BiTE technology

According to the International Agency for Research on Cancer, the number of new cancer cases worldwide in 2020 was estimated at around 19.3 million. Bispecific T-cell engagers (BiTE molecules) are an important weapon in the fight against cancer. The technology behind this, namely the BiTE technology, uses the activity of the body's own immune cells for the targeted elimination of tumour cells.

But how exactly does BiTE technology work?

Thanks to its T-lymphocytes, the human body is able to identify cancer cells and destroy them on its own. However, tumour cells develop individual mechanisms to avoid being recognised and destroyed. At this point, BiTE molecules intervene by binding to both T cells and tumour cells and linking the two cell types. In this way, it can be ensured that the T-cells attack and eliminate the tumour unerringly, while surrounding healthy tissue remains largely spared. Since the BiTE molecules merely serve as a link between the two cell types, the technology is referred to as a strategy of targeted immuno-oncology.

In the production of the artificial BiTE molecules, parts of two natural antibodies are joined together, which enables the antibody construct to bind simultaneously and specifically to two different cell types. It is on the basis of this construction that the term „bispecific" originates. One arm of the molecule binds to a protein on the surface of the T-cells (T-receptor) and the other arm binds to the specific tumour protein (tumour antigen). The only prerequisite is that the selected tumour antigen is produced in large numbers by the tumour cells, because only then is it on the surface of the tumour stem cells and can be eliminated as the source of origin.

INNOVATIVE TECHNOLOGICAL APPROACH

- **Company:** Amgen GmBH
- **Technological basis:** BiTE molecules
- **Field of application:** cancer therapy
- **Advantages:** targeted elimination of tumour cells

  Building long-lasting memory of T cells to reduce relapses
- **Website:** https://www.amgen.de/

The greatest effect is seen when BiTE molecules bind to cytotoxic T cells. When these cells are activated, they secrete various proteins and cytokines, triggering reliable cell death of the cancer cell. After the elimination of a cancer cell, this immune cell turns directly to the destruction of the next tumour cell and multiplies simultaneously to maximise the immune attack. The advantage of the resulting new immune cells is that they do not necessarily require a BiTE molecule, but automatically recognise the deadly tumour cells and form a long-lasting memory to effectively destroy recurring cancer cells in the future, thus reducing the likelihood of recurrence.

The future of BiTE molecules

An optimisation approach now consists in the challenge of extending the half-life of the BiTE molecules. As these have so far been extremely small in size, they are degraded by the kidneys within hours and thus have to be continuously administered to the respective patients via infusions.

With the current state of science, the structure of the BiTE molecules can already be enlarged. To do this, part of a natural antibody is attached to the molecule without changing the activity. This results in so-called HLE-BiTE molecules (half-life-extended), which are protected from a variety of physical degradation mechanisms.