# Guide to Cell, Gene, and Cell-Based Gene Therapies

## Recent advances are changing the future of medicine

Cell therapies, gene therapies, and cell-based gene therapies represent cutting-edge advancements in the field of medicine. Cell therapies involve using living cells to treat or repair damaged tissues and organs, harnessing the body's natural healing abilities. Gene therapies, on the other hand, aim to correct genetic mutations by inserting functional genes into the patient's cells. Cell-based gene therapies combine the power of both approaches, using genetically modified cells to deliver therapeutic genes directly to affected tissues.

These innovative therapies hold immense potential for shaping the future of healthcare, so staying at the forefront of these advancements is key. According to the Alliance for Regenerative Medicine, there are at least 10 new cell and gene therapy products that could be approved in 2023 in the U.S. and Europe[1], and by 2030, 60 cell and gene therapies are expected to reach regulatory approval.[2]

Because these advanced therapies overlap considerably in their approaches and aims, it can be difficult to distinguish between them, especially with cell therapies and cell-based gene therapies. This infographic provides clarification, outlining the similarities and differences as well as applications and future trends.

| | Cell Therapies | Gene Therapies | Cell-Based Gene Therapies |
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| **Definition** | Use living cells to treat or repair damaged tissues/organs[3] | Correct genetic mutations by inserting functional genes[4] | Combines strategies from both cell and gene therapies and uses genetically modified cells to deliver therapeutic genes[5] |
| **Approach** | Utilizing stem cells or derivates to replace damaged or diseased cells with new, healthy ones[6] | Directly modify patients' genetic makeup[6] | Combine cell therapy and gene therapy for enhanced treatment[6] |
| **Potential Applications** | Treating cancers, autoimmune disorders and infectious diseases, rebuilding damaged cartilage in joints, repairing spinal cord injuries, improving a weakened immune system, and helping patients with neurological disorders[7] | Holds promise to treat a wide range of diseases, such as cancer, cystic fibrosis, heart disease, diabetes, hemophilia and AIDS[8] | Assisting in developing vaccines, blood products, hormone extracts, and more to advance therapeutic options for cancer, autoimmune and immune-based diseases, transplantation, heredity disorders, and COVID-19[9] |
| **Delivery Methods** | Direct injection, implantation, infusion[10] | Viral vectors, non-viral vectors, gene-editing technologies[11] | Viral vectors, non-viral vectors, gene-editing technologies[11] |
| **Challenges** | Immune response, cell sourcing, scalability | Immune response, gene delivery, off-target effects | Immune response, cell sourcing, gene delivery, off-target effects |
| **Future Trends** | Advanced cell sourcing, tissue engineering, immune tolerance[12] | Improved gene delivery and gene-editing advancements[13] | Enhanced cell engineering, combination therapies, personalized medicine[13] |

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