J. Appl. Biosci., 51(2): December, 2025
doi: 10.61081/joab/51v2i101

ISSN (Print) 0975-685X
ISSN (Online) 0975-864X

Editorial

Gene Editing: Promise and Responsibility

Gene editing is one of the most powerful scientific tools of our time. It started as a laboratory discovery but has now moved into medicine and farming with big impacts. The approval of CRISPR-based treatments for sickle cell disease and beta-thalassemia showed that editing genes can cure serious inherited illnesses. This was a turning point, proving that science can change lives in ways once thought impossible. Since then, new methods, like base editing and prime editing, have made the process even more accurate, cutting down mistakes and making treatments safer.

The use of gene editing is not limited to rare diseases. It is now being used in cancer treatment, immune system research, and fighting infections. Doctors are working with engineered T-cells and CRISPR-based therapies to attack cancer cells and control viruses. In farming, gene editing is helping to grow crops that can survive drought and animals that resist diseases. These changes could help secure food supplies in a world facing climate change.

India has recently taken a major step forward in this area. Scientists at Indian Agricultural Research Institute (IARI) have developed an indigenous gene-editing technology that can make crop breeding cheaper and more commercially viable. This "desi" platform is expected to reduce dependence on foreign technologies and lower costs for farmers and seed companies. By enabling faster development of improved crop varieties, it could help India strengthen food security and support farmers in adapting to climate challenges. The move also highlights India's growing role in global biotechnology, showing that innovation is not limited to medical applications but extends to agriculture and sustainability.

But with such power comes responsibility. Global groups, like the Observatory on Genome Editing and UNESCO's Bioethics Committee, stress the need for fair rules that respect different cultures and values. One of the most debated issues is germline editing, changing the genes of embryos in ways that will pass to future generations. Most countries ban this, but the technology is spreading fast, and rules need to keep up.

In debates on gene editing, people often say it should be used "only when it is safe." This sounds straightforward, but in reproduction it is more complicated. For adults or children already born, safety means weighing benefits against risks. But when editing embryos, the idea of harm changes. Philosophers point to the "nonidentity problem": if a child exists only because of the editing, that child cannot claim to be harmed, since without the editing they would not exist at all. The only exception is if the editing creates a life so painful it is not worth living.

Another principle is reproductive liberty, the right of parents to make choices about having children. Strong versions of this principle say that even if parents make harmful choices, the law should not block them. Combined with the nonidentity problem, this means almost no reproductive uses of gene editing can be banned as unsafe. Even if unsafe, parents still have the right to choose them.

This creates a tension. "Only when it is safe" sounds like a strict rule, but in practice it becomes only a moral guideline for parents, not a legal standard. Some bioethicists may use this phrase to calm public fears while hiding the full impact of their views. It works as a shield, but it does not solve the deeper ethical problem.

Beyond these philosophical debates, three big challenges shape the future of gene editing. The first is fairness. Gene therapies are very costly and hard to deliver. Without public funding and fair licensing, they may widen the gap between rich and poor rather than close it. The second is regulation. Science is moving faster than the rules. Governments need flexible systems that protect people but do not block progress. The third is consent. Editing the genes of adults respects their choice. Editing embryos affects people who cannot give consent, raising hard questions about identity and ethics across generations.

India's new homegrown gene-editing technology for crops shows how innovation can be both local and global. It offers hope for cheaper, faster solutions to food security, but it also reminds us that governance, ethics, and equity must keep pace with science. As we look ahead, the key question is not only what we can edit, but why we should edit, who will benefit, and what the consequences will be. Gene editing is more than a scientific tool; it is a social contract. It demands honesty, humility, and shared responsibility. The challenge is not only to master the science but also to face the ethical puzzles and policy gaps that come with it. If we do this with care, gene editing can be a force for healing and hope. If we ignore these issues, it risks becoming a source of inequality and confusion.

Prof. Geetanjali Mishra
and
Prof. Omkar
Editors

Corresponding email: omkar.lkouniv@gmail.com