

EVE™ HT FL: Elevating CAR-T through High Throughput Precision

Immune cell therapy, particularly CAR-T cell therapy, utilizes the body's immune system to combat diseases, primarily cancer. CAR-T cells are genetically modified T cells designed to target and destroy cancer cells. In the manufacturing process of CAR-T, high-throughput fluorescence Cell Counters like EVE™ HT FL play a crucial role. They assess cell viability, enumerate CAR-T cells, ensure quality control of starting material, optimize culture conditions, determine optimal harvesting time, detect contaminants, and facilitate data documentation for regulatory compliance, enhancing efficiency and quality in CAR-T manufacturing.

In summary, EVE™ HT FL enhances efficiency and quality in CAR-T manufacturing, contributing to the success of this personalized immunotherapy.

Cell Therapies: Tissue cell therapy, Immune cell therapy, and Stem cell therapy

Cell therapies encompass tissue cell therapy, immune cell therapy, and stem cell therapy. In biomedicine, they stand as distinct fields, with cell therapy further divided into tissue-cell therapy, immune cell therapy, and stem-cell therapy. Gene therapy, on the other hand, is categorized into immune cell gene therapy and stem cell gene therapy. This discussion focuses on immune cell therapy, specifically CAR-T, and how high-throughput fluorescence Cell Counters such as EVE™ HT FL are applied in CAR-T manufacturing.

What is Immune Cell Therapy?

Immune cell therapy, also known as immunotherapy, is a medical approach that utilizes the body's immune system to combat diseases, particularly cancers and immune-related disorders. This personalized treatment involves extracting a patient's immune cells, genetically modifying them in the laboratory to enhance their targeting abilities, and reintroducing them into the patient's bloodstream. Its applications extend to new drug development, toxicology testing, and biomarker research. Notable examples include CAR-T cell therapy, where engineered T cells specifically target and destroy cancer cells. Immune cell therapy offers precision medicine tailored to an individual's immune profile and has shown remarkable success in certain cancers, opening new possibilities for treating previously challenging conditions. Ongoing research aims to expand its applicability and optimize safety and efficacy.

What is CAR-T Cell?

CAR-T cells are T cells that undergo genetic modification to create an artificial T-cell receptor. This innovative immunotherapy aims to enhance the ability of T cells to identify and eliminate cancer cells. The process involves extracting T cells from individuals, altering them genetically, and then reintroducing the engineered CAR-T cells into patients to target and destroy tumors more effectively. These CAR-T cells can either come from the patient's own blood (autologous) or from a healthy donor's T cells (allogenic). To ensure safety, CAR-T cells are designed to specifically recognize antigens

present on tumors but not on healthy cells.

EVE™ HT FL: Efficient, Accurate, and High-Throughput Solutions for CAR-T Products

When working with cells like PBMCs or T-cells, accurate assessment of cell concentration and viability is essential for maintaining quality throughout subsequent procedures. Cell counting in these kinds of samples becomes a challenging task due to common contaminants like red blood cells and non-cellular debris, introducing complexities such as time consumption, subjectivity, and a higher likelihood of errors.

The EVE™ HT FL is a high-throughput automated fluorescence cell counter equipped with bright field and two fluorescence channels (AO/DAPI).

AO (Acridine Orange) and DAPI (4', 6-diamidino-2-phenylindole) are fluorescent dyes that bind to DNA, staining the nucleus of targeted cells. AO is a permeable dye that stains the nucleus of all cells, regardless of the cell's condition. DAPI is an impermeable dye that only stains the nucleus of non-viable cells with damaged membranes.

To accurately evaluate the viability of cell types like PBMCs or stem cells, it is advisable to use dual-fluorescence staining. This method effectively excludes non-nucleated cells (e.g., RBCs), platelets, and debris from the samples. In just 3 minutes, up to 48 samples can be counted and analyzed.

How Can EVE™ HT FL be Applied in the Manufacturing Process of CAR-T?

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1. Cell Viability Assessment

EVE™ HT FL, a high throughput fluorescence Cell Counter, enables quick and accurate determination of the percentage of viable CAR-T cells, in other words, real-time monitoring of cell viability. Moreover, it allows for real-time monitoring of cell growth and proliferation. In CAR-T manufacturing, where a large number of T cells are often needed, this capability is crucial for ensuring the overall quality of the final CAR-T product. By tracking these parameters, researchers can optimize culture conditions to ensure the production of a sufficient number of viable CAR-T cells.

2. Enumeration of CAR-T Cells

EVE™ HT FL streamlines the enumeration process of CAR-T cells. By automating cell counting, it excels in enumerating total cell counts, including both viable and non-viable cells, further facilitating the determination of cell concentration. This allows for accurate seeding of cells during various stages of the manufacturing process. This is crucial for maintaining the desired cell density and optimizing downstream processes.

3. Quality Control of Starting Material

The success of CAR-T therapy is highly dependent on the quality of the starting T cell population. EVE™ HT FL facilitates a comprehensive evaluation of cellular morphology, size, and overall quality. Ensuring that the starting T cells meet predetermined criteria is essential for consistent and effective CAR-T production.

4. Optimization of Culture Conditions

Continuous monitoring of cell cultures provides insights into the effects of different culture conditions on CAR-T cell growth and health. Researchers can use this information to optimize media composition, incubation parameters, and other variables, leading to enhanced CAR-T cell production efficiency.

5. Determination of Optimal Harvesting Time

EVE™ HT FL aids in determining the optimal harvesting time for CAR-T cells. By monitoring cell viability during the culture period, researchers can identify the point at which the cells exhibit maximum viability and are most suitable for harvesting, optimizing the overall manufacturing timeline.

6. Detection of Contaminants or Abnormalities

AO/DAPI staining can highlight contaminants or abnormalities within the cell population. Deviations in cell morphology or the presence of unwanted cell types can be quickly identified, allowing for corrective actions to be taken to maintain the purity of the CAR-T cell product.

Conclusion

In conclusion, EVE™ HT FL can be applied in CAR-T manufacturing, offering capabilities for assessing cell viability, enumerating cell counts, monitoring cell growth, and ensuring the overall quality of the CAR-T cell product. Its high-throughput nature contributes to the efficiency and success of the manufacturing process, ultimately impacting the therapeutic efficacy of CAR-T cell therapies.

Source: <https://www.eve-ht.com/post/cell-counting-methods-andinnovation>