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Personalised Cell Therapy for Cancer Treatment

Automation of CAR-T-Cell therapies by Fraunhofer IPA and Festo

At Next-Gen Life Science Automation, Festo is researching new solutions for medical technology and laboratory automation. At Hannover Messe 2026, Festo and Fraunhofer IPA will be demonstrating the construction of a cassette for the process step of modifying cells in CAR-T cell therapy. Automation significantly reduces production times and costs, making customised cancer therapies faster, cheaper and available to more patients.

Cancer remains one of the greatest challenges in medicine. Standardised treatments are not always successful, as tumour diseases vary biologically. A drug that helps one patient may have little effect on another. The alternative is CAR-T cell therapies - CAR stands for chimeric antigen receptors. These therapies take a personalised approach: the patient's own immune cells, known as T cells, are removed, modified, multiplied and returned so that the immune system can fight the cancer cells itself. This individualised treatment approach promises greater efficacy and fewer side effects. In addition, the therapy only needs to be carried out once.

However, the therapy is only available to a limited extent due to its complexity, manual production and high costs. The Fraunhofer Institute for Manufacturing Engineering and Automation (IPA) has therefore developed an automation concept for small, decentralised production systems for the treatment of immune cells using technology from Festo. These modular mini-factories could be operated at university hospitals, for example, work largely automatically and require hardly any specialised personnel.

Faster, cheaper and higher availability through automation

Automation significantly reduces production times and costs, making CAR-T therapies faster, cheaper and available to more patients. The mini-factories consist of various modules that the cassettes pass through step by step. One cassette is required per patient for each process step of the therapy, in which the T cells undergo the necessary treatments. In the cassette for the process step for modifying the cells, automation components from Festo ensure precise fluid transport in a very small installation space. The cassette contains a self-contained and sterile fluid system that contains all the elements needed to modify the cells. The elements themselves are passive. They are operated from the outside when the cassette is inserted into one of the modules of the mini factory.

In the cell culture chamber, the T cells are brought into contact with viruses that introduce genetic material with the blueprint for so-called CAR receptors. This causes the T cells to produce special CAR receptors and become CAR T cells. The various media must be precisely dosed into the cell culture chamber, mixed and tempered.

Diffusion bonded manifolds: compact manifold plates for precise fluid control

Fluid transport is handled by a diffusion bonded manifold from Festo. The manifold block contains a channel system and connects all areas of the cassette via it. Valves are integrated into the manifold, which are switched externally via a control air to establish the connection between individual elements.

The fluid movement works by pushing and pulling with compressed air or vacuum. Thanks to intelligently controlled compressed air, even the smallest quantities can be precisely dosed and transported within the cassette - and in the smallest possible installation space. To be able to use the cassette for other patients afterwards, only the elements that have been in contact with the cells and viruses need to be replaced. The system is designed so that this can be done in a few simple steps and outside of a cleanroom.

Diffusion Bonded Manifolds from Festo: Nominated for the Hermes Award 2026

Festo is among the three nominees for the Hermes Award 2026 with its Diffusion Bonded Manifolds. The Hermes Award is one of the world's most prestigious industry prizes and is presented at the Hannover Messe for outstanding innovation - products and solutions with a particularly high degree of technological innovation.

Festo as an automation partner for life sciences

With flexible automation solutions, Festo supports the transfer of innovative therapies into clinical practice and makes state-of-the-art biotechnology available where it is needed. With the help of its product portfolio of pneumatics, electrics, software and AI, Festo realises the perfect seamless automation solution together with the customer. www.festo.com/lifetech

Immagini stampa



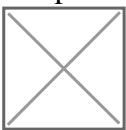
Exhibit CAR-T-Cell

The exhibit shows the construction of a cassette for the modification of cells in CAR-T cell therapy components from Festo.



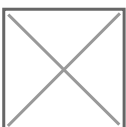
Exhibit CAR-T-Cell front

The exhibit shows the construction of a cassette for the modification of cells in CAR-T cell therapy components from Festo.



Collaboration between Festo and Fraunhofer IPA

Fraunhofer IPA has developed an automation concept for the cassette to modify the cells with technology from Festo.



Cassette

The cassette contains a self-contained and sterile fluid system that contains all the elements needed to modify the cells.