World Academy of Science, Engineering and Technology
International Journal of Bioengineering and Life Sciences
Vol:19, No:06, 2025

Ethical Considerations in In-Utero Gene Editing

Authors : Shruti Govindarajan

Abstract : In-utero gene editing with CRISPR-Cas9 opens up new possibilities for treating genetic disorders during pregnancy while still in mother's womb. By targeting genetic mutations in the early stages of fetal development, this approach could potentially prevent severe conditions—like cystic fibrosis, sickle cell anemia, and muscular dystrophy—from causing harm. CRISPR-Cas9, which allows precise DNA edits, could be delivered into fetal cells through vectors such as adeno-associated viruses (AAVs) or nanoparticles, correcting disease-causing mutations and possibly offering lifelong relief from these disorders. For families facing severe genetic diagnoses, in-utero gene editing could provide a transformative option. However, technical challenges remain, including ensuring that gene editing only targets the intended cells and verifying long-term safety. Ethical considerations are also at the forefront of this technology. The editing of a fetus's genes brings up difficult questions about consent, especially since these genetic changes will affect the child's entire life without their input. There's also concern over possible unintended side effects, or changes passed down to future generations. Moreover, if used beyond therapeutic purposes, this technology could be misused for 'enhancements,' like selecting for certain physical or cognitive traits, raising concerns about inequality and social pressures. In this way, in-utero gene editing brings both exciting potential and complex moral questions. As research progresses, addressing these scientific and ethical concerns will be key to ensuring that this technology is used responsibly, prioritizing safety, fairness, and a focus on alleviating genetic disease. A cautious and inclusive approach, along with clear regulations, will be essential to realizing the benefits of in-utero gene editing while protecting against unintended consequences.

Keywords : in-utero gene editing, CRISPR, bioethics, genetic disorder
Conference Title : ICB 2025 : International Conference on Bioethics
Conference Location : Venice, Italy
Conference Dates : June 21-22, 2025