Tofflon

ISPE July 2023

INTRODUCTION TO CELL GENE THERAPY & TOFFLON ADVANCED CGT INTEGRATED SOLUTIONS

Cell gene therapy, also known as gene transfer therapy, is a branch of medical research and treatment that aims to treat or prevent diseases by modifying the genetic material within cells. It involves introducing genetic material, such as genes or gene-editing tools, into a patient's cells to correct or modify the underlying genetic cause of a particular disease.

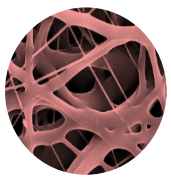
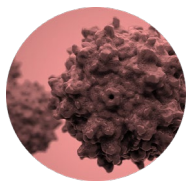
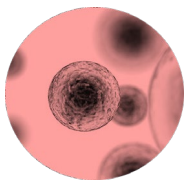
The primary goal of cell gene therapy is to address genetic disorders caused by mutations or abnormalities in a patient's DNA. By introducing functional genes into the affected cells, it is possible to restore the normal cellular function and potentially cure or alleviate the symptoms of the disease. This approach holds promise for a wide range of genetic conditions, including inherited disorders and certain types of cancers.

Approaches to Cell Gene Therapy

There are several approaches to cell gene therapy, depending on the specific disease and the target cells involved. Some common techniques include:

1. Gene Replacement Therapy: This approach involves introducing a functional copy of a gene into the patient's cells to replace the mutated or dysfunctional gene responsible for the disease.
2. Gene Editing: Using tools like CRISPR-Cas9, scientists can modify the existing genes within the patient's cells, either by correcting mutations or by introducing specific changes to achieve a desired therapeutic effect.
3. Gene Addition Therapy: In some cases, introducing an additional gene into the patient's cells can compensate for a missing or defective gene, improving cellular function and treating the disease.
4. Cell-Based Gene Therapy: This approach involves modifying the patient's own cells, such as immune cells or stem cells, ex vivo (outside the body) and then reintroducing them into the patient. These modified cells can then exert therapeutic effects once inside the body.

Cell gene therapy has shown significant potential in the treatment of various genetic disorders and is currently being investigated in clinical trials for a wide range of conditions, including blood disorders, inherited eye diseases, muscular dystrophy, and certain types of cancer. However, it is important to note that cell gene therapy is still an evolving field, and many treatments are in the experimental stages or limited to specific cases.

Chimeric Antigen Receptor T-cell (CAR-T) Therapy

CAR-T (Chimeric Antigen Receptor T-cell) therapy is a specific type of cell gene therapy that harnesses the power of a patient's own immune system to treat certain types of cancers.

In CAR-T therapy, a patient's T cells (a type of white blood cell) are extracted from their bloodstream and genetically modified in a laboratory. The genetic modification involves introducing a chimeric antigen receptor (CAR) into the T cells. The CAR is designed to recognize and bind to a specific protein, known as an antigen, present on the surface of cancer cells.

The modified CAR-T cells are then multiplied in the laboratory to create a large population of cells. After this expansion, the CAR-T cells are infused back into the patient's body. Once in the bloodstream, the CAR-T cells can recognize and bind to the cancer cells, leading to their destruction.

The CAR-T cells have several advantages over traditional cancer treatments. They can target cancer cells specifically, sparing healthy cells from damage. Additionally, CAR-T cells have the potential to persist in the body, providing long-lasting immune surveillance against cancer recurrence. It has demonstrated high response rates and, in some cases, led to complete remission.

However, CAR-T therapy also carries some risks and potential side effects. The immune response triggered by CAR-T cells can cause a severe reaction called cytokine release syndrome (CRS), which can lead to fever, flu-like symptoms, and, in severe cases, organ dysfunction. Neurological toxicities can also occur, ranging from mild confusion to more severe effects.

Ongoing research and clinical trials are focusing on expanding the application of CAR-T therapy to other types of cancers and improving its safety and efficacy. The field of CAR-T therapy is rapidly evolving, and it represents a significant advancement in personalized cancer treatment.





Miracle of CAR-T : Emily Whitehead – First Pediatric Patient to Receive CAR T-Cell Therapy, Celebrates Cure 11 Years Later

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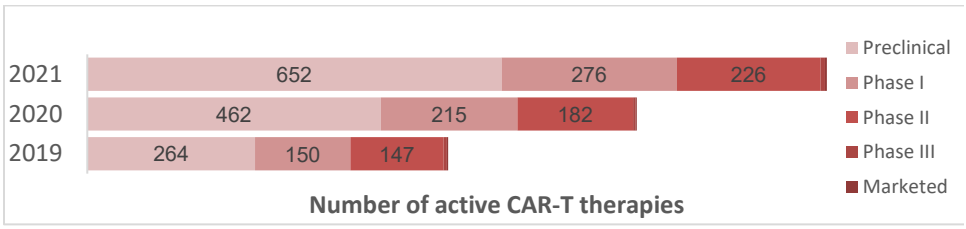
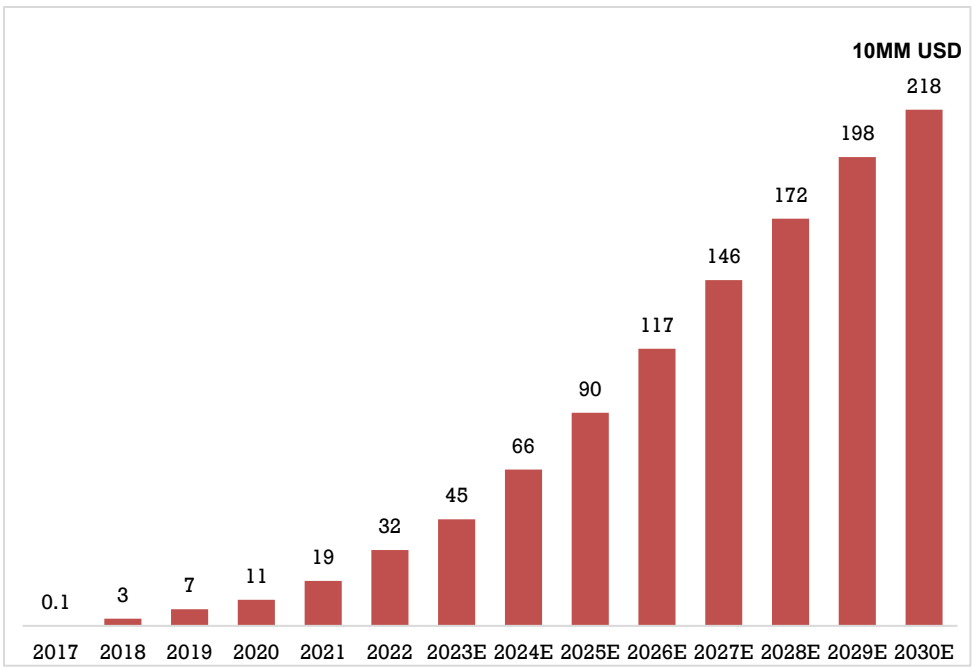
Cell Therapy Market





Historical and prospective market size for cell therapy

Source:Frost&Sulliva

The cell gene therapy market is experiencing significant growth and is projected to expand in the coming years. In recent years, several cell gene therapies have gained regulatory approval, including CAR-T therapies for certain types of leukemia and lymphoma. These approvals have contributed to the growth of the cell gene therapy market.

Tofflon Life Science Division

Tofflon Life Science Division was first established in 2015 and since its inception, several milestones have occurred along the road-map including the development, launch and sales of GMP cell therapy isolator and honeycomb incubator system in 2017, development and sales of wave bioreactor systems in 2019 and establishment of single-use consumables and bioreagents (culture media) manufacturing facilities in 2020 and 2021 respectively. Our Biological Cell Laboratory built in 2016 is a supporting laboratory for product development and verification of life science instruments and equipment and also a dedicated platform for R & D of CGT research and application of key reagent and consumables. It undertakes the task of developing key reagent consumables and provides cooperative development and product application transformation of biotechnology and related products.





Key Equipment Introduction

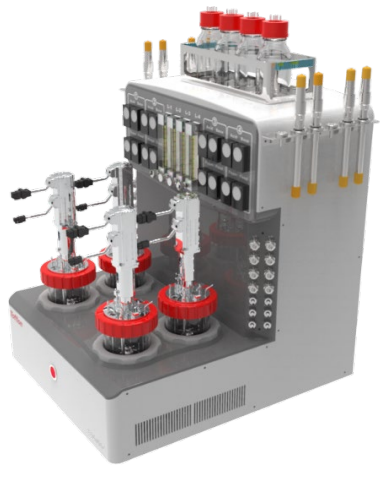
GMP Cell Therapy Isolator

The necessary equipment required for cell preparation, such as centrifuge, shaker, incubator, water bath, microscope, etc., are configured in this A-level working environment (meeting ergonomic design) according to the customer's process ensuring ease of operations. It provides aseptic guarantee for the whole process of cell preparation, cell separation, extraction, activation, sampling, culture, fluid change, observation and collection on the system equipment and is combined with our cell drug GMP management system. It is a cell drug manufacturing equipment with strong practicability, GMP compliance and ergonomic requirements for the mass production of cell therapy drugs. The GMP cell drug preparation station is also suitable for the application of clinical trials of cell therapy products.



Parallel Bioreactor System

Tofflon PBS parallel bioreactor system is widely used in many fields such as process screening and validation, initial culture of strains or cells, and can create an application system composed of "convenient, efficient and safe" biological fermentation process and related comparative data. Each reactor is provided with an independent temperature control module, a stirring system and other component units, so that each reactor can be independently operated at different temperatures and stirring speeds, and the screening and verification of test conditions and the optimization of reaction conditions are accelerated.



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Single Use Fixed Bed Bioreactor System

Tofflon SuBed-C Single-Use fixed bed reactor is applied to the fields of biopharmaceutical vaccine production, cell therapy, gene therapy and much more. This bioreactor is the perfect assistant related to the preparation of adeno-associated virus (AAV), lentivirus (LV), adenovirus (Adeno), oncolytic virus (Oncolytic) and other viruses. It occupies a small area of 2 m2, and can express a culture area of 500 m2, which is equivalent to 3000 culture spinner bottles (1700 cm2/bottle) and the Kla of the equipment can be greatly improved by using the water curtain oxygen exchange technology.



Single Use Cell Processor – TCell Pro

Tofflon Single-Use cell processing system (TCell Pro) is a fully enclosed and automated cell processing system, which can meet the GMP requirements in the environment above Grade C. It can be used for the research, development or production of cell products, improve the development process of cell products, and provide Single-Use solutions for the research and development of cell products. It adopts the principle of axial density gradient centrifugation, controls the flow rate and flow direction of the test solution through a special gas path control mode and a pipeline steering device, and enables the automatic processing of cell products.



Controlled Rate Freezer

Successful cryopreservation of biological samples depends on the rate of freezing, precise temperature control, and reasonable temperature gradient. When the temperature is below -90 ℃, most of the biological samples can be directly transferred to liquid nitrogen for long-term storage. In the process of cell freezing, liquid water turns into ice, cell metabolism stops, and at the same time, water is lost, which leads to the change of intracellular salt and metabolite concentration, and then causes osmotic pressure imbalance, which directly affects the recovery of frozen cells.

At the same time, if the rate of freezing is too fast or too slow, this can easily lead to the loss of water in cells or the formation of large ice crystals, affecting the survival rate of cells. Different cells and their solutions have different requirements for the temperature control and rate of the cooling process.

Through the use of controlled rate freezer instrument, the appropriate cryoprotectant selected for different cells, and the appropriate heating and cooling rate set; this can effectively overcome the above adverse factors.

CSS – Fluid Handling Platform

Tofflon CSS fluid handling platform uses a process combined with Single-Use consumables to achieve high-throughput, accurate, fast and reliable closed and fully automatic aseptic dispensing. The system consists of a stock solution mixing unit, a semiconductor temperature control unit and a multi-station sub-packaging unit, which can be customized according to the actual process requirements of customers. The system is mainly used in the packaging of pharmaceutical and medical industries universal cell products such as UCar-T, Car-NK and mRNA vaccines.



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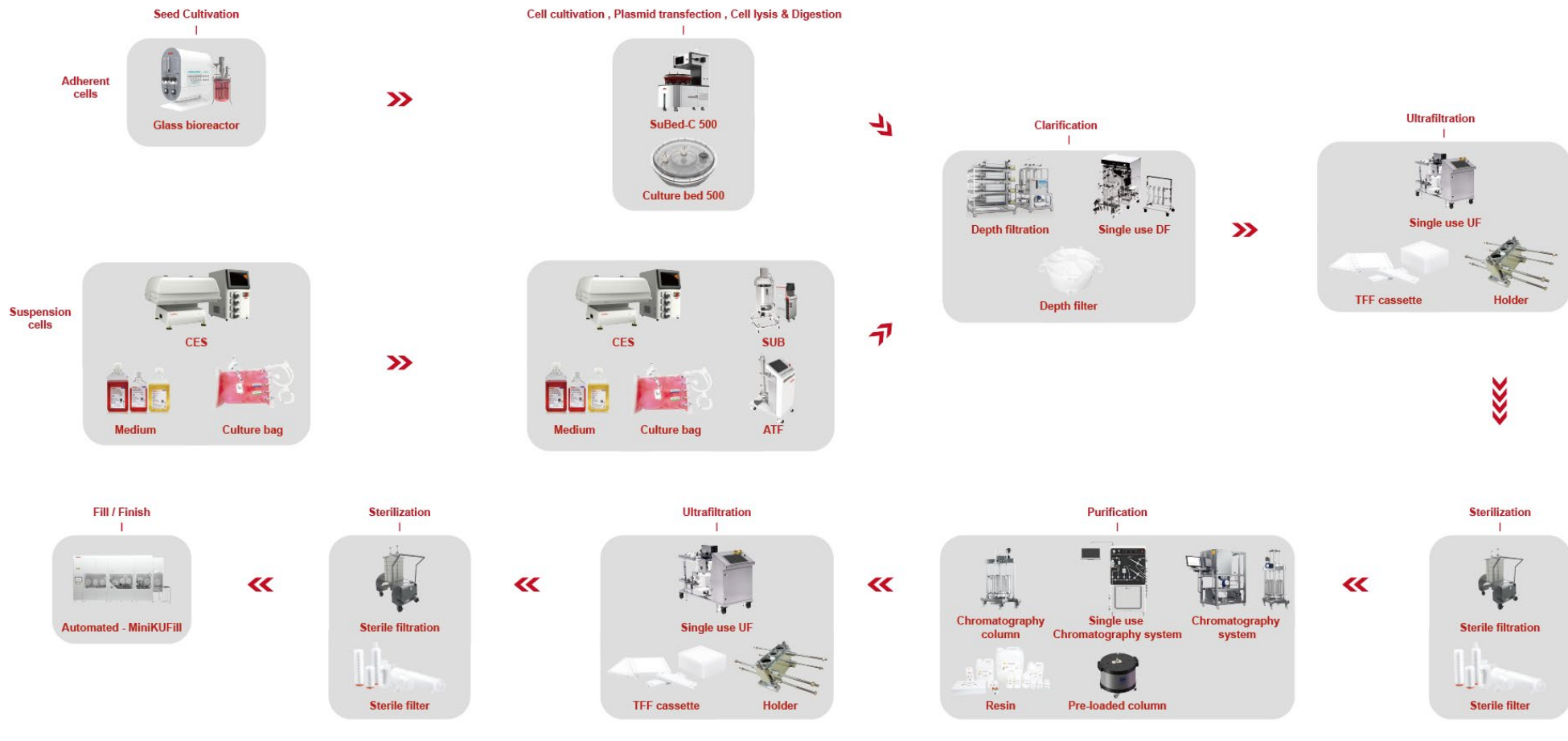
Tofflon Total & Integrated Solutions Platform

Plasmid Preparation Platform



Viral Vector Preparation Platform



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