between enhancement and therapy is weakened or vague, the range of properties parents might choose for their child might include height, skin color, disease resistance, longevity, and even intelligence. Whenever we can imagine improving human qualities, we can also imagine diluting them for certain purposes, as in removing empathy. Unless there is a clear and universal boundary between therapy and enhancement and a system of enforcement, embryo editing will likely result in a eugenic society.

AGAINST: VIOLATION OF AN ETHICAL PRINCIPLE

Imagine a world where all societies were equitable with no economic disparities and with universal healthcare. Assume everyone had equal access to therapeutic gene editing as well as enhancement, and that it were proven sufficiently safe. Were there to be an occasional mistake, national health care would step up to the plate and take care of a genetically disabled child for his or her entire life.

Would there still be a reason remaining for opposing gene editing? There is an ethical principle that is widely accepted in all enlightened societies. "Treat persons not as a means to an end, but as an end in themselves." An embryo is not yet a person, so strictly speaking the ethical principle does not apply. But a corollary to the principle seems like a reasonable derivative. The germ plasm of a person-to-be is the essence of what makes us human. The corollary: Do not treat the human germ plasm (the embryo) as a means to an end, but as an end in itself. Attempting to genetically engineering an embryo for some trait (other than for preventing diseases) violates this principle. Under those circumstances, the germ plasm of the embryo is viewed purely instrumentally to achieve some end and is not respected as an end in itself for the nascent person. Thus, in this ideal world where the boundary between therapy and enhancement was clearly and universally accepted and well regulated, the ethical principle excludes enhancement but not medical uses of gene editing. ■

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